Draft Final

Remedial Investigation/Feasibility Study

Jeld Wen / Former Nord Door Facility
300 West Marine View Drive
Everett, Washington 98201

Prepared For:
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Klamath Falls, OR

and

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PROFESSIONAL CERTIFICATION

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ACRONYMS

2,3,7,8-TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
ARARs	applicable or relevant and appropriate requirements
ARI	Analytical Resources Inc.
AS	Air sparging
AST	above ground storage tank
bgs	below ground surface
BMP	Best Management Practice
BNSF	Burlington Northern Santa Fe
BSAF	biota/sediment accumulation factor
BTEX	benzene, toluene, ethylbenzene, total xylenes
CAP	Cleanup Action Plan
CFR	Code of Federal Regulations
CHP	catalyzed hydrogen peroxide
cm	centimeters
COPC	contaminants of potential concern
Corps	U.S. Army Corps of Engineers
cPAH	carcinogenic polycyclic aromatic hydrocarbons
CSL	cleanup screening level
CSM	conceptual site model
CWA	Clean Water Act
DCA	Disproportionate Cost Analysis
DMMP	Dredged Material Management Program
DNS	determination of non-significance
dw	dry weight
EA	exposure area
Ecology	Washington State Department of Ecology
EIM	environmental information management
EIS	environmental impact statement
EMC	Everett Municipal Code
EMNR	enhanced monitored natural recovery
EPA	Environmental Protection Agency
FS	feasibility study
HCID	hydrocarbon identification
HDPE	High-density polyethylene
HPA	hydraulic project approval
IDW	inverse distance weighting
IHS	Indicator Hazardous Substances
ISCO	In-Situ Chemical Oxidation
mg/kg	milligrams per kilogram
ng/kg	nanograms per kilogram
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
MDL	method detection limit
MNA	monitored natural attenuation

ACRONYMS (CONTINUED)

MNR	monitored natural recovery
MTCA	Model Toxics Control Act
MW	monitoring well
NRCS	National Resource Conservation Service
NWP	Nationwide Permit
OC	organic carbon
OMM	operations, monitoring and maintenance
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
pCi/g	picocuries per gram
PCL	preliminary cleanup level
PCP	pentachlorophenol
PHS	priority habitat species
POTW	publicly-owned treatment works
PQL	practical quantitation limit
PSCAA	Puget Sound Clean Air Agency
QAPP	quality assurance project plan
RCW	Revised Code of Washington
RAL	Remedial action levels
RI	remedial investigation
SAP	sampling and analysis plan
SCO	sediment cleanup objective
SCUM II	Sediment Cleanup User's Manual II
SEPA	State Environmental Policy Act
SLV	screening level values
SMA	sediment management area
SMS	Sediment Management Standards
SMP	Shoreline Master Program
SVE	soil vapor extraction
SVOC	semi-volatile organic compounds
SWAC	surface weighted average concentration
TEE	Terrestrial Ecological Evaluation
TEF	toxic equivalency factor
TEQ	toxic equivalency quotient
TOC	total organic carbon
TPH	total petroleum hydrocarbons
TPH-Gx	total petroleum hydrocarbons as gasoline
TPH-Dx	total petroleum hydrocarbons as diesel
TVS	total volatile solids
USC	United States Code
UST	underground storage tank
VOC	volatile organic compound
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife

ACRONYMS (CONTINUED)

WDNR	Washington Department of Natural Resources

EXECUTIVE SUMMARY

This report presents revisions to the 2020 Revised Draft Remedial Investigation (RI) and Feasibility Study (FS) of the former E.A. Nord, Inc, door facility (through its successor, JELD-WEN, Inc. [JELD-WEN]) located at 300 West Marine View Drive, Everett, Washington, 98201 (Site). In accordance with the requirements of the 2008 Agreed Order Number DE 5095 between JELD-WEN and the Washington State Department of Ecology (Ecology), this RI/FS report summarizes the findings of soil, groundwater, seep water, soil vapor, sediment porewater, and bulk sediment investigations performed at the Site. The objective of the RI was to collect the data necessary to adequately characterize the Site for the purpose of developing and evaluating cleanup action alternatives. The purpose of the FS was to develop and evaluate cleanup action alternatives to enable a cleanup action to be selected for the Site.

JELD-WEN no longer owns the Site property. Historically, JELD-WEN owned five adjoining parcels with a combined upland area of approximately 36 acres, as well as adjacent tidal mudflats which were sold to W&W Everett Investments LLC in December 2013. Properties surrounding the W&W Everett Investments LLC-owned property include parcels owned by the Port of Everett, the City of Everett, the Burlington Northern Santa Fe (BNSF) railroad, and Wick Family Properties LLC.

Historical activities at the Site have included casket manufacturing, pole treating, fish net storage, and wood door and sash manufacturing. JELD-WEN acquired certain assets, including the real property of the E.A. Nord, Inc, door plant, in May 1986 through the bankruptcy court. JELD-WEN operations included the purchase of rough green wood; drying, planing and cutting the lumber; and assembly of finished wooden doors, rails, posts, columns, and spindles. Operations at Nord Door ceased in 2005. Several asphalt operations (currently Cadman, formerly CEMEX, Rinker Materials, and Sterling Asphalt) have leased the northwest portion of the Site since the mid-1990s and has operated this portion of the Site as an asphalt batch plant through the present.

Numerous investigations were completed at the Site between 1991 and 2019. These prior investigations identified areas of soil, groundwater, and soil vapor impacts exceeding Washington State Model Toxics Control Act (MTCA) cleanup levels and sediments exceeding Sediment Management Standards (SMS) cleanup levels for certain chemicals.

On January 2, 2008, JELD-WEN and Ecology entered into Agreed Order No. DE 5095 to prepare an RI/FS and Cleanup Action Plan (CAP) for the Site, consistent with MTCA (Chapter 173-340 Washington Administrative Code [WAC]) and SMS (Chapter 173-204 WAC) requirements. The findings of this 2020 Revised Draft RI/FS are summarized below.

Upland RI Findings

The upland RI identified the primary sources of upland contamination to be generally associated with three historical Site operations areas: fuel oil storage and pole treating using creosote on the eastern edge of the Site and below West Marine View Drive (Creosote/Fuel Oil Area), wood surface treating using Woodlife wood treatment solution in the northeast corner of the Site (Woodlife Area), and historical filling activities in the southern portion of the Site (Knoll Fill Area). Soil and groundwater impacts associated with these source areas were characterized in the

upland RI. Additional potential isolated source areas that were identified in the October 2016 RI/FS have subsequently been further assessed and proposed cleanup of the isolated areas identified in the October 2016 RI/FS were not carried forward to the FS in this 2020 Revised RI/FS report. A summary of assessment areas is presented on Table ES-1.

Creosote/Fuel Oil Area

Pole treating activities were conducted in the Site uplands by National Pole Company prior to the 1940s. By the mid-1940s the Site was operated by Nord Door as a stile and rail door plant. The Nord Door facility operated an oil-fired boiler on the eastern portion of the Site prior to 1957. Former fuel oil aboveground storage tanks (ASTs) were located in the eastern portion of the Site along West Marine View Drive and also further to the west, beneath what is now the southern portion of the main manufacturing building. These ASTs were removed in the mid-to late-1950s.

The former pole treating activities and fuel oil ASTs are considered primary sources of total petroleum hydrocarbons (TPH), carcinogenic polycyclic aromatic hydrocarbon (cPAH), semi-volatile organic compound (SVOC), and volatile organic compound (VOC) (naphthalene and benzene) contamination to soil and groundwater at the Site. Upland areas with elevated concentrations of these chemicals occur along the eastern portion of the Site, extending beneath West Marine View Drive, at depths generally between 3 and 15 feet below ground surface (bgs), except for areas of the former creosote tank operations (eastern portion of the existing warehouse) where impacts have been identified to approximately 50 feet bgs. The fuel oil and creosote impacts are primarily located below buildings or pavement. Groundwater data collected during the RI/FS shows groundwater migration and/or seepage to surface water does not appear to be a significant release mechanism for transport of creosote and/or fuel oil impacts.

The former pole treating activities and fuel oil ASTs are also considered primary sources of naphthalene contamination measured in soil gas at the Site. Upland areas with elevated concentrations of naphthalene in soil gas occur beneath the eastern portion of the existing former main manufacturing building or paved parking areas.

Woodlife Area

An approximately 10,000-gallon AST containing Woodlife wood treatment solution (which contained pentachlorophenol [PCP]) was formerly located northeast of the main manufacturing building. The use of the Woodlife AST was discontinued prior to JELD-WEN's purchase of the Site in 1986, and the AST was removed in 1991. The former Woodlife storage and use area was identified as a historical source of dioxins/furans and PCP impacts to soil and groundwater at the Site. Elevated concentrations of these chemicals were generally limited to shallow depths (from the surface down to 5 feet bgs) and are also primarily located beneath buildings or pavement in the eastern corner of the Site. Groundwater data collected during the RI/FS shows groundwater migration and/or seepage to surface water does not appear to be a significant release mechanism to transport of dioxins/furans. Assessment of the stormwater sump in the North Truck Dock identified localized groundwater impacts. The weep holes in the stormwater sump and associated potential transport mechanisms were addressed shortly after the assessment of the North Truck Dock drainage.

Knoll Fill Area

Lands west of the BNSF railroad were created by filling of the tidal delta at the confluence of Snohomish River and Possession Sound. The earliest fill records are not available; however, historical aerial photographs show filling activity along the shoreline to the south of the former Nord Door facility from at least 1938 through the late 1970s. Between 1955 and 1967, a majority of the southern portion of the Site had been cleared and filled. Additional fill activities occurred between 1967 to 1978 that included development of the southern shoreline to its current extent and additional fill in the Knoll Area to create the existing "knoll" feature.

Due to the nearshore area adjacent to the Knoll Area being identified as an area of sediment impacts for polychlorinated biphenyls (PCBs), upland investigations were conducted in the Knoll Area. Groundwater from monitoring wells as well as in groundwater seeps measured Total PCB congeners above groundwater PCLs. Soil sample analytical results for Total PCB congeners do not seem to indicate the current bank or surface soil (0-12 feet bgs) in the Knoll Area to be a source of the PCBs in groundwater. Surface soils before 1967 to 1978 fill activities (now saturated soils below 12 feet) may have been contaminated with PCBs. Results from the SPME sampling indicate groundwater PCBs do not seem to be a source to sediments contaminated with PCBs but rather that sediment PCBs could be a source of PCBs in Knoll Area groundwater due to tidal mixing.

The RI demonstrated that potential exposure pathways to upland Site contaminants are limited to current and future industrial workers and current and future construction workers with the Knoll Fill Area groundwater contaminants addressed with the marine sediment FS alternatives.

Marine Sediment RI Findings

Chemicals of concern identified in Site marine sediments are primarily defined by PCBs and dioxins/furans. The extent of PCBs and dioxins/furans were used to define the site boundary. Wood and cPAHs have also been identified as contaminants of potential concern; they are generally co-located with PCBs and/or dioxins/furans.

Elevated concentrations of total PCBs were detected in surface sediments (0-2 feet below mudline) in tidal mudflats adjacent to the undeveloped Knoll Area at the southeastern corner of the Site. Sampling of Site upland soils and the exposed bank has not revealed a source of PCBs to the marine area. Groundwater and porewater sampling have also not identified an active source or complete transport pathway to sediments. Fill material used to construct the uplands, the Knoll Area, and upper intertidal sediment areas, or spills prior to filling, are suspected sources of the PCBs characterized in the surficial sediment matrix.

Elevated concentrations of dioxins/furans were detected in surface and subsurface sediments in tidal mudflats immediately adjacent to historical and/or current stormwater outfalls draining upland areas of the Site. Elevated sediment concentrations adjacent to outfalls are present within mudflats both north (inlet area) and south of the upland property. Elevated dioxin/furan concentrations were detected at greater depths (up to 7 feet below mudline) than the total PCBs. The primary source of dioxins/furans to Site sediments is likely from former area-wide hog fuel burner emissions and/or upland manufacturing activities. Localized atmospheric deposition from hog fuel burner emissions would ultimately be transported to the current and/or former stormwater outfalls by precipitation and runoff from impervious upland surfaces and by direct atmospheric deposition. Some areas where stormwater draining upland areas of the Site historically

discharged to surface sediment via outfall may have subsequently become buried as a result of the periodic filling events that created the current upland footprint of the Site. Overwater activities (e.g. log rafting and log handling) resulted in deposition onto surface sediments.

In addition to PCBs and dioxins/furans, wood debris (as measured by total volatile solids testing [TVS]) and cPAHs are also addressed in the RI/FS. Region-wide historical wood industry operations have resulted in the presence of wood in the marine areas throughout the Everett waterfront. Creosote-treated structures have also been identified as potential sources of cPAHs, the extent of SMS chemical exceedances is generally encompassed by the extents of PCBs and dioxin/furan impacted areas. The boundary of the Site is defined by total PCBs and dioxins/furans. Further assessment of the wood (which may be measured by TVS, visual observation, breakdown products, or other methods) and cPAH toxic equivalency quotient (TEQ) may be required to evaluate compliance with MTCA and SMS regulations in pre-remedial design investigations or during long-term post-construction monitoring, where required, within the marine Site boundary.

A total of approximately 16.6 acres of tidal mudflats in the Site area exceed preliminary SMS sediment cleanup objectives for PCBs and/or dioxins/furans. Detailed radioisotope analyses revealed that sediments in these areas have been stable (i.e., minimal vertical sediment mixing) over the past 60 to 70 years. The radioisotope data also revealed that bioturbation is limited to less than 0.3 feet; however, because clams may burrow deeper than 0.3 feet, the preliminary SMS point of compliance for marine sediments at the Site is 1 foot below mudline.

Dietary ingestion of fish and shellfish is the primary exposure route through which human receptors may potentially be exposed to sediment contaminants at the Site. Potential receptors include recreational and/or tribal subsistence fishers. The ecological risk assessment concluded that there are unlikely to be risks to wildlife that forage for clams adjacent to the Site.

Upland Feasibility Study

Based on the upland RI findings and consultation with Ecology, the upland FS alternatives were developed for two assessment areas: Creosote/Fuel Oil Area and the Woodlife Area. The Knoll Fill Area is an assessment area discussed in the RI and the groundwater contaminants are addressed with the marine sediment FS alternatives.

Groundwater at the Site is not a current of future source of drinking water and this is discussed in further detail in Section 5.2. The upland FS alternatives were developed based on area specific exposure pathways and the associated preliminary cleanup levels. Upland cleanup alternatives have been prepared for each assessment area with detailed MTCA evaluations of each alternative.

Creosote/Fuel Oil Area

Affected media in the Creosote/Fuel Oil Area include soil, groundwater, and soil gas. FS alternatives for the Creosote/Fuel Oil Area were developed by considering distinct areas that require cleanup action: on-property vadose zone; on-property shallow groundwater (to 15 feet bgs); on-property deep groundwater; off-property vadose zone; off-property shallow groundwater (to 15 feet bgs); and, off-property deep groundwater. Based upon the specifics of the assessment area (access, depth of contamination, potential receptors, feasibility, etc.) remedial actions retained as FS alternatives for the Creosote/Fuel Oil Area include combinations of remediation

technologies. Those technologies include: sub-slab depressurization (SSD), soil vapor extraction (SVE), in-situ chemical oxidation (ISCO), in-situ bioremediation (ISB), soil removal, thermal treatment (via steam injection), and in-situ stabilization / solidification (ISS). The following seven alternatives were evaluated for this area:

- Alternative 1: SSD, Engineering Controls, and Institutional Controls
- Alternative 2: ISB and SSD
- Alternative 3: ISCO and SSD
- Alternative 4: Soil Removal and ISB
- Alternative 5: Thermal Treatment
- Alternative 6: In-Situ Soil Stabilization/Solidification and Thermal Treatment
- Alternative 7: Hotspot Soil Removal and ISB

Alternative 1 does not meet minimum MTCA requirement for cleanup as this alternative would leave contamination in place with long-term engineering and institutional controls, would not use permanent solutions to the maximum extent practicable and would not provide for a reasonable restoration timeframe (WAC 173-340-360(2)). Therefore, Alternative 1 is not scored for any benefits criteria and is not presented in the DCA process.

Alternative 4, which would excavate and remove most contaminated soils from the subject property, provides the greatest degree of permanence and has the highest overall benefit among all the practicable alternatives evaluated. As such, Alternative 4 is the baseline cleanup alternative against which cleanup action alternatives were compared. Alternative 4 was found to be disproportionately costly to the next most permanent cleanup, Alternative 7, which would remove hotspot shallow soils from the property and employ bioremediation for the rest of the area. Alternative 7 becomes the most permanent cleanup to the maximum extent practicable as this alternative is not disproportionately costly to the next most permanent Alternative 5, which uses thermal treatment and provides less environmental benefit with higher implementation cost.

Alternative 2, which would rely on biological treatment for the entire area, is the least costly alternative. This alternative suffers from a lesser degree of certainty, permanence, and effectiveness over the long term when compared with Alternative 7. In addition, Alternative 7 results in quicker risk reduction due to mass removal contaminants within a shorter timeframe compared to longer restoration timeframe necessary for biological treatment. The other remaining alternatives (Alternative 3 & 6) are less permanent and more costly than Alternative 7. Ecology, therefore, has selected Alternative 7 as the preferred cleanup alternative.

Woodlife Area

Affected media in the Woodlife Area include soil and groundwater. FS alternatives for the Woodlife Area were developed by considering the horizontal and vertical delineation of impacts identified during RI sampling activities. Based upon the specifics of the assessment area (access, depth of contamination, potential receptors, feasibility, etc.) remedial actions retained as FS alternatives

for the Woodlife Area include: engineering controls and soil removal. The following two alternatives were evaluated for this area.

Alternative 1: Engineering Controls, Institutional Controls and Long-Term Monitoring

Alternative 2: Soil Removal

Alternative 1: Leaves contamination in place with long-term engineering and institutional controls, would not use permanent solutions to the maximum extent practicable and would not provide for a reasonable restoration timeframe (WAC 173-340-360(2)). Alternative 2, which would permanently remove contaminated soil from the affected area, is the recommended cleanup alternative for the area.

Knoll Area

Affected media in the Knoll Fill Area includes groundwater. Assessment of the Knoll Fill Area identified groundwater contamination by PCBs with no apparent source area in corresponding soil (0-12 feet), but recognition that the groundwater to surface water migration pathway is complete via groundwater seeps. Based upon the specifics of the assessment area (access, depth of contamination, potential receptors, feasibility, etc.) upland remedial actions were not retained as FS alternatives for the Knoll Fill Area and remedial actions protective of potential receptors to groundwater contamination identified in the Knoll Fill Area are proposed as part of the marine sediment FS alternatives.

RI findings indicated PCBs in sediment could be a source to PCBs in the upland groundwater due to tidal action. The marine area recommended alternative (Alternative M5), which is discussed in detail in the marine FS section, would remove a greater volume of the PCB-contaminated sediment near the knoll area compared to other alternatives. Implementation of the M5 remedy in the marine area could result in decreased PCB concentration in the groundwater. Knoll area PCBs will be reevaluated during long term monitoring and periodic review.

Marine Sediment Feasibility Study

Based on the marine sediment RI findings, seven FS alternatives were developed and scored in consultation with Ecology that range from monitored natural recovery (MNR) and source control (i.e. removal of creosote treated pilings, bulkheads and other structures) to full removal. Except for the MNR and source control only approach, all alternatives are designed to meet the threshold criteria at the completion of construction (although a 10-year post-construction recovery period is allowed under MTCA/SMS regulations). Therefore, the highest ranked alternative relative to the MTCA/SMS DCA evaluation should be selected in the Cleanup Action Plan. The seven sediment cleanup alternatives evaluated in this FS include:

- Alternative M1: Source Control and Natural Recovery
- Alternative M2: Engineered Cap On-Grade (throughout SMA-3)
- Alternative M3: Targeted Removal and Engineered Cap (2-foot depth in SMA-3 Southern Shoreline and Engineered Cap On-Grade SMA-3 Inlet)
- Alternative M4: Partial Removal and Engineered Cap (2-foot depth throughout SMA-3)

- Alternative M5: Expanded Partial Removal (2 to 4-foot depth SMA-3 southern shoreline and a portion of SMA-2; 2-foot depth in SMA-3 Inlet) and Engineered Cap
- Alternative M6: Removal Focus (full removal throughout SMA-3)
- Alternative M7: Full Removal (full removal throughout all SMAs)

Alternative M1 does not meet MTCA minimum requirements and was therefore not scored (i.e. it is not protective of human health and the environment, cleanup standards would not be met within a reasonable restoration timeframe).

Alternative M7, removal and off-site disposal of all sediments above cleanup levels, provides the greatest level of permanence. As such, Alternative M7 was the original baseline against which other alternatives were compared to determine which alternative is permanent to the maximum extent practicable. Through the disproportionate cost analysis, Ecology determined that Alternative M7 was disproportionality costly compared to the next most permanent, lower-cost alternatives (Alternatives M5 and M6). Because Alternative M5 provides greater overall benefits than Alternative M6, Alternative M5 became the new baseline alternative. Alternative M5 was then evaluated against the next most permanent and lower cost alternative, Alternative M4. Ecology determined that the incremental benefits of Alternative M5 are not disproportionate to the incremental costs compared to M4 for reasons summarized below.

Alternative M5 includes greater mass removal of sediment hotspot areas than Alternative M4; Ecology anticipates contaminated sediment will be disposed of at a permitted upland disposal facility. The additional removal further reduces risks to humans and animals utilizing the tide flats, including future recreational and tribal subsistence shellfishers. M5 is more resilient to climate change impacts, including more frequent severe storms expected over time, than Alternative M4 as less contaminated material will be left in place along the shoreline. Due to the increased removal and offsite disposal of the most highly contaminated marine sediments, the likelihood of subsequent releases and exposure to contaminants is reduced compared to Alternative M4. Additionally, Alternative M5 removes a greater volume of sediments contaminated with PCBs adjacent to the knoll. The current conceptual site model indicates that marine sediments may be a source of PCBs in groundwater. Implementation of Alternative M5 may result in decreased groundwater PCB concentrations. M5 has a higher degree of certainty that it will be effective over time and is deemed more permanent and protective than Alternative M4.

The incremental decrease in cost between M5 and M4 is not significant enough to justify selection of Alternative M4. Ecology, through its disproportionate cost analysis, determined Alternative M5 to be permanent to the maximum extent practicable. As such, Alternative M5 is preferred.

Alternatives M2 and M3 scored lower in permanence and overall benefits compared to Alternatives M4 through M7. The disproportionate cost analysis excluded these alternatives from consideration as the preferred alternative.

1. INTRODUCTION

In accordance with the requirements of Agreed Order Number DE 5095 between JELD-WEN, Inc. (JELD-WEN) and the Washington State Department of Ecology (Ecology), dated January 2, 2008, SLR International Corporation (SLR) and Anchor QEA, LLC (Anchor QEA) have prepared this 2020 Draft Final Remedial Investigation/Feasibility Study (RI/FS) Report for the former Nord Door facility located at 300 West Marine View Drive, Everett, Washington, 98201 (Site). The Site location is depicted on Figure 1-1.

This Draft Final version of the RI/FS incorporates the revisions necessary to address Ecology's comments from April 30 and November 12, 2020. A summary of the Ecology comments and responses are included in Appendix O.

1.1 OBJECTIVE AND SCOPE OF WORK

The objective of the RI/FS was to collect and evaluate sufficient information regarding potential hazardous substances to enable development of a cleanup action to be selected for the Site, consistent with Washington State Model Toxics Control Act (MTCA; Chapter 173-340) and Sediment Management Standards (SMS; Chapter 173-204) requirements. The scope of work for the RI investigations and FS development were performed in accordance with the following Ecology-approved Work Plans:

- Final Work Plan for Remedial Investigation/Feasibility Study and Draft Cleanup Action Plan (Work Plan); prepared by SLR and submitted to Ecology on October 21, 2008.
- Quality Assurance Project Plan (QAPP), Marine and Maulsby Marsh Sediment Characterization, JELD-WEN Former Nord Door Site, prepared by Anchor QEA and submitted to Ecology in June 2011.
- Phase 2 Remedial Investigation Work Plan, Addendum to Final Work Plan for Remedial Investigation/Feasibility Study and Draft Cleanup Action Plan (Phase 2 RI Work Plan); prepared by SLR and submitted to Ecology on August 9, 2011.
- Amendment to the Phase 2 Work Plan, Addendum to Final Work Plan for Remedial Investigation/Feasibility Study and Draft Cleanup Action Plan (Phase 2 RI Work Plan); prepared by SLR and submitted to Ecology on February 20, 2013.
- JELD-WEN Former Nord Door Site Sediment Quality Assurance Project Plan Addendum, prepared by Anchor QEA and submitted to Ecology on February 14, 2013.
- Draft JELD-WEN Former Nord Door Site Sediment Second Quality Assurance Project Plan Addendum – Feasibility Study Data Gaps, prepared by Anchor QEA and submitted to Ecology on August 20, 2013.
- Second Amendment to the Phase 2 Remedial Investigation Work Plan Addendum to Final Work Plan for Remedial Investigation/Feasibility Study and Draft Cleanup Action Plan; prepared by SLR and submitted to Ecology on November 7, 2013.

- 2nd Amendment to the Phase 2 Remedial Investigation Work Plan, Addendum to Final Work Plan for Remedial Investigation/Feasibility Study and Draft Cleanup Action Plan; prepared by SLR and submitted to Ecology on June 10, 2015.
- Source Control Evaluation (SCE) Work Plan to Address Data Gaps Identified in RI/FS and Draft Cleanup Action Plan; prepared by SLR and submitted to Ecology in December 2017.
- April 2019 Work Plan Addendum to the SCE Work Plan to Address Data Gaps Identified in RI/FS and Draft Cleanup Action Plan; prepared by SLR and submitted to Ecology in April 2019.
- Critical Areas Survey scope of work developed in consultation with Ecology in June 2019.

1.2 GENERAL SITE INFORMATION

The Site consists of five adjoining parcels with a combined land area of approximately 55 acres, which includes approximately 36 acres above the tidal mudflats. For the purposes of this RI/FS, the Site is defined as the former operating areas (i.e. former Nord Door site), on-property refers to the JELD-WEN historically owned property (former operating areas and Knoll Area), and off-property refers to off-site areas including West Marine View Drive, the Burlington Northern Santa Fe (BNSF) right-of-way (ROW) and Maulsby Marsh, as well as other surrounding properties where contaminants potentially associated with historical activities have been identified. Other property owners associated with the upland areas of the Site include BNSF, the City of Everett, and the current property owner Ron Woolworth. Owners of surrounding tidal mudflat areas include Wick Family Properties LLC, Port of Everett, and Foss Redevelopment. Administrative aspects of the Site are summarized below:

Site Name: Jeld-Wen / Former Nord Door Facility

Site Address: 300 West Marine View Drive

City and State: Everett, WA 98201

County: Snohomish

Township/Range/Section: Section 7, Township 29N, Range 5E of the Willamette Meridian

Latitude: 48º 00’ 49.5”

Longitude: 122º 12’ 34.5”

Ecology Facility Site ID Number: 2757

Ecology Region: Northwest Region

Ecology Project Manager: Mahbub Alam, Ecology, Toxics Cleanup Program

Ecology Project Coordinator: Sandra Caldwell, Ecology, Toxics Cleanup Program

JELD-WEN Project Coordinator: Bonnie Basden, JELD-WEN

JELD-WEN Project Manager: R. Scott Miller, SLR

JELD-WEN Sediment Project Manager: Nathan Soccorsy, Anchor QEA

2. SITE DESCRIPTION AND ENVIRONMENTAL BACKGROUND

2.1 SITE LOCATION AND DESCRIPTION

The Site is located at the confluence of the Snohomish River to the north and Port Gardner Bay (Possession Sound) to the west (Figure 1-1). The Site consists of five adjoining parcels (29050700100400, 29050700101200, 29050700400100, 29050700401900, and 29050700402000) with a combined land area (both in-water and upland) of approximately 55 acres.

The structures currently located on the former Nord Door portion of the Site include the following: the main manufacturing building, an office building, a training center building, a maintenance warehouse, a planer building, and two dry kiln buildings (Figure 2.1-1). These buildings have been subject to significant weathering and are not currently occupied. In addition, machinery including a hog fuel bin and other pieces of equipment (most seems to have reached design life) remain outside the northwest portion of the main manufacturing building.

The buildings and surrounding paved areas on the former Nord Door portion of the Site are currently leased to industrial tenants. The former main manufacturing building located on the eastern portion of the Site has remained primarily vacant, with intermittent use as a storage facility. The northeastern portion of the Site (approximately 6.1 acres) is currently leased to Cadman. The Cadman (leased) portion of the Site operates as an asphalt batch plant. The main structures on this portion of the Site include an approximately four-story asphalt building, feeder shed, and a conveyor system. Numerous aggregate piles are located around the perimeter of the Cadman portion of the Site. A conveyor system connects from the barge dock located at the north end of the Site to the aggregate piles. Aggregate is transferred via wheel-loader from the storage piles to feeders located on the north side of the plant. The feeders convey aggregate to the dryers and mixing towers. These features are shown on Figure 2.1-1.

An approximately 2-acre vegetated knoll is located at the southern end of the Site. The “Knoll Area” was created through several apparent filling operations, initially being filled to match the surrounding grade in the early to mid-1960s. Additional fill material was placed during the 1970’s which created the existing “knoll” feature.

Surface water in the Site vicinity is utilized both commercially and recreationally. The Tulalip Tribes Reservation is located approximately one mile north of the Site, on the north side of the Snohomish River. Tulalip tribal members living on the Tulalip Reservation are engaged in both commercial and subsistence fishing near the confluence of Port Gardner Bay and the Snohomish River. There is no current or proposed future use of groundwater in the Site vicinity.

The Site is bound to the east/northeast by vacant land and tidal mudflats owned by the Port of Everett; to the west by tidal mudflats owned by Wick Family Properties LLC (formerly Wick Towing), Port of Everett, and Foss Maritime Company LLC; to the southeast by West Marine View Drive (City of Everett), beyond which is the BNSF railway and vacant marshland (Maulsby Marsh) owned by BNSF; and to the north/northwest by Port Gardner Bay. The surrounding tidal mudflat parcels contain piling and creosote-treated structures that were not used by the Former Nord

Door operations but nonetheless are considered part of the Site. Surrounding parcels and property owners are shown on Figure 2.1-2.

The Site lies on an area of fill that extends into Port Gardner Bay. The Site is relatively flat, with a maximum elevation of approximately 15 feet above mean sea level (aMSL) while the Knoll Area extends to approximately 26 feet aMSL. The tidal mudflats and a portion of the upland areas of the Site lie within the 100-year flood plain.

The future use of the Site property is expected to be industrial.

2.2 SITE HISTORY

The Site is built upon fill material placed in various stages beginning in the late 1800s. Areas on the eastern, northern, and southern sides of the Site were filled in various stages beginning in the late 1800s or early 1900s when the adjacent BNSF railroad, formerly Great Northern Railroad, was laying tracks along Port Gardner Bay. Historical activities at the Site have included casket manufacturing, pole treating, wood door and sash manufacturing, and fish net storage. As discussed above, the Knoll Area was initially filled in the early to mid-1960s.

Prior to JELD-WEN's ownership, the Site had been in use as a stile and rail door plant since the mid-1940s by Nord Door. Prior to the 1940s, National Pole Company operated a pole treating plant on the eastern portion of the Site. Sound Casket Manufacturing operated a wood casket factory on the southern portion of the Site from at least 1936 until sometime prior to 1947, at which time the casket facility was operated by Northwestern Lumber & Manufacturing Co., Inc. By 1976 some of the structures associated with the former wood casket plant had been incorporated into the Nord Door facility. A rectangular fish net storage building and several smaller structures were present on the far southern portion of the Site (current Knoll Area), south of the casket facility, from at least 1947 through 1955. The structures were no longer present in 1967, by which time the area had been further filled creating the "knoll" feature.

Based on a review of historical aerial photographs and Sanborn maps (Appendix A), it appears that the original boiler for the Nord Door facility was an oil-fired boiler located near Norton Avenue (now West Marine View Drive). The 1955 aerial photograph and the 1957 Sanborn Map show that the former pole treating plant had been removed from the Site and the boiler for the Nord Door facility was a wood-fired boiler. Sometime prior to 1968, the wood-fired boiler was moved to its current location in the center of the Site adjacent to the main manufacturing building (Figure 2.1-1).

JELD-WEN acquired certain assets, including the real property of the Nord Door plant, in May 1986. Operations associated with the Nord Door stile and rail door plant included buying rough green wood, sorting, stacking, drying, planing, and cutting the lumber. The finished wooden doors, rails, posts, columns, and spindles were assembled on-site.

JELD-WEN ceased operations at the Nord Door plant in 2005. Various asphalt companies (Cadman [current], CEMEX, Rinkers Materials and Sterling Asphalt) have leased the northeast portion of the Site since the mid-1990s and operated this portion of the Site as an asphalt batch plant. Aerial photographs depicting the Site in 1947, 1955, 1965, 1974, 1984, and 1995 are provided as Figure 2.2-1 through Figure 2.2-6, respectively. Historical features identified on

Sanborn maps have been noted on the historical aerial photograph figures. Copies of the Sanborn Maps and aerial photographs are included as Appendix A.

2.3 PRIOR ENVIRONMENTAL INVESTIGATIONS

Numerous pre-RI investigations were conducted at the Site between 1991 and 2008, the findings of which were summarized in detail in the Work Plan (SLR, 2008). Appendix B contains an excerpt from the Work Plan summarizing the Regulatory History and Prior Investigations performed at the Site. Identified areas of impact at the Site included: creosote and polycyclic aromatic hydrocarbons (PAHs) from historical pole treating operations at the east side of the facility and beneath West Marine View Drive; PAHs and total petroleum hydrocarbons (TPH) from historical fueling oil storage at the east side of the facility; shallow soil and groundwater impacts from thinner storage (toluene) at the northeast corner of the facility; pentachlorophenol (PCP) impacts to soil from wood treatment solution (Woodlife) storage and usage at the northeast corner of the facility (appeared to be localized); TPH and PAH impacts to soil near the former fueling station in the central portion of the Site; PAH impacts to soil near the former casket manufacturing area; PAH impacts to soil near monitoring well MW-1; and, PAH and TPH from fill material placed at the Site (appeared to be wide-spread but relatively minor). Pre-RI sample locations are included on Figure 2.3-1 and pre-RI analytical results are included on the data summary tables discussed in Section 4.1. A summary of laboratory analyses conducted on each sample (pre- and post-RI) is presented in Table 2.3-1.

3. ENVIRONMENTAL SETTING/PHYSICAL CHARACTERISTICS

This section summarizes the topography, climate, geology, hydrogeology and ecology of the Site area.

3.1 TOPOGRAPHY

The Site is located on a peninsula of fill which extends into Port Gardner Bay. Surface features at the Site include numerous buildings, asphalt and concrete paved areas, and unpaved graveled or grassy areas (primarily the Knoll Area). Approximately 95% of the Site is currently paved or covered by buildings. The Site is adjoined by waterways and/or tidal mudflats to the north, south, and west. A narrow channel separates the Site from the adjoining property to the northeast. The Site is relatively flat, with a maximum elevation of approximately 15 feet aMSL. The Knoll Area extends to approximately 26 feet aMSL.

The northeastern, northwestern, and southern shorelines of the Site are currently armored with relatively large asphalt, concrete, and riprap materials which slope steeply downward to the tidal flats. Pockets of dune grass are located between rubble and scattered along relatively thin bands along the shoreline, including at the base of the riprap.

3.2 GEOLOGY AND HYDROGEOLOGY

The Everett area lies within the Puget Sound lowland, a tectonic/geomorphic depression between the Olympic Mountains and the Cascade Range. The north-south trending depression extends from Oregon to southwestern British Columbia. The depression is characterized by relatively thick accumulations of post-glacial and glacial deposits overlying tertiary sedimentary and igneous rocks. The lowlands area has been influenced by at least five major advances and several lesser advances of Pleistocene continental ice. Glacial deposits consist of a complex sequence of lacustrine deposits, advance outwash, drift, till, and recessional deposits. A variety of river deposits characterize the interglacial periods. The Quaternary glacial and interglacial deposits range in thickness from 0 to 300 feet in the Site vicinity (Yount et al., 1985). The underlying bedrock consists primarily of tertiary sedimentary and volcanic rocks.

The Site is underlain by Holocene-age younger alluvial and estuarine deposits (Minard, 1985), which consists mostly of stream-laid stratified sediments. These deposits lie in and along the present streams near the water table. The sediment is largely sand, silt, and clay with considerable amounts of organic matter. The thickness of these deposits probably exceeds 90 feet.

According to the Soil Survey of Snohomish County Area, Washington (National Resource Conservation Service [NRCS], 1983) upland soils at the Site are classified as Urban Land. Urban Land is defined as areas that are covered by streets, buildings, parking lots, and other structures that obscure or alter the soils so that identification is not possible. Soils at the Site are likely classified as Urban Land as a result of the historic filling activities. Soils encountered at the Site consist primarily of sands and silts, with interbedded layers of woody debris. Borings installed on the Site encountered organics consisting of shells and shell pieces. Test pits and borings completed in the Knoll Area consisted primarily of sandy fill material with shells and shell pieces

down to the native mudflat layer. Evidence of general fill material was encountered at some test pits completed near the center of the Knoll Area (concrete, etc.). Saturated soil at the Site was encountered at depths ranging from 3 to 10 feet bgs.

Depth to groundwater across the Site has been measured between 2.5 and 12 feet bgs, with an average depth of approximately 6.5 feet bgs. Groundwater flow is generally toward Port Gardner Bay to the west/northwest; however, groundwater gradient on the edges of the peninsular fill area have been found to be tidally influenced.

3.3 CLIMATE

The Site is located in the west-central portion of Snohomish County. The climate of the Snohomish County area is tempered by winds from the Pacific Ocean. The average daily temperature in Everett in the summer is 62 degrees Fahrenheit and in the winter is 40 degrees Fahrenheit. Snow and freezing temperatures are uncommon. Summer rainfall is generally infrequent and light. During the rest of the year, rains are frequent, especially late in fall and in winter. The average annual precipitation in Everett is 36 inches (NRCS, 1983).

3.4 SEA LEVEL RISE PREDICTIONS

Global climate change is projected to result in sea level rise and increased storm intensity in the Everett area. This sub section summarizes a more detailed evaluation of the effects of climate change and projected sea level rise that is presented in Appendix C. To assess the potential effect at the Site, Ecology guidance (Ecology 2017), relatively recent Everett-specific projections (Miller et al, 2018), and Federal Emergency Management Agency (FEMA) flood plain information were reviewed to determine Site-specific projections and evaluations to inform the future environmental setting and considerations relative to remediation. The Site is relatively flat with a top-of-bank elevation of approximately 12- to 14-feet Mean Lower Low Water (MLLW; used here as a datum).

Current Tidal Datums for NOAA Station 9447659 (Everett, WA)

Tide	Tide Level (feet MLLW)
Mean Higher High Water (MHHW)	11.09
Mean High Water (MHW)	10.21
Mean Tide Level (MTL)	6.51
Mean Sea Level (MSL)	6.48
Mean Low Water (MLW)	2.8
Mean Lower Low Water (MLLW)	0

Source: Center for Operational Oceanographic Products and Services; NOAA Tides & Currents

Everett-specific sea level rise projections consider low and high scenarios using a Representative Concentration Pathway (RCP) methodology. In the low estimate greenhouse gases are projected to stabilize by mid-century and decrease thereafter while the high scenario projects continued increase in greenhouse gasses until the end of the 21st century (Mauger 2015). In addition to sea level rise the projections include vertical land movement of -0.1 ± 0.2 feet per century. The Site-specific low and high projections are as follows:

- Low Greenhouse Gas Scenario (RCP 4.5): By mid-century, the sea level is projected to rise between 0.5- and 1-foot. By the turn of the century and shortly thereafter, up to 3 feet of rise is projected.
- High Greenhouse Gas Scenario (RCP 8.5): By mid-century, the sea level is projected to rise between 1- and 2-feet. By the turn of the century and shortly thereafter, up to 5-feet of rise is projected.

The potential for midcentury sea level rise of 1 to 2 feet (RCP 8.5) results in new MHHW level at elevation up to 14 feet. Projections for sea level rise at the turn of the century of 5 feet would result in MHHW elevation over 16 feet. Figure 3.4-1 depicts elevation contours of 13, 15, and 17 feet MLLW to reflect 2, 4, and 6 feet of sea level rise to depict the range of sea level rise by adding projected rise to current MHHW elevation. With the projections defined, the Ecology guidance (Ecology 2017) was assessed to determine potentially relevant interpretations. The Ecology guidance presents three categories that could potentially apply to the Site.

Ecology guidance (Ecology 2017) includes low risk, short-term risk, and long-term/high risk scenarios to account for climate change-related criterion. Based on the Site-specific projections, the selected remedy will need to be assessed relative to the applicable scenario to determine if any climate change-related data needs are required to be developed and assessed in remedial design. In addition to the Ecology guidance FEMA projections should also be considered when determining risks of inundation.

3.5 UPLAND ECOLOGY

Information regarding federal- and state-listed sensitive, monitored, and candidate Endangered Species Act species was sought from the Washington Department of Fish and Wildlife (WDFW) Priority Habitat Species (PHS) list data. Habitats and species maps obtained from the WDFW are included in Appendix D. No federally listed endangered species were identified in the vicinity of the Site.

The purple martin is listed as a State candidate species on state lists. Three nesting pairs were identified at the Everett waterfront, at the confluence with the Snohomish River (Appendix D). These pairs were identified as active in 2004. Purple martins are large insect-eating, colonial nesting swallows that nest in a variety of cavities. Purple martins most commonly feed in flight on insects. Favorable martin foraging habitat includes open areas, often located near moist to wet sites, where flying insects are abundant.

In addition, the bald eagle, which is listed as a federal species of concern and a State sensitive species, may be found near the Site. No nesting bald eagles have been observed on the Site; however, the Site is located within the 800-foot shoreline nest buffer. The closest nesting territory (Hale #506-2) is located approximately one-quarter mile southeast of the Site (Appendix D). Wintering bald eagles require perch trees for day use and mature/old-growth forest stands for night roosts. Perch trees are typically dominant live or dead trees situated near a shoreline where a nest or defendable territory is evident or a prey source is abundant. Prey items are primarily fish and waterfowl.

3.6 MARINE ECOLOGY

In the summer of 2019, a scope of work to conduct a critical areas evaluation was developed in consultation with Ecology. The field work was implemented in July and reported to Ecology in the August 2019 Critical Areas Report (CAR; Appendix D.2). The CAR characterized ecological conditions in the study area to allow for the avoidance, minimization, and mitigation of impacts related to future cleanup activities. Existing critical areas and associated regulated buffers identified in the CAR were addressed as defined in Chapter 19.37 of the Everett Municipal Code (EMC; City of Everett 2019a).

During the investigation, 14 estuarine wetlands were identified and delineated within the study area (Wetlands E1 through E14). As described in the CAR, most of the estuarine wetlands are small patches or groups of small patches of salt-tolerant vegetation near the marine ordinary high water mark (OHWM), and 8 of the 14 wetlands are less than 100 square feet in total area. No freshwater wetlands or stream critical areas were identified within the study area. A delineation of the OHWM of the marine shoreline of Port Gardner Bay in the study area was performed. The OHWM delineation also included a delineation of piles and derelict structures within the study area below the OHWM. Under EMC Chapter 19.37.190, the Port Gardner Bay shoreline is defined as a Fish and Wildlife Habitat Conservation Area (FWHCA) under the category of "habitats of primary association." Figure 3.6 depicts the location and extent of identified wetland areas, OHWM elevation, and pile/derelict structures locations.

In accordance with State regulations, the City of Everett manages a Shoreline Master Program (SMP). The SMP is submitted for review and approval on an 8-year cycle for State review and approval to ensure shorelines are managed in compliance with applicable regulations. The most recent SMP was approved in October 2019 and is accessible online (https://everettwa.gov/553/Shoreline-Master-Program). The SMP divides shoreline areas into seven Ecological Management Units (EMU) and the Site is within Lower Snohomish Channel as EMU 5. The SMP summarizes historical use and modifications to the Everett shoreline in addition to identifying shoreline designations.

A summary of permitted, conditional, and prohibited shoreline uses and shoreline modification activities for each shoreline designation is presented in SMP Table 1 and Table 2, respectively. The uplands of the Site are designated as Urban Industrial. The tidal mudflats south of the Site are designated as "Urban Maritime Interim." The inlet and Maulsby Marsh (referred to as Maulsby Swamp in the SMP) are designated as Aquatic Conservancy[1]. Selection of future Site remedial activities should identify permitted, conditional, and prohibited shoreline uses of SMP-defined designations and determine if data needs associated with such designations are addressed in the remedial design.

[1] The SMP defines an Aquatic Conservancy as follows: *"The "Aquatic Conservancy" shoreline environment designation is applied to areas that scored highly for salmonid habitat in the 2001 Snohomish Estuary Wetland Integration Plan Salmon Overlay."*

On a bay-wide scale, information regarding listed and candidate Endangered Species Act fish species in the project area was sought from the WDFW (Appendix D). There are no federally listed endangered fish species identified in the project area. Federally listed threatened species (also noted as State candidate species) that may be found in the Snohomish River near the Site include the Coho salmon, Dolly Varden/bull trout, fall Chinook salmon, fall chum, pink salmon, resident cutthroat, sockeye salmon, summer Chinook salmon, and summer steelhead, which may migrate through the area during certain periods of the year.

No surf smelt, sand lance, rock sole, or herring spawning areas were identified in the Site area (Appendix D). Dungeness crab is included as a priority species in WDFW's PHS list. Dungeness crab habitat was identified in areas surrounding the Site (Appendix D).

4. REMEDIAL INVESTIGATION

Prior to initiating the RI/FS in 2008, earlier investigations of upland areas of the Site had identified an area impacted by historic fuel oil and creosote releases (see Appendix B). This area is located in the east/southeast portion of the Site and beneath West Marine View Drive. The primary focus of the RI was to assess other data gaps identified by JELD-WEN and Ecology that warranted further investigation prior to completion of the FS. Areas of the Site evaluated as part of the RI included the following:

- Hog fuel burner ash, a potential source of dioxins and furans;
- A former Woodlife wood treatment solution storage and use area;
- A formerly unpaved storage area in the southwest portion of the Site;
- A formerly unpaved barrel storage area in the south-central portion of the Site;
- A former casket manufacturing area in the southern portion of the Site;
- A former machine shop/maintenance area in the central portion of the Site;
- Surface soils adjacent to seven on-site transformers;
- A former fish net storage area and Knoll Area in the southern portion of the Site;
- Groundwater in the existing groundwater monitoring wells;
- Soil, groundwater, and sediment conditions on the BNSF railroad property/Maulsby Marsh to the east of the Site;
- Sediment in the tidal mudflats immediately adjacent to the Site uplands;
- Sub-slab soil gas beneath the existing warehouse;
- Stormwater conveyance system (including North Truck Dock sump);
- Deep zone groundwater in the eastern portion of the Site;
- Additional assessment of the Knoll Area; and,
- Groundwater seeps around the shoreline of the Site.

The initial RI investigation was completed between May and October 2009 and was performed in conformance with the Ecology-approved Work Plan (SLR, 2008). On November 20, 2009, JELD-WEN submitted an Initial RI Investigation Data Summary Report (SLR, 2009) to Ecology. This document contained a preliminary summary of RI field activities, data results, and identified data gaps that warranted further investigation.

To address the data gaps identified in the Initial RI, JELD-WEN prepared a Phase 2 RI Work Plan (SLR, 2011) to address upland areas of concern, and also contracted with Anchor QEA to further characterize the tidal mudflats and Maulsby Marsh areas immediately adjacent to upland areas of the Site. The scope of work for the sediment assessment was outlined in the Quality Assurance Project Plan (QAPP; Anchor QEA, 2011).

Findings of the Phase 2 Upland RI were summarized in a report provided to Ecology which found that the additional assessment was sufficient to complete characterization of upland impacts in all areas except dioxins/furans in the former Woodlife storage and use area. An amendment to the Phase 2 RI Work Plan was submitted in February 2013 (SLR, 2013a) for additional characterization of dioxin/furan impacts in the Woodlife storage and use area. The findings of the investigation were summarized in a Summary Report for Additional Upland Assessment (SLR, 2013b).

In November 2013, a Second Amendment to the Phase 2 RI Work Plan (SLR, 2013c) was submitted to Ecology which provided for upland soil exploration and soil and groundwater sampling to evaluate the fill material present in the Knoll Area. In addition, another amendment to the Phase 2 RI Work Plan was submitted to Ecology to further assess the vertical extent of contamination in the historical fuel oil/pole treating area, the horizontal extent of the fuel oil/pole treating area impacts to the north and south, and the vapor intrusion pathway using soil gas sampling (SLR, 2015). The findings of these investigations were incorporated into the October 2016 Draft RI/FS report.

Upon review of the October 2016 Draft RI/FS report, additional assessment of the existing groundwater monitoring wells, the stormwater conveyance system (including the North Truck Dock), and groundwater seeps was completed as part of a Source Control Evaluation (SCE). Further assessment was completed to address data gaps identified by Ecology in the SCE activities, including additional assessment of groundwater monitoring wells (including deep zone groundwater monitoring wells) and further assessment of the Knoll Fill Area.

In addition, quarterly groundwater monitoring was performed at existing and newly installed groundwater monitoring wells beginning in 2015. JELD-WEN requested, and Ecology approved, a change to semiannual groundwater monitoring beginning in 2020. Monthly product measurement and extraction has been performed at deep zone well MW-8B. DNAPL that accumulates in the sump is removed with a hand bailer and stored in 55-gallon drums pending off-site disposal with other investigation derived waste. Removable DNAPL has not been observed at any other shallow or deep groundwater monitoring well.

Phase 2 RI - Marine Sediments

A series of data review meetings between JELD-WEN and Ecology were conducted between 2009 and 2014 that led to agreements to perform successive rounds of sediment sampling and analysis to complete the RI. The scope of the supplemental sampling is described in three Addendums to the Phase 2 RI Work Plan Sediment QAPP (Anchor QEA 2013a; Anchor QEA 2013b, Anchor QEA 2014).

All sampling data collected during the RI, including validated sediment/tissue sampling and analysis data from the Phase 2 RI marine investigations and 2019 dissolved phase PCB testing (SPME), have been uploaded to Ecology's Environmental Information Management (EIM) system database.

Phase 2 RI - Maulsby Marsh

Maulsby Marsh sediment sampling and analysis data were uploaded to Ecology's EIM system following validation. However, based on Ecology's review of the data, it was determined that chemicals of concern detected in the marsh sediments were not attributable to Site releases. Therefore, no additional analysis of this area was required for the RI/FS, and archived samples were disposed at the direction of Ecology. A summary of Maulsby Marsh sediment results is presented in Appendix E.

4.1 UPLAND INVESTIGATIONS

Upland RI investigations were conducted at the Site between 2009 and 2019. A summary of laboratory analyses conducted on each sample from the upland investigation is presented in Table 2.3-1. A summary of the analytical findings are presented in Table 4.1-1 (soil) and Table 4.1-2 (groundwater). Analytical results of all upland soil, groundwater, and soil gas samples discussed below are presented in Table 4.1-3 through Table 4.1-11 (soil), Table 4.1-12 through Table 4.1-20 (groundwater), and Table 4.1-21 (soil gas). Upland sample locations are presented on Figure 2.3-1 and soil boring and test pit logs are provided in Appendix F.

4.1.1 SUMMARY OF UPLAND SAMPLING INVESTIGATIONS, METHODS, AND LOCATIONS

This section summarizes the various upland investigations including a description of the completed sampling activities and the areas of interest for the investigations. Additional discussion concerning the results from the primary assessment areas (Creosote/Fuel Oil Area, Woodlife Area, and Knoll Fill Area) are included in Section 5.

4.1.1.1 INITIAL RI INVESTIGATION

In May and June, 2009, an initial RI investigation was completed at the Site including 13 direct push (Geoprobe) borings for the collection of soil and grab groundwater samples (GP-302 through GP-312, GP-334 and GP-335), surface and near surface soil sampling with a hand auger (SS-313 to SS-321) and sampling of stored ash material from a drum (SS-301) at the locations depicted on Figure 2.3-1. In addition, 12 locations (HA-322 to HA-333) adjacent to Maulsby Marsh and BNSF property were selected for soil and grab groundwater sampling with a hand auger and temporary well points in September and October 2009 to address potential impacts to Maulsby Marsh. In October 2009 a round of groundwater samples was collected from existing monitoring wells MW-1 through MW-6.

4.1.1.2 PHASE 2 UPLAND SOIL AND GROUNDWATER INVESTIGATION

Based on the findings of the initial RI, pre-RI sampling conducted at the Site, and a series of communications with Ecology, several upland areas were identified as warranting additional characterization. In May 2011, SLR completed five additional Geoprobe borings for the collection of soil and grab groundwater samples (401-P through 405-P) at the locations depicted on Figure 2.3-1 and collected additional groundwater samples from existing groundwater monitoring wells at low tide and high tide in accordance with an Ecology-approved Work Plan (Phase 2 RI Work Plan, SLR, 2011).

The findings of this investigation were deemed sufficient, at that time, to complete characterization of upland impacts at the Site for completion of the RI/FS and draft CAP in all areas except the former Woodlife Storage and Use Area.

4.1.1.3 ADDITIONAL UPLAND ASSESSMENT – FORMER WOODLIFE AREA

In March 2013, SLR conducted an additional investigation of the former Woodlife storage and use area to further characterize dioxin/furan impacts in this area of the Site. The investigation included the completion of 12 soil borings (GP-501 to GP-512) for the collection of soil and grab groundwater samples. Three soil samples were collected from each boring at depths of 1 foot, 3 feet, and 5 feet bgs. One groundwater grab sample was collected from a temporary well installed at each boring. Sample locations are presented on Figure 2.3-1.

The soil and groundwater sampling completed in March 2013 was sufficient to characterize the horizontal and vertical extent of dioxin/furan impacts in the Former Woodlife Area in soil and groundwater at upland areas of the Site for the purpose of the RI/FS.

4.1.1.4 ADDITIONAL UPLAND ASSESSMENT – KNOLL AREA

Marine sediment investigations conducted between 2009 and 2013 identified PCBs as a contaminant of potential concern (COPC) in sediment near the Knoll Area. In November 2013, nine test pits (TP-10 through TP-18) were completed to evaluate the fill material in the Knoll Area and four Geoprobe borings (GP-601 through GP-604) were completed to evaluate groundwater in the Knoll Area (see Figure 2.3-1). Test pits were completed to depths of approximately 5 to 15 feet bgs and Geoprobe borings were completed to a maximum depth of 40 feet bgs.

4.1.1.5 ADDITIONAL UPLAND ASSESSMENT – CREOSOTE/FUEL OIL AREA

In December 2013, three Geoprobe borings (GP-605 to GP-607) were completed to further evaluate the horizontal and vertical extent of soil and groundwater impacts in the Creosote/Fuel Oil Area (see Figure 2.3-1). Borings were advanced to a depth of 34.5 feet bgs and groundwater samples were collected in temporary wells.

4.1.1.6 ADDITIONAL UPLAND ASSESSMENT – HISTORICAL FUEL OIL/POLE TREATING AREA, VAPOR INTRUSION PATHWAY, AND GROUNDWATER ASSESSMENT

In August 2015, SLR conducted additional assessment activities based on discussions with Ecology regarding the interim RI/FS report to further assess three items: 1) the vertical extent of contamination in the Creosote/Fuel Oil Area; 2) the horizontal extent of contamination in the Creosote/Fuel Oil Area; and, 3) the vapor intrusion pathway to the existing main manufacturing building using soil gas sampling.

In July and August 2015 soil and groundwater samples were collected from temporary Geoprobe locations to assess the depth and extent of impacts to the east of the Site (four deep borings, GP-701 to GP-704, adjacent to West Marine View Drive), underneath the existing main manufacturing building (three deep borings, GP-708 to GP-710, and two shallow borings, GP-711 and GP-712), and to the southeast of the existing main manufacturing building (three shallow borings, GP-705

to GP-707). Deep borings were extended up to 55 feet bgs and shallow borings were extended to approximately 11 feet bgs. The completed depths were based on field conditions encountered at the time of the investigation.

Soil gas samples from beneath and adjacent to the existing main manufacturing building were collected to support the assessment of the vapor intrusion pathway. Nine locations were selected for shallow soil gas sample collection from the area below the existing surface (concrete or asphalt). Soil gas samples were collected above the groundwater table encountered at the time of the field work (encountered at approximately three and a half feet bgs). Soil gas sample points were installed with a Geoprobe direct push drilling rig utilizing a post-run tubing system designed for collection of soil gas samples.

Based on the findings of the Geoprobe soil and groundwater investigation, seven groundwater monitoring wells were installed with a hollow-stem auger drilling rig at locations and depths presented to Ecology (SLR, 2015). One set of nested groundwater monitoring wells was completed inside the existing main manufacturing building with one well completed in the shallow zone (MW-8A screened between 4 and 14 feet bgs) and one well completed in the deeper zone (MW-8B screened between 40 to 50 feet bgs with a 2-foot sump). Two additional sets of nested monitoring wells were completed in the area east of the Site adjacent to West Marine View Drive (MW-9A/MW-9B and MW-10A/MW-10B). In addition, one shallow groundwater monitoring well was completed to the north of the existing main manufacturing building and west of the north entrance to the property to assess groundwater impacts adjacent to surface water (MW-7).

4.1.1.7 SOURCE CONTROL EVALUATION TO ADDRESS DATA GAPS

In December 2017, SLR conducted additional assessment activities based on data gaps identified during Ecology initial review of the October 2016 Draft RI/FS Report. Source Control Evaluation (SCE) activities were completed for further characterization of: 1) groundwater seeps; 2) the existing site stormwater drainage system; and, 3) the North Truck Dock (NTD) stormwater sump.

An assessment of groundwater seeps observed discharging into Port Gardner Bay on the northern, western, and southern side of the Site was completed to identify potential impacts to surface water and sediment via groundwater seep drainage from the Site. The groundwater seep assessment consisted of identification of observed seeps during low tidal conditions, visual observations from identified seeps, and groundwater seep sampling of select groundwater seep locations along the shoreline of the Site.

While door manufacturing at the Site ceased in 2005, the Industrial Stormwater General Permit for the door manufacturing operations was not terminated until March 2007 (see Attachment 5 of the SCE Work Plan). Stormwater drainage plans that were previously provided to Ecology showing the location and configuration of the Site stormwater drainage system did not match observations made by Ecology during an April 2017 visit to the Site. As a component to the SCE, an assessment of the Site stormwater drainage system configuration was completed to locate and identify current and/or historical outfalls, drainage system collection points, pipe locations, and the approximate drainage areas for the collection points (SLR, 2019a).

As part of the stormwater drainage assessment, the stormwater sump in the NTD area was traced and mapped by a utility locating service, and samples were collected of water entering the sump (via identified inlet pipes and apparent groundwater weep holes), solids inside the sump, and soil adjacent to observed current and historical discharge points on the adjacent Port of Everett property. Following the investigation, the current property owner plugged the weep holes, removed the solids from within the sump and at the bottom of the truck ramp, and re-routed the discharge line to an existing stormwater line that terminates at the inlet to the east of the Site.

4.1.1.8 ADDENDUM TO SCE WORK PLAN

In May 2019, SLR conducted a data gap assessment based on communications and discussions with Ecology following submittal of the SCE Summary Report. The data gap assessment included further characterization to address data gaps identified in the SCE activities and previous RI investigations. This included assessment of: 1) extent of existing groundwater impacts and deep zone groundwater assessment; 2) follow-up assessment of Knoll Area; 3) additional assessment of “Area 4” locations identified in the October 2016 Draft RI/FS (i.e. isolated areas of impact); follow-up assessment related to the stormwater conveyance system; and, assessment of vertical and horizontal groundwater flow and gradient (SLR, 2019b).

One additional set of nested monitoring wells (MW-11A and MW-11B) were installed near the southern corner of the main manufacturing building, and to the south of previously identified deep zone impacts. The deep well was completed to 40’ bgs with a 2-foot sump. Soil borings were completed with a Geoprobe drilling rig (composite soil samples of 0-12 feet were requested by Ecology), and monitoring wells were subsequently installed with a HSA drilling rig.

Three soil borings were completed in the Knoll Area and completed as groundwater monitoring wells (MW-12 to MW-14). Composite soil samples were collected from 0-12 feet bgs and the monitoring wells were completed to 23 to 25 feet bgs.

Two soil borings were completed at previously identified areas of isolated impacts (former borings GP-311 and GP-34). Composite soil samples were collected from 0-12 feet bgs and the soil borings were subsequently completed as shallow permanent groundwater monitoring wells MW-15 and MW-16 to approximately 13 feet bgs.

As a follow-up to the stormwater conveyance system assessment, three soil borings were completed in areas of previously identified damaged stormwater lines that were connected to identified outfalls. GP-801 and GP-802 included composite soil sampling from 0-12 feet bgs and collection of a grab groundwater sample from a temporary well. MW-17 included composite soil sampling from 0-12 feet bgs and installation of a permanent groundwater monitoring well to approximately 13 feet bgs.

To better understand the site-wide groundwater gradient (including deep zone gradient and potential vertical gradient), a transducer study was performed for two weeks in May 2019. Pressure transducers were installed at all nested well locations (shallow and deep well) and at several new and existing groundwater monitoring wells.

Three additional groundwater monitoring wells were installed to further assess PCB concentrations potentially related to fill activities in and around the Knoll Area. MW-18 was

installed on the eastern edge of the Knoll Area adjacent to West Marine View Drive, MW-19 was installed between GP-801 and the shoreline, and MW-20 was installed at the northern extent of estimated fill activities associated with the Knoll Fill Area. This assessment also included SPME sampling from temporary wells installed in the mudflats adjacent to the Knoll Area and from groundwater monitoring wells installed in the Knoll Area.

4.1.1.9 GROUNDWATER MONITORING PROGRAM

Groundwater monitoring at permanent monitoring wells began on a quarterly basis in 2015. Groundwater sampling was performed per the Groundwater Monitoring Program Work Plan and SAP (SLR, 2019c) and included measurement of depth-to-water measurements and purging and sampling the monitoring wells per EPA low-flow methods. JELD-WEN requested, and Ecology approved, modifications to the analytical testing and a change to semiannual groundwater monitoring beginning in 2020. Monthly product measurement and extraction has been performed at deep zone well MW-8B. Tables presenting field measurements and analytical results from the quarterly groundwater sampling events and figures depicting examples of groundwater gradient estimates are included in Appendix G.

4.1.2 UPLAND ANALYTICAL RESULTS AND FINDINGS

An expanded summary of upland analytical results and findings, identification of Indicator Hazardous Substances (IHS), and a discussion of selected screening levels are presented in the conceptual site models for selected assessment areas (Creosote/Fuel Oil Area, Woodlife Area, and Knoll Fill Area) are included in Section 5.0 of this report.

4.1.2.1 INITIAL PRELIMINARY CLEANUP LEVEL ASSESSMENT

In order to identify Indicator Hazardous Substances (IHS) and specific areas of concern to focus potential remedial actions, historical analytical results were screened against initial Preliminary Cleanup Levels (PCLs) consisting of published regulatory levels, natural background concentrations, and laboratory practical quantitation limits (PQLs). Selected initial PCLs and the PCL sources are presented on Table 4.1.2.1-1 (soil) and Table 4.1.2.1-2 (groundwater). Analytical results per analyte group with a comparison to the initial PCLs are summarized on Table 4.1-1 and Table 4.1-2 and presented on Table 4.1-3 to Table 4.1-11 (soil), Table 4.1-12 to 4.1-20 (groundwater) and Table 4.1-21 (soil gas).

Initial PCLs used to screen general analytical results were based on the following process:

- Soil initial PCLs were selected based on most stringent of the CLARC 2019 values & TEE, with the exception that Method A values were only used when a Method B value was not available. The most stringent value was compared to natural background, if available, or practical quantitation limit (PQL). The PQL values were developed from a review of Ecology-provided laboratory study by selected the lowest laboratory-provided value. It should be noted that in many cases the saturated soil protective of groundwater is the selected PCL; however, as detailed in Section 5.2.7, groundwater is not a current or future source of drinking water and the use of these values significantly increases the designation of “impacted” areas. Therefore, area specific PCLs are used for the IHS described in Section 5 to assess areas relevant to cleanup alternatives.

- Groundwater initial PCLs were selected based on the most stringent groundwater to surface water pathway cleanup levels from MTCA. The most stringent value was compared with other applicable groundwater cleanup levels (i.e. potable water or vapor intrusion), and then compared to the laboratory PQLs.

Soil exceedances of initial PCLs include the following COPCs and areas:

- TPH-Gx and TPH-Dx (diesel range) were measured above initial PCLs at 8 and 10 sample locations, respectively. These locations were primarily located within the Creosote/Fuel Oil Area and appear to be co-located with cPAH impacts.
- cPAH TEQ values were calculated above initial PCLs at 31 sample locations. Other PAHs were also measured above initial PCLs (primarily based on soil to groundwater value), however at locations co-located with cPAH impacts.
- Dibenzofuran and/or carbazole (SVOCs) measured above initial PCLs at locations within the Creosote/Fuel Oil Area and co-located with cPAH impacts.
- VOCs measured above the initial PCL (primarily based on soil to groundwater value) at locations located within the Creosote/Fuel Oil Area and co-located with cPAH impacts.
- Metals measured above the initial PCLs but at concentrations that appear to be representative of natural background concentrations and are not considered COPCs.
- TEQ Dioxin/Furan values were calculated above initial PCL (based on PQL) at 22 locations, primarily located within the Woodlife Area.

Groundwater exceedances of initial PCLs include the following COPCs and areas:

- TPH-Gx and TPH-Dx (diesel range) were measured above initial PCLs at 15 and 28 sample locations, respectively. These locations were primarily located within the Creosote/Fuel Oil Area and appear to be co-located with naphthalene impacts.
- cPAH TEQ values were calculated above initial PCLs at 34 sample locations. Other PAHs including: 1-methylnaphthalene, 2-methylnaphthalene, acenaphthene, fluoranthene, fluorene, naphthalene, phenanthrene, and pyrene were also measured above initial PCLs. These locations were primarily located within the Creosote/Fuel Oil Area and appear to be co-located with naphthalene impacts.
- SVOCs including 1,1-Biphenyl (only 1 location), dibenzofuran, 2-4-Dimethylphenol, and 3,4-Methylphenol were measured above initial PCLs. These locations were primarily located within the Creosote/Fuel Oil Area and appear to be co-located with naphthalene impacts.
- Total PCB congeners were measured above initial PCL at 8 locations primarily within the Knoll Fill Area.
- Metals were measured above initial PCLs at select locations throughout the Site. The metals concentrations do not appear to be related to historical site operations or specific assessment areas and are not COPCs.
- TEQ Dioxin/Furan values were calculated above the initial PCL at 2 locations located within the Woodlife Area.

Other isolated areas of impact above initial PCLs were identified in upland soil and groundwater but were not subsequently carried through to the FS due to the findings of additional assessment activities, including the following:

- A former equipment fueling station was located at the southeastern end of the kiln buildings. Soil boring GP-34 was completed in this area during a pre-RI investigation. TPH-Dx (heavy oil range) was identified in boring GP-34 at a concentration above the PCL. Test pit excavations (TP2-1 to TP2-4) were subsequently completed near the former fueling station extending over sampling location GP-34. Test pits were completed through the center of, and to the north, east, and south of former boring GP-34. Field evidence of impacts were identified in the location of former boring GP-34, but no impacts were observed in surrounding test pits. The test pit excavation exposed an area containing wood debris (lumber and saw dust) along with other miscellaneous waste (asphalt pieces, bottles, scrap metal) to a depth of 5 to 6 feet bgs. Four soil samples were collected from the test pit excavations and selectively analyzed for TPH, SVOCs, PAHs, and VOCs. No TPH, SVOCs, or VOCs were identified above PCLs in the confirmation samples. The soil sample collected from the central test pit, in the approximate location of boring GP-34, identified cPAHs above PCLs (note that cPAHs were not measured above the PCL in GP-34). The test pit investigation confirmed that the TPH and cPAH concentrations in soil above PCLs in the former fueling area are limited in extent and potentially unrelated to the former equipment fueling station.

  Subsequent investigation during the 2018-2019 SCE included installing monitoring well MW-16 adjacent to former boring GP-34 and test pit TP-2. Analytical results for soil and groundwater at MW-16 did not identify cPAHs above the PCLs.

- cPAHs were identified in Boring GP-14 (pre-RI investigation) above the PCL. Subsequent investigations completed as part of the RI (GP-211, GP-707, and MW-11A/11B) did not identify cPAHs above the PCL and this area appears to be outside of the identified impacts in the Creosote/Fuel Oil Area.

- Naphthalene was identified above the PCL in boring GP-311 at 0.27 milligrams per kilogram (mg/kg), slightly above the PCL of 0.24 mg/kg.

  During the 2018-2019 SCE monitoring well MW-15 was installed adjacent to former boring GP-311. A soil composite sample from 0 to 12 feet bgs did not measure naphthalene above PCLs (0.0088 mg/kg). The initial PCL for naphthalene presented in this 2020 Revised RI/FS is 1,600 mg/kg based on direct exposure.

- TPH-Dx (heavy oil range) was identified in a groundwater sample from Geoprobe boring GP-24 at a concentration of 1,480 micrograms per liter (µg/L), above the PCL of 500 µg/L. No SVOCs, PAHs, or VOCs were identified in boring GP-24 above laboratory PQLs.

  Monitoring well MW-1 was subsequently installed adjacent to GP-24 and has shown no exceedances of PCLs for TPH in groundwater over several rounds of groundwater monitoring. The elevated concentration of TPH in the Geoprobe boring is anomalous and may have been the result of turbidity or colloidal interference in the groundwater sample.

- TPH-Dx (diesel range) was identified in a groundwater sample from Geoprobe boring GP-603 in the Knoll Area (former fish net storage area) at a concentration of 980 µg/L, above the PCL of 500 µg/L.

Subsequent investigation of the Knoll Area was completed as part of the 2018-2019 SCE, including the installation of 4 groundwater monitoring wells (MW-12 to MW-14, and MW-18) and groundwater seep sampling. TPH-Dx (diesel range) was not measured above PCLs in the groundwater seep.

- Naphthalene and cPAHs were identified in a groundwater sample from Geoprobe boring GP-601 above the PCLs. No other groundwater samples from the Knoll Area identified IHS above PCLs.

  Subsequent investigation of the Knoll Area was completed as part of the 2018-2019 SCE, including the installation of 4 groundwater monitoring wells (MW-12 to MW-14, and MW-18) and groundwater seep sampling. Naphthalene and cPAHs were not measured above PCLs from the monitoring wells or groundwater seep (with the exception of cPAHs at MW-13 at 0.02 ug/L, above the PQL-based PCL of 0.015 ug/L). While these isolated areas of TPH-Dx (diesel range), cPAHs, and naphthalene impacts are not drivers for developing a remedial action for groundwater in the Knoll Fill Area, these areas will nonetheless be addressed by the Knoll Fill Area groundwater remedial actions.

4.1.3 UPLAND INDICATOR HAZARDOUS SUBSTANCES

Based on the screening process described above, along with an assessment of known historical operations areas and suspected contaminants associated with those operations, the following IHS were selected for the development of proposed remedial action alternatives presented in the FS (Section 7). Further assessment of the primary assessment areas in relation to the IHS, including a presentation of the extent of IHS impacts, are presented in Section 5.

- TEQ cPAH values for soil and naphthalene for groundwater in the Creosote/Fuel Oil Area.
- Naphthalene for soil gas in the Creosote/Fuel Oil Area.
- Total PCB congeners for groundwater in the Knoll Fill Area (significant soil impacts have not been identified in the Knoll Fill Area).
- TEQ Dioxin/Furan values for soil and groundwater in the Woodlife Area.

4.2 MAULSBY MARSH FRESHWATER SEDIMENT CHARACTERIZATION

As described in section 4.1, upland investigations in the Creosote/Fuel Oil Area revealed contamination in soil and groundwater that extended below West Marine View Drive. The presence of this contamination led to the collection of hand-auger samples in the upland areas within the BNSF rail alignment area that also resulted in detections of site-related contaminants. Further characterization of Maulsby Marsh was included in the Marine and Maulsby Marsh Sediment Characterization QAPP (Anchor QEA 2011). Tiered sampling and analysis of sediments were conducted in accordance with the QAPP in 2012. The full results of the investigation are presented in Appendix E.

4.2.1 SUMMARY OF FRESHWATER SEDIMENT SAMPLING INVESTIGATIONS, METHODS, AND LOCATIONS

A total of 18 freshwater surface sediment samples were collected. Of those, 9 surface sediment samples located closest to the BNSF railroad tracks (MS001 through MS009) were submitted to the laboratory for analysis of PCBs, pesticides, metals, SVOCs, TPH, and sediment conventional analyses including grain size, total solids, total organic carbon, ammonia, and total sulfides. Material collected from the remaining sample locations were submitted to the laboratory as archive samples. A portion of each sample was archived for possible EPH testing. All TPH testing was initially conducted on the first tier of 9 samples collected using Northwest TPH (NWTPH) methods. The four sediment samples with the highest NWTPH concentrations, (MS001, MS002, MS003, and MS006) were tested further for EPH to further characterize the nature of hydrocarbons in these samples.

4.2.2 FRESHWATER SEDIMENT ANALYTICAL RESULTS

Upon receipt of the initial 9 sediment sample results, Ecology consultation was conducted to determine if or where additional tier testing was required. The data results were screened by then draft Freshwater SCO values (now adopted in 2019 SCUM) to determine if Site-related contaminants of concern, particularly TPH and PAHs, were detected above criteria. Some parameter results did exceed criteria (Table 4.2.2) but were not related to the Site COCs. Therefore, no additional analysis was required to delineate the extent of contamination.

4.2.3 INDICATOR HAZARDOUS SUBSTANCES – FRESHWATER SEDIMENT

Not applicable.

4.2.3.1 NATURE AND EXTENT OF INDICATOR HAZARDOUS SUBSTANCES – FRESHWATER SEDIMENT

Not applicable.

4.3 MARINE SEDIMENT CHARACTERIZATION

This section details results for the Marine Sediment Site Characterization.

4.3.1 MARINE SURFACE SEDIMENT CHARACTERIZATION

This section summarizes the characterization of surface sediment concentrations in marine areas of the Site.

4.3.1.1 SUMMARY OF SURFACE SEDIMENT SAMPLING INVESTIGATIONS, METHODS, AND LOCATIONS

Four separate work plans were developed that included collection and analysis of surface sediment samples from the Site:

- SAIC 2008 – One Site location analyzed for total PCBs (Aroclor method) and dioxins/furans

- Bay Wood Products 2009 – Two Site locations analyzed for dioxins/furans
- SLR 2009 – JELD-WEN Phase 1 RI/FS Work Plan
- Anchor QEA 2012/2014 – JELD-WEN Phase 2 RI/FS Work Plan

Each of these sampling and analysis efforts is summarized in the sections below. The combined surface sediment sampling locations are presented on Figure 4.3-1 and Figure 4.3-2; laboratory analyses conducted on each sample are summarized in Table 4.3-1. All surface sediment results are compiled in Appendix H, Table H-1 and compared to SMS sediment cleanup objective (SCO) chemical criteria for marine sediments. Field collection forms are presented in Appendix I. The data quality summary is included in Appendix J.

SAIC 2008

A single surface sediment sample (0 to 10 centimeters [cm]; Station A2-18B; see Figure 4.3-1) was collected in August 2008 within the Site area as part of the larger Port Gardner sediment quality investigation conducted by Ecology (SAIC, 2009). The surface sediment sample was collected using a modified van Veen grab sampler. The sample was analyzed for dioxins/furans and total PCBs (Aroclor method; Table 4.3-1).

Bay Wood Products 2009

Two surface sediment samples (Stations BW-03-SS and BW-11-SS; see Figure 4.3-1) were collected by the Port of Everett in June 2009 from the adjacent northern tidal mudflat area as part of the RI/FS for the adjacent Bay Wood Products Site (Bay Wood; Cleanup Site ID: 2581). The Bay Wood surface sediment samples were collected from a depth of 0 to 10 cm at low tide by hand. The two locations were collected by measuring a 1-square-meter grid at the station location and then collecting equal volumes of 0 to 10 cm sediment from each corner of the square using a stainless-steel trowel. Surface sediment samples were analyzed for dioxins/furans (Table 4.3-1).

SLR 2009

As part of the initial Site RI/FS sampling, 34 surface sediment (0 to 10 cm) samples were collected by JELD-WEN in June 2009 and analyzed following the Ecology-approved Work Plan (SLR, 2009). All sediment samples were collected from fine-grain materials using hand tools at low tide. Sediment samples were collected adjacent to each of the nine identified historical and/or current stormwater outfalls (Stations 3SED1 through 3SED8, and 3SED10; Figure 4.3-1). Surface sediment samples were also collected from the eastern-most segment of the channel along the north boundary of the Site (Station 3SED9) and in the vicinity of the former fish net storage building and Knoll Area at the southeastern corner of the Site (Stations 3SED11 and 3SED12). At each sampling location, three separate grab samples (denoted with an A, B, or C identifier) were collected either along the stormwater flow alignment (for outfall area samples) or in a radial pattern (for all other samples), with each sample approximately 10 feet equidistant from the other(s).

Anchor QEA 2012/2014

The 2008 and 2009 sampling data summarized above identified dioxins/furans and total PCBs as COPCs in the marine sediments at the Site. However, additional data were needed to characterize the horizontal and vertical extent of these COPCs at the Site. In addition, since elevated concentrations of PAHs were detected in upland soils and groundwater at the Site (Section 4.1), further sampling and analysis was needed to determine if PAHs may also be a COPC in Site sediments. The Ecology-approved Phase 2 RI/FS Work Plan was developed to address these data gaps (SLR, 2011), and included the following:

- In May 2012, surface sediment (0-10 cm) samples were collected from 10 Exposure Areas (EAs) located immediately adjacent to the Site shoreline (see Figure 4.3-1).
- Two Site EAs were targeted for more detailed composite sampling and analysis of surface sediment and tissue (see Section 4.4). The first composite area (JW-EA-01; see Figure 4.3-1) targeted tidal mudflats at the head of the relatively narrow channel immediately adjacent to stormwater outfalls draining uplands at the northeastern corner of the Site. The second composite area (JW-EA-10) targeted tidal mudflats immediately adjacent to the former fish net storage building and Knoll Area at the southeastern corner of the Site. For comparison purposes, sediment and tissue samples were also collected from upstream, downstream, and regional reference areas with similar grain size and other habitat characteristics (see Figure 4.3-2).

All surface sediment samples were obtained at low tide by collecting and homogenizing five equal volume aliquots to create each sample. One aliquot was collected at the target location and the other four aliquots were collected approximately 3 feet from the target location at four points in a compass pattern. Sediments were collected with decontaminated stainless-steel spoons or disposal scoops, placed into a stainless-steel bowl, homogenized and placed into sample containers. The discrete surface sediment locations were composited by EA in the upland area of the facility. The discrete collection procedure was replicated in all subsequent surface sediment sampling described in this subsection.

In October 2012, archived sediment samples were submitted for additional discrete sample analyses. The submittal was composed of 29 sediment locations that were all analyzed for dioxin/furans. Six of the 29 locations were also submitted for PCB congener analyses.

In April 2013, Ecology approved a QAPP Addendum (Anchor QEA, 2013a) to submit additional archived surface sediment samples for dioxin/furan and/or PCB analysis, and to collect and analyze surface sediments from another 10 stations. Following review of these data, an additional seven discrete samples were submitted for dioxin/furan and/or PCB analysis. In September 2013, Ecology approved a second QAPP Addendum (Anchor QEA, 2013b) for the collection and analysis of the final two surface sediment samples to complete the RI/FS. In March 2014, Ecology approved a third QAPP Addendum (Anchor QEA, 2014) for the collection and analysis of clam tissue from an additional three locations to further refine the PCB biota sediment accumulation factor (BSAF).

4.3.1.2 SURFACE SEDIMENT ANALYTICAL RESULTS

This section summarizes analytical results for the combined RI/FS surface sediment sampling data set collected between 2008 and 2013, as summarized above. All surface sediment analytical results are presented in Appendix H, Table H-1 which compares the results to preliminary SCO and cleanup screening level (CSL) benthic chemical criteria. For chemical summations, different non-detect summation methods were performed (i.e., assuming non-detect [U] equals 0, ½, and the reporting limit).

Surface samples were analyzed for grain size, conventional parameters, SVOCs, PAHs, dioxins/furans, and PCBs (both as Aroclors and as congeners). Summary tables including the detection frequency, minimum, maximum, mean and non-detect information for each analytical group are presented in Tables 4.3-2 through 4.3-14.

Validation reports for the RI/FS data are provided in Appendix J. The reviews confirmed that the overall quality of the chemistry data was acceptable for use in site characterization for this RI/FS.

4.3.1.2.1 GRAIN SIZE AND CONVENTIONAL PARAMETERS

Grain size was evaluated in 54 sediment samples as part of the SLR 2009 and Anchor QEA 2012/2013 sediment characterization. While most Site surface sediments are composed of sand and silt-sized materials, there are localized areas with coarser materials. Surface sediment gravel content at the Site ranges from 0.1% to 69.9%; sand content ranges from 1.6% to 77%; silt content ranges from 2.5% to 85%; and clay content ranges from 0.9% to 20.9%. A grain size results summary table is presented in Table 4.3-3.

Conventional sediment analyses included total organic carbon (TOC), black carbon, and total volatile solids (TVS), along with other parameters. Conventional parameter results are summarized in Table 4.3-1, and key analytes are highlighted below:

- TOC was measured in 99 samples, and ranged from 0.289% in sample 3SED6-B to 6.65% in sample 3SED3-A.
- Black carbon was detected in all 20 samples analyzed and ranged from 0.12% in sample JW-EA06-COMP-120507 to 0.21% in sample JW-EA01-SS03-120507.
- TVS was measured in 34 samples and ranged from 1.69% in sample 3SED10-A to 10.53% in sample 3SED8-B. All surface sediment samples collected from the Site had TVS concentrations below wood waste cleanup standards developed to date at other Puget Sound sediment cleanup sites. For example, the TVS cleanup level developed for the Former Scott Mill Site in Anacortes was 12.2%, and the TVS screening level used in the RI/FS of the adjacent Bay Wood Site is 15.0%; maximum concentrations at the Site are below these regional benchmarks. In addition, detailed examinations of sediment cores (e.g. see Section 4.3.2) revealed that surface and near-surface sediments throughout the Site area contain less than 20% wood by volume (typically in the form of bark fragments), which again is below wood waste cleanup standards developed to date for other Puget Sound sediment cleanup sites.

4.3.1.2.2 METALS

Metals were analyzed in 34 samples collected from the Site. Cadmium was not detected in any of the samples. The detection frequency for all other metals ranged from 76% to 100%. A summary of metals results is presented in Table 4.3-4. None of the results exceed the SCO chemical criteria for metals, and thus metals were not identified as COPCs in Site sediments.

4.3.1.2.3 SEMIVOLATILES

SVOCs were analyzed in 34 surface sediment samples collected from the Site. Summaries of SVOC dry weight (dw) values and organic carbon (OC) normalized results are provided in Table 4.3-5 and Table 4.3-6, respectively. Three surface sediment samples had detectable concentrations of three different SVOCs that exceeded SCO chemical criteria (see Appendix H, Table H-1).

- Benzoic acid exceeded the SCO and CSL chemical criteria in sample 3SED9-A.
- Dibenzofuran exceeded the SCO chemical criterion in sample 3SED10-A.
- Hexachlorobenzene exceeded the SCO and CSL chemical criteria in sample 3SED6-C.

Because of the isolated detections of these SVOCs at the Site, and also because these chemicals have not been identified as COPCs in the Site uplands (see Section 4.1), SVOCs were not identified as COPCs in Site sediments. Moreover, samples 3SED9-A and 3SED10-A also exceed SCO chemical criteria for Site COPCs (dioxins/furans and/or total PCBs) and are included within the footprint of prospective remedial actions at the Site (see Section 11).

4.3.1.2.4 POLYCYCLIC AROMATIC HYDROCARBONS

Thirty-nine (39) surface sediment samples collected from the Site were analyzed for PAHs. Both dw and OC-normalized values are presented in Table 4.3-7 and Table 4.3-8, respectively. PAHs were detected in all but two samples. Four individual PAH results exceeded SCO chemical criteria, but only in a single sample collected adjacent to a stormwater outfall (see Appendix H, Table H-1):

- Acenaphthene, fluoranthene, fluorene, and phenanthrene exceeded SCO chemical criteria in sample 3SED10-A.

The concentrations of PAHs detected in sample 3SED10-A, and also in sediment and tissue samples collected from other areas of the Site, are within the upstream, downstream, and regional reference area ranges (see Figure 4.3-2). Thus, PAHs were not identified as COPCs in Site sediments for benthic protection. Similar to the dibenzofuran detection summarized above, sample 3SED10-A also exceeded SCO chemical criteria for Site COPCs (dioxins/furans and/or total PCBs) and is included within the footprint of prospective remedial actions at the Site (see Section 11).

Sediment cPAH TEQ, calculated in accordance with toxicity factors in WAC 173-340-708(e), was retained as a COPC for the evaluation of human health protection for completeness. However, samples with cPAH TEQ exceeding the preliminary SCO criterion of 21 µg/kg dw (based on natural background), were encompassed within the footprint of prospective remedial actions at

the Site as defined by total PCBs and dioxin/furan TEQ (see below). Surface sediment cPAH TEQ dw concentrations (U = 1/2) in the Site area are summarized in Figure 4.3-3.

4.3.1.2.5 POLYCHLORINATED BIPHENYLS

Thirty-five (35) surface sediment samples collected from the Site were analyzed for PCBs using the Aroclor method, and an additional 37 surface sediment samples were analyzed for PCBs using the congener method. Both dw and OC-normalized values for total PCBs are presented in Table 4.3-9 and Table 4.3-10.

Of the 72 surface sediment samples collected from the Site area that were analyzed for PCBs (using either the Aroclor or congener method), 18 samples (25%) had detectable concentrations of total PCBs that exceeded the preliminary SCO chemical criterion (based on human health protection) of 35 µg/kg (dw basis; see Section 6.1.1.3). Surface sediment total PCB dw concentrations (U=0) in the Site area are summarized in Figure 4.3-4, using inverse distance weighting (IDW) contouring of the RI/FS data set. The highest dw concentration of total PCBs on an EA basis (approximately 141 µg/kg at station JW-EA-10) was detected immediately adjacent to the Knoll Area. Since total PCB concentrations in this area of the Site also exceeded the upstream, downstream, and regional reference area range, total PCBs were retained as a COPC in Site sediments.

4.3.1.2.6 DIOXINS/FURANS

Seventy-seven (77) surface sediment samples collected from the Site were analyzed for dioxins/furans. All samples had one or more dioxin/furan detection. Both dw and OC-normalized dioxins/furans congener results are presented in Table 4.3-13 and Table 4.3-14, respectively. Total dioxin/furan TEQ levels in each sample were calculated using World Health Organization (2005) toxic equivalency factors for mammals.

Of the 77 surface sediment samples collected from the Site area that were analyzed for dioxins/furans, 48 samples (62%) had TEQ levels that exceeded the preliminary SCO chemical criterion (based on the practical quantitation limit [PQL]) of 5 ng/kg; dw basis; see Section 6.1.1.3). Surface sediment dioxin/furan TEQ dw levels (U=1/2) in the Site area are summarized in Figure 4.3-5, using IDW contouring of the RI/FS data set. The highest dw dioxin/furan TEQ level on an EA basis (approximately 91 ng/kg at station JW-EA-06) was detected immediately adjacent to historical and/or current stormwater outfalls draining uplands at the western end of the Site. Since dioxin/furan TEQ levels in this area of the Site exceed the upstream, downstream, and regional reference area range, dioxin/furan TEQ was retained as a COPC in Site sediments.

4.3.1.2.7 COPLANAR (DIOXIN-LIKE) PCB CONGENERS

A subset of PCB congeners denoted coplanar PCBs (i.e., those congeners not substituted at the ortho ring positions) exhibit dioxin-like properties and, like dioxins/furans, TEQ levels for these congeners can also be calculated using World Health Organization (2005) toxic equivalency factors for mammals. Seventy-two (72) surface sediment samples collected from the Site were analyzed for coplanar PCB congeners, and all samples had one or more coplanar PCB detection. Both dw and OC-normalized coplanar PCB congener results are presented in Table 4.3-11 and Table 4.3-12, respectively.

Surface sediment coplanar PCB congener TEQ concentrations (U=1/2) in the Site area are summarized in Figure 4.3-6. The highest dw coplanar PCB TEQ level on an EA basis (approximately 1.8 ng/kg at station JW-EA-09-SS38) was detected offshore of the Knoll Area. While this maximum TEQ level is below the preliminary SCO chemical criterion for dioxin/furan TEQ (based on the PQL) of 5 ng/kg, the cumulative risks of dioxins/furans plus coplanar PCB congener TEQ levels are nevertheless additive. Coplanar PCB congener TEQ levels offshore of the Knoll Area exceeded the upstream, downstream, and regional reference area range. However, since the spatial pattern of elevated coplanar PCB congener TEQ levels at the Site is similar to that of total PCBs, retaining coplanar PCB congeners as a Site COPC would not change the footprint of prospective remedial actions at the Site (see Section 11).

4.3.2 MARINE SUBSURFACE SEDIMENT CHARACTERIZATION

This section summarizes the characterization of subsurface sediments at the Site. Sampling and processing were carried out in accordance with the Sampling and Analysis Plan (SAP, Anchor QEA, 2011).

4.3.2.1 SUMMARY OF SUBSURFACE SEDIMENT SAMPLING INVESTIGATIONS, METHODS, AND LOCATIONS

As specified in Section 2.1 of the SAP (Attachment 1 of the Ecology-approved QAPP), sediment coring sample locations were determined based on a review of the marine surface sediment sample results summarized in Section 4.2. Twelve sediment cores were collected at locations shown in Figure 4.3-7 to characterize the vertical extent of sediment COPCs at the Site.

Nine cores were collected in April 2013 and two additional cores were collected in September 2013 for physical testing, and dioxin/furan and PCB congener analysis. Cores were collected utilizing an electrically powered vibracoring device. Prior to deployment, a decontaminated 4-inch-diameter aluminum core barrel was attached to the coring device and the corer was lowered through the water column under winch control. The unit was then energized and lowered by means of its weight and vibration applied until the desired penetration depth was achieved or refusal was encountered. The core penetration was continuously monitored while the vibracore was advanced into the sediments. Core penetration was monitored using a transducer attached to the top of the core tube, which measured the distance the vibracore was advanced into the sediment.

During the April 2013 core sample acquisition, the field team (with Ecology oversight) observed potential visual indication of contamination (i.e. staining) and hydrocarbon-like odors at the 7- to 7.3-foot depth interval at core location JW-SC05 (no similar observation in the overlying sediments). In consultation with Ecology, the interval was submitted for SVOC testing (including PAHs) to characterize the subsurface sediment interval. Following the initial testing, an additional overlying subsurface interval from 6 to 7 feet at location JW-EA-SC-05 and single interval at EA04-SC13 were submitted for SVOC testing (including PAHs).

Station JW-EA07-SC27 was inaccessible by boat due to its high tidal elevation, and the sediment core at this location was collected using a hand operated push core. The hand coring device utilized a decontaminated 3-inch-diameter polycarbonate core tube. Sediment sampling was conducted by pushing the coring device vertically into the sediment using a sliding hammer

device, and manually pulling the core back out. Two additional cores were collected in September 2013 at locations JW-GC1b and JW-GC2 using the hand coring device described above to collect sediment samples for geochronology analyses.

All cores collected in April 2013 for chemistry analyses were processed at an on-site upland location the day following core collection. Two additional cores, JW-401 and JW-402, collected in September 2013 for chemistry analysis, were transported and processed at Analytical Resources Inc. (ARI) analytical laboratory the day following core collection. All cores were stored upright on ice and processed following procedures described in the SAP. Each core section was logged throughout the full penetration depth and the sediment description was recorded. Copies of the field collection forms and core processing logs describing sediment lithology are included in Appendix H. Appendix H, Table H-1 summarizes the coordinates and mudline elevations of the sampling locations. Core sampling locations are presented in Figure 4.3-7. Cores for sediment characterization were sectioned at 2-foot intervals to a depth of 6 feet below mudline, then at 1-foot intervals to the bottom of the core. The core collected by hand at JW-EA07-SC27 was processed in 1-foot sections to the bottom of the core. Each core interval was submitted for conventional, dioxin/furan, and/or PCB congener analysis, as summarized in Table 4.3-1. Sample intervals below those specified for analysis were submitted to the laboratories for archive storage for future analysis, as necessary.

Additionally, duplicate hand-collected cores were taken from locations JW-GC1 and JW-GC2 (Figure 4.3-7) for wet sieving and geochronology analysis, consistent with the Second QAPP Addendum (Anchor QEA, 2013b). Wet sieve and geochronology samples were collected at 2 cm intervals to a depth of approximately 1 foot below mudline. Wet sieving (using a #200 sieve) was used to obtain a visual estimate of the percent of wood fragments present in the cores. As summarized in Appendix H, Table H-3, wood debris averaged approximately 7% by volume in both cores, ranging from 0% to 20%. The radiochemical analyses are summarized in Table 4.3-22 and are discussed in Section 4.3.3.5.

4.3.2.2 SUBSURFACE SEDIMENT ANALYTICAL RESULTS

Appendix H, Table H-2 presents tabular summaries of the subsurface sediment data. Subsurface samples were analyzed for grain size, TOC, PAHs, SVOCs, dioxins/furans, PCBs, and selected radionuclides (for geochronology analyses). Where chemical summations are required, all non-detect summation methods have been included (e.g., U=0, ½, and the reporting limit).

4.3.2.2.1 GRAIN SIZE AND TOTAL ORGANIC CARBON

Grain size was analyzed in 20 samples and results ranged from fine clay to gravel, with the highest percentages in the sand range. Gravel content ranged from 0.2% to 3.7%; sand content ranged from 13.8% to 93.1%; silt content ranged from 4.4% to 65.1%; and clay content ranged from 1.2% to 23.6%. Grain size results are presented in Table 4.3-15. Thirty-nine (39) intervals were analyzed for TOC and results ranged from 0.305% in the 6- to 8-foot interval of core SC402 to 8.78% in the 7- to 7.3-foot interval from core EA02-SC05. A summary of TOC results is presented in Table 4.3-16.

4.3.2.2.2 SEMIVOLATILE ORGANIC COMPOUNDS

Consistent with the Ecology-approved QAPP, SVOCs were analyzed in the 6- to 7-foot (interval D) and 7- to 7.3-foot (interval E) intervals of core EA02-SC05 and in the 6- to 7-foot interval (interval D) of core EA04-SC13. A summary of SVOC results for these samples is presented in Table 4.3-17 and below:

- 4-methylphenol exceeded SCO chemical criteria in interval E of EA-SC-05 and interval D of EA04-SC13.
- Benzoic acid exceeded the SCO chemical criteria in interval D of EA-SC-05.
- Dimethyl phthalate exceeded the SCO chemical criteria in interval E of EA-SC-05.

As discussed in Section 4.2.2.3, with the exception of benzoic acid, which had elevated concentrations at a single surface sediment sample at the Site, these chemicals were generally not detected above SCO chemical criteria in surface sediments, and also have not been identified as COPCs in the Site uplands (see Section 4.1). Thus, SVOCs were not identified as COPCs in Site sediments.

4.3.2.2.3 POLYCYCLIC AROMATIC HYDROCARBONS

PAHs were analyzed in the 6- to 7-foot (interval D) and 7- to 7.3-foot (interval E) intervals collected from core EA02-SC05 and the 6- to 7-foot interval (interval D) of core EA04-SC13. A summary of PAH results is presented in Table 4.3-18. None of the subsurface samples exceeded SCO chemical criteria for PAHs. As discussed in Section 4.2.2.4, PAHs were not identified as COPCs in Site sediments.

4.3.2.2.4 POLYCHLORINATED BIPHENYLS

PCB Aroclors were analyzed in a single core interval collected at station EA02-SC05, and PCB congeners were analyzed in an additional 10 core intervals collected from stations EA09-SC36, EA09-SC38, and EA10-SC42. A summary of PCB results is presented in Table 4.3-19 and Table 4.3-20.

Relative to surface (0 to 10 cm) concentrations, all of the underlying 0- to 2-foot core sample interval samples had lower concentrations of total PCBs (Figure 4.3-8). While the 0- to 2-foot core interval samples collected near the Knoll Area had total PCB concentrations that exceeded the preliminary SCO chemical criterion (based on human health protection) of 32 µg/kg (dw basis; see Section 6.1.1.3), all of the deeper (i.e., 2- to 4-foot) core intervals had total PCB concentrations that were well below 32 µg/kg. Based on these data, only relatively shallow sediments at the Site exceed the preliminary SCO chemical criterion for total PCBs.

4.3.2.2.5 DIOXINS/FURANS

Thirty-six (36) subsurface core intervals were analyzed for dioxins/furans. Total dioxin/furan TEQ dw levels in subsurface sediments ranged from below detection (less than 0.16 ng/kg) to approximately 105 ng/kg. A summary of dioxins/furans results is presented in Table 4.3-21.

Unlike total PCBs as discussed above, relatively deeper subsurface sediments in some areas of the Site exceeded the preliminary SCO chemical criterion for dioxin/furan TEQ (based on the PQL) of 5 ng/kg, particularly at locations closest to stormwater outfalls. For example, at station EA-02, located towards the head of the northern channel Site boundary, dioxin/furan TEQ values greater than 5 ng/kg extended more than 7 feet below mudline (below the bottom interval of the core collected at this location; Figure 4.3-8). In other Site areas with elevated surface sediment dioxin/furan TEQ levels (e.g., station JW-EA-06, located adjacent to historical and/or current stormwater outfalls draining uplands at the western end of the Site), subsurface sediments exceeding 5 ng/kg were typically limited to the top 4 feet of sediments.

4.3.2.2.6 GEOCHRONOLOGY

In sediment environments, chronological scales can often be determined by analyzing the vertical distribution of relatively short-lived radioactive isotopes in surface and near-surface core intervals. Consistent with geochronology investigations successfully performed at other areas in Puget Sound (e.g., Lefkovitz et al., 1997), geochronology sampling and analysis in the Site area focused on two radioisotopes: Cesium-137 (Cs-137), released to the atmosphere from nuclear tests in the 1950s/1960s with a half-life of approximately 30 years; and Lead-210 (Pb-210) a naturally occurring radioisotope present in sediments both from atmospheric deposition and background activity with a half-life of approximately 22 years. Cs-137 was analyzed on 30 samples, and Pb-210 was analyzed on 29 samples. All samples were obtained from high-resolution core sections collected from stations JW-GC1 and JW-GC2 (Figure 4.3-9), both located offshore of the Knoll Area. A summary of radiochemical data is presented in Table 4.3-22.

In core JW-GC-1, Cs-137 was detected in the first interval collected below mudline (0.14 pCi/g at 2 to 4 cm) but had non-detectable Cs-137 activities (typically less than 0.01 pCi/g) below this interval. In core JW-GC-2, Cs-137 was detected in all five near-surface intervals with a peak activity (0.26 pCi/g) at 10-12 cm, and detectable Cs-137 (0.13 pCi/g) extended to 18-20 cm (Figure 4.3-9). Cs-137 was released to the atmosphere from nuclear tests as early as 1954 and reached a peak in approximately 1963 (e.g., see Lefkovitz et al., 1997). Thus, the Cs-137 core data suggest an average contemporary net sedimentation rate (corrected for the average 7% wood debris measured in these two cores; see Section 4.3.2) at the Site of approximately 0.17 ± 0.08 cm/year (i.e., an average 0.6-inch accumulation over a 10-year period), with different rates measured at each core:

- JW-GC-1: 0.06 to 0.11 cm/year
- JW-GC-2: 0.20 to 0.30 cm/year

The structured vertical profile of Cs-137 activity, particularly in core JW-GC-2, is also indicative of stable sediments (i.e., little vertical sediment mixing) over the past 60 to 70 years (Figure 4.3-9). Further, the data from both cores suggest that bioturbation of surface sediments is less than 10 cm, and more likely less than 4 cm. Thus, the SMS marine sediment default 10 cm bioactive zone is a conservative overestimate of bioturbation at the Site.

Pb-210 was detected in all 29 geochronology samples. However, all Pb-210 activities measured in the two geochronology cores were not statistically different ($P>0.10$) from the deeper sediment background range, and thus could not be used to reliably estimate sedimentation rates. This is likely due to the low Pb-210 activities in glacial and agricultural sediments moving through the

Site area from the upper Snohomish River watershed, which limit the utility of the Pb-210 dating method at this Site.

4.3.3 CLAM TISSUE SAMPLING

4.3.3.1 SUMMARY OF SUBSURFACE SEDIMENT SAMPLING INVESTIGATIONS, METHODS, AND LOCATIONS

As discussed in Section 4.2.1, two Site EAs were targeted for detailed composite sampling and analysis to characterize site-specific bioaccumulation of COPCs. The first composite area (JW-EA-01; see Figure 4.3-1) targeted tidal mudflats at the head of the relatively narrow channel immediately adjacent to historical and/or current stormwater outfalls draining uplands at the northeastern corner of the Site. The second composite area (JW-EA-10) targeted tidal mudflats immediately adjacent to the former fish net storage building and Knoll Area at the southeastern corner of the Site. For comparison purposes, sediment and tissue samples were also collected from upstream, downstream, and regional reference areas with similar grain size and other habitat characteristics (see Figure 4.3-1). Consistent with the Ecology-approved Phase 2 RI/FS Work Plan (Anchor QEA, 2013b), composite clam tissue samples of a single relatively abundant species, *Mya arenaria* (soft shell clam), were collected in May 2013 and analyzed for dioxins/furans, PCB congeners, PAHs, and lipids.

4.3.3.2 CLAM TISSUE ANALYTICAL RESULTS

The clam tissue analyses are presented in Appendix H, Table H-4. Percent lipids varied little between each of the five composite tissue samples, ranging from approximately 0.32% to 0.6%. Similarly, total cPAH TEQ levels in the two Site composite samples (JW-EA-01 and -10) ranged from approximately 1.3 to 1.8 µg/kg wet weight (U=1/2), and were within the regional and upstream/downstream reference range of approximately 0.58 to 5.6 µg/kg wet weight. Consistent with the sediment data discussed in Section 4.2.2.4, the tissue data further confirmed that cPAHs are not COPCs in Site sediments.

Dioxins/furans were detected in all five composite clam tissue samples. Dioxin/furan TEQ levels in the two Site composite tissue samples (JW-EA-01 and -10) ranged from approximately 0.13 to 0.23 ng/kg wet weight (U=1/2), and this range is similar to or up to roughly two times higher than the regional sample level of approximately 0.11 ng/kg (Table 4.3-23).

PCB congeners, including coplanar PCBs, were detected in all eight composite clam tissue samples. Tissue total PCB concentrations from the five site-specific locations (JW-EA-01, JW-EA-10, P-100, P-50, and P-25) ranged from approximately 2.9 to 4.2 µg/kg wet weight (U=0), roughly three to five times higher than the regional sample concentration of approximately 0.89 µg/kg. Finally, tissue coplanar PCB congener TEQ levels ranged from approximately 0.0022 to 0.076 ng/kg wet weight (U=0), roughly two to four times higher than the regional sample level of approximately 0.0014 ng/kg.

The clam tissue data confirm that PCBs and dioxins/furans bioaccumulate at the Site, although the magnitude of bioaccumulation is relatively modest (i.e., up to a factor of five higher than regional sample levels for PCBs, and up to a factor of two higher for dioxins/furans), particularly compared to the relatively more elevated sediment concentrations of these COPCs (Table 4.3-

23). Black carbon materials present in Site sediments likely partially sequestered PCBs and dioxins/furans, reducing their bioavailability. Black carbonaceous particles in sediments such as soot, coal, and charcoal bind very strongly to hydrophobic chemicals such as PCBs and dioxins/furans (partitioning coefficients for black carbon can be up to 100 times higher than for other organic carbon materials), and their presence in sediments (both natural and anthropogenic) has been demonstrated to substantially reduce bio-uptake and exposure (e.g., Luthy et al., 1997).

As discussed in Ecology's SCUM II guidance (Ecology, 2019), the site-specific BSAF expresses the approximate steady-state relationship between the concentration of a bioaccumulating COPC normalized to the organic carbon content of the sediment, and the COPC concentration measured in the total extractable lipids of an organism. There are many simplifying assumptions inherent in BSAF calculations, including assuming that all COPC bioaccumulation is due to sediment exposure, but current SMS guidance recommends using site-specific BSAFs for individual COPCs to calculate SCO chemical criteria for human health protection (see Section 6.1.1.3).

For total PCB congeners, initial statistical analysis were conducted on all site-specific results (JW-EA01, JW-EA10, P-100, P-50, and P-25) using EPA's ProUCL program. The analysis revealed that the result from JW-EA01 is a statistical outlier, likely because this station is not representative of the rest of the marine area, as it is located at the head of the relatively narrow channel immediately adjacent to stormwater outfalls draining uplands at the northeastern corner of the Site. In accordance with SCUM II, linear regression analysis was performed on the total PCB congener dataset (excluding JW-EA01) to calculate the site-specific PCB BSAF.

For dioxin/furan TEQ and coplanar PCB congener TEQ, linear regression was performed using the regional and upstream/downstream reference stations, along with two stations within the Site, to calculate site-specific BSAFs for these COPCs.

The site-specific BSAF (unitless) values for sediment COPCs are summarized below:

- Total PCB BSAF: 0.032 (slope of regression; $R^2 = 0.76$)
- Dioxin/furan TEQ BSAF: 0.060 (slope of regression; $R^2 = 0.38$)
- Coplanar PCB Congener TEQ: 0.011 (slope of regression; $R^2 = 0.87$)

The site-specific BSAF values for all these sediment COPCs, as summarized above, are all significantly less than 1.0, the theoretical equilibrium value assuming little or no site-specific sequestering. As discussed above, the comparatively lower BSAF values measured reflect reduced bioavailability of COPCs at the Site.

4.3.4 MARINE SEDIMENT INDICATOR HAZARDOUS SUBSTANCES

When defining MTCA or SMS cleanup requirements at a site that has been impacted by a number of hazardous substances, those hazardous substances that contribute a small percentage of the overall threat to human health and the environment may be eliminated from consideration (Chapter 173-340-703 WAC). The remaining hazardous substances shall serve as IHS for purposes of defining site cleanup requirements.

4.3.4.1 IDENTIFICATION OF INDICATOR HAZARDOUS SUBSTANCES – MARINE SEDIMENT

As discussed in Sections 4.2 through 4.4, COPCs identified in marine sediments at the Site include total PCBs, dioxin/furan TEQ, coplanar PCB congener TEQ, and cPAH TEQ. Measurements of percent wood by volume and TVS throughout the Site are all below wood waste cleanup standards developed to date for other Puget Sound sediment cleanup sites. While wood waste, wood waste degradation products, and all other SMS chemicals are not COPCs at the Site, most of the relatively isolated elevated concentrations of these parameters nevertheless occur within the footprint of prospective remedial actions at the Site (see Section 11). As part of remedial design or post-remediation monitoring, TVS may be further characterized to determine compliance with the SMS regulations within the Site boundary.

Elevated coplanar PCB congener TEQ levels at the Site are encompassed within the footprint of prospective remedial actions based on total PCBs and dioxin/furan TEQ. Moreover, the current surface weighted average concentration (SWAC) of coplanar PCB congener TEQ is 0.61 ng/kg dw, which is below the preliminary site-specific SCO of 1.5 ng/kg dw (Figure 4.3-6). Therefore, coplanar PCB congener TEQ is not an IHS.

Site-specific tissue results for cPAH TEQ were not elevated in comparison to regional and upriver/downriver reference locations. In addition, locations where cPAH TEQ levels were elevated above the preliminary SCO of 21 µg/kg dw SCO (based on natural background) are also encompassed within the footprint of prospective remedial actions based on total PCBs and dioxin/furan TEQ. The arithmetic average cPAH TEQ level based on samples collected immediately outside the preliminary Site boundary is 9.9 µg/kg dw (Figure 4.3-2). Therefore, coplanar cPAH TEQ is also not an indicator hazardous substance. As part of remedial design or post-remediation monitoring, cPAH TEQ may be further characterized to determine compliance with the SMS regulations within the Site boundary.

4.3.4.2 NATURE AND EXTENT OF INDICATOR HAZARDOUS SUBSTANCES - MARINE SEDIMENT

Total PCBs

An IDW data model was used to interpolate surface sediment concentrations throughout the marine Site area (Figure 4.3-4). As discussed in Section 4.3.3.3, only relatively shallow sediments (0 to 2 feet below mudline) at the Site exceed the preliminary SCO chemical criterion of 30 µg/kg dw for total PCBs.

Dioxin/Furan TEQ

An IDW data model was also used to interpolate surface sediment dioxin/furan TEQ concentrations throughout the marine Site area (Figure 4.3-5). As discussed in Section 4.3.3.4, compared with total PCBs, relatively deeper subsurface sediments (approximately 4 to greater than 7 feet below mudline) in some areas of the Site exceeded the preliminary SCO chemical criterion for dioxin/furan TEQ of 5 ng/kg dw.

Summed Dioxin Furan and PCB TEQ

Where both coplanar PCB and dioxin/furan congeners have been analyzed (only roughly one-third of the RI/FS data set), the sum of their respective TEQs has been calculated as shown on Figure 4.3-10. As discussed in Section 4.6.3, since incorporation of coplanar PCB congener TEQ data did not change the footprint of prospective remedial actions at the Site, coplanar PCBs were not retained as indicator hazardous substances for marine areas of the Site.

5. CONCEPTUAL SITE MODELS

Conceptual site models (CSM) incorporate physical and chemical information to understand potential fate and transport mechanisms at the Site. The CSMs consider contaminant sources, release mechanisms, transport and exposure pathways, potential receptors, and sediment stability. The CSMs developed for the Site describe the potential release mechanisms from the potential primary sources of hazardous substances to potential secondary and tertiary sources, the exposure media and routes, and the potential human and ecological receptors. This model reflects current conditions and possible future development in assessing exposure pathways. The CSMs are based on available historical land use information, future land use as industrial, and site-specific information gathered during sampling activities. A summary of the CSMs including potential primary sources, release/transport mechanisms, primary exposure media and routes of exposure, potential receptors, and sediment stability are presented below.

5.1 GENERAL SITE OPERATIONS

General Site Operations

Past activities at the Site including door manufacturing, casket manufacturing, pole treating, and mill operations have resulted in likely releases of hydraulic fluids, creosote, fuel oil, toluene, other petroleum hydrocarbon constituents, and dioxins/furans (from former hog fuel burner emissions and associated ash from the historical mill). Potential primary release mechanisms from past activities include leaks or spills to soil, surface pavement, or stormwater at the Site, and releases from USTs to subsurface soil and/or groundwater. Isolated areas of soil and groundwater impacts are described in Section 4.1.2.1 and were confirmed to be limited in extent or below screening levels through follow-up investigations. These areas are not expected to be significant sources of any ongoing release.

5.2 CREOSOTE/FUEL OIL AREA

A conceptual site model including discussion of suspected points of release, contaminant fate and transport, and exposure pathways for the Creosote/Fuel Oil Area is provided below.

5.2.1 HISTORICAL USE

Characterization data and reported history of use indicate that the primary source of COPCs in soil and groundwater in the Creosote/Fuel Oil Area is the former pole treating operation on the Site. Prior to the early 1940s, National Pole Company operated a pole treating plant in the eastern portion of the Site and adjacent to the current placement of West Marine View Drive. Based on a review of aerial photographs and historical photos of the area it is likely that the roadway at that time was elevated on pilings (Appendix A).

Based on review of aerial photographs and historical maps, features associated with pole treating activities included two circular creosote ASTs of unknown capacity, three long rectangular ASTs possibly containing creosote, a rack for drying and storing treated poles, an oil house, and a rectangular building used as a combination lunchroom, engine room and machine shop (Figure 2.2-1), 1947 Aerial Photo with Site Features). The creosote ASTs, drying racks, and oil house

were removed between 1943 and 1948. Pole treating operations are not observed in aerial photographs or site maps after 1948. Mudflats east adjacent to the pole treating operations and underneath the suspected elevated roadway appear to have been filled between 1938 and 1947 (Appendix A).

The Nord Door facility operated an oil-fired boiler on the eastern portion of the Site prior to 1957. Former fuel oil ASTs were located in the eastern portion of the Site along West Marine View Drive and also further to the west, beneath what is now the southern portion of the main manufacturing building. These ASTs were removed in the mid-to late-1950s.

5.2.2 PHYSICAL SETTING

The current location of West Marine View Drive historically consisted of tidally-influence mudflats that were likely filled between 1938 and 1947. Based on a review of boring logs from the Creosote/Fuel Oil Area, fill material appears to consist primarily of dredged sandy sediment with aggerate material below roadway pavement. Construction of West Marine View Drive in its current location (filled land versus elevated roadway on pilings) was completed by 1947 based on the available aerial photographs and Site maps. West Marine View Drive was modified as a wider paved roadway in the 1960's.

Shallow groundwater has been measured as shallow as approximately 2 feet bgs and is likely influenced by surface water infiltration, site features, stormwater conveyance lines, and utilities infrastructure. Boring logs do not identify a continuous aquitard or aquiclude for the Site (Appendix F). Shallow groundwater samples at the Creosote/Fuel Oil Area have shown elevated conductivity, TDS, and salinity measurements indicating brackish groundwater conditions. The tidal influence assessment conducted in 2019 within the Creosote/Fuel Oil Area indicated changes in groundwater elevation associated with tidal swings were minimal.

Calculated shallow groundwater gradients reported during quarterly groundwater sampling activities, and data generated in the 2007 and 2019 transducer studies (Appendix G) indicate groundwater in the Creosote/Fuel Oil Area flows primarily west from the historical operations area towards Puget Sound with a gradient that averages 0.002 feet per foot (Appendix L). Groundwater below 15 feet bgs is considered "deep" groundwater for this RI/FS report. Calculated deep groundwater gradients reported during quarterly groundwater sampling activities indicate a similar westerly flow direction (Appendix G), and no vertical gradient has been measured in the paired wells (MW-8A-8B, MW-9A/9B, and MW-10A/10B).

Surface water in Maulsby Marsh flows west toward Puget Sound and drains through a culvert located on the southern edge of the marsh. Based on minimal tidal influence observed in monitoring wells in the Creosote/Fuel Oil Area, surface water elevations in Maulsby Marsh are not expected to be tidally influenced.

5.2.3 SUSPECTED AND CONFIRMED RELEASES

Based on historical documentation and analytical testing National Pole treated timber poles with a creosote wood preservative. Creosote is derived from coal tar and consists of a mixture of aromatic hydrocarbons, anthracene, naphthalene, and phenanthrene derivatives. Likely historical releases of COPCs to soil and groundwater associated with pole treating operations include spills

and incidental releases of creosote to the ground associated with transporting and drying treated poles.

Releases of petroleum hydrocarbons in the Creosote/Fuel Oil Area are likely associated with the historical fuel storage tanks that were located south of the identified pole treating activities (Appendix A). The highest concentrations of COPCs in soil and groundwater were reported during pre-RI investigations in the central portion of the Creosote/Fuel Oil Area including borings GP-9, -10, -11, -12, -214, -215, and several borings under the existing West Marine View Drive (see Figure 5.2-1). Grading and filling activities associated with construction of West Marine View Drive likely resulted in burial of surficial contamination east of the primary operations area. Additional assessments focused on the Creosote/Fuel Oil Area were performed under Ecology-approved work plans.

Hand auger soil samples were collected from twelve locations in Maulsby Marsh in 2009 to assess potential impacts east-adjacent to the Site and the BNSF railroad tracks. The assessment analytical results indicate that Creosote/Fuel Oil Area releases have not affected the marsh sediments or surface water. One soil sample (HA-329) from one-foot bgs measured elevated concentrations of TPH-Dx (diesel range) and PAHs above initial PCLs. Follow-up assessment of Maulsby Marsh sediment was completed in 2011 and it was determined that Creosote/Fuel Oil Area-related COPCs were not present in the freshwater marsh sediments and the contaminants detected in the marsh sediments were not attributable to Site releases (see Appendix E).

Maulsby Marsh is adjacent to the BNSF railroad tracks where the application of herbicides/pesticides has been observed on the vegetated area that included sample location HA-329. Soil and groundwater analytical results from location HA-329 appear to be an outlier amongst the BNSF sampling, potentially associated with treated railroad ties, and are not considered representative of overall soil and groundwater conditions in the area between the BNSF railroad tracks and Maulsby Marsh.

5.2.4 CONTAMINANT FATE AND TRANSPORT

Soil

COPCs identified for the Site have relatively high partition coefficients and migrate slowly in soil through natural processes including density-driven flow, capillary draw, advection, and diffusion into the subsurface. RI data indicate that the migration pathway from soil to groundwater is complete at the Site; however, additional transport associated with groundwater flow through contaminated soil is also limited (see below). Droplets of non-aqueous phase liquid (NAPL) was observed in soil samples from Geoprobe boring locations, although not as a continuous unit. The presence of dense non-aqueous phase liquid (DNAPL) at depth indicates vertical migration of historical releases through density-driven flow. Soil cross sections for on-property and off-property portions of the Creosote/Fuel Oil Area are included as Figure 5.2.4-1 and Figure 5.2.4-2, and sample locations used for development of the cross sections are shown on Figure 5.2.4-3.

Soil Vapor

Migration of vapor from contaminated groundwater into soil gas has been assessed at the Site. Soil gas sampling from within the footprint of the existing main manufacturing building identified naphthalene and benzene exceedances of sub-slab soil gas vapor PCLs.

Groundwater

Groundwater sampling data has demonstrated that creosote impacts to soil and groundwater are localized around the former operation areas in the Creosote/Fuel Oil Area and beneath West Marine View Drive. Groundwater data collected during the RI/FS shows groundwater migration and/or seepage to surface water does not appear to be a significant mechanism for the transport of creosote and/or fuel oil impacts.

Estimates of the shallow groundwater velocity in the Creosote/Fuel Oil Area (Appendix L) are on the order of one-half foot per day. At this velocity, hundreds of soil porewater volume exchanges have occurred in the Creosote/Fuel Oil Area over the estimated 70 years since the suspected release(s). However, creosote impacts to soil and groundwater remain localized in an area measuring approximately 650 by 500 feet. The analytical results indicate that groundwater transport is not a significant mechanism for Creosote/Fuel Oil Area contaminant migration.

Deep groundwater impacts including concentrations of naphthalene (up to 15,900 ug/L, see Table 5.2-2) were reported for groundwater samples collected from deep monitoring well MW-8B. There does not appear to be a contiguous DNAPL plume in the shallow or deep zone as evidenced by NAPL only being observed as droplets in the soil matrix at select boring locations and the majority of groundwater impacts appear to be as dissolved phase; however, additional assessment is needed to define the horizontal extent of deep groundwater impacts. Sufficient deep zone groundwater plume data exists to complete the RI/FS with this identified data gap.

Surface Water and Stormwater

Creosote and fuel oil impacts at the Site in soil are primarily located at depth beneath buildings or pavement. Locations where creosote concentrations in soil exceeded the PCL in subsurface soil at unpaved areas include a thin strip of landscaping on the eastern portion of the Site and areas along the BNSF railroad ROW east of West Marine View Drive. Sediment and tissue sampling data in the adjacent marine and Maulsby Marsh areas did not identify creosote and/or fuel oil releases to surface water. Therefore, overland transport/surface runoff via stormwater is not considered a significant release mechanism for the creosote or fuel oil impacts at the Site.

Stormwater collection and transport via the on-site stormwater conveyance system has been identified as a likely potential historical contributor to sediment contamination on the north and south off-shore areas. However, the majority of the on-site stormwater conveyance system is located outside of the Creosote/Fuel Oil Area (see Figure 3 from the SCE Summary Report, SLR, 2019a) and the primary COPCs in sediment are dioxins/furans and PCBs. Because the majority of subsurface contamination in the Creosote/Fuel Oil Area occurs at depth, and minimal collection of stormwater occurs in the Creosote/Fuel Oil Area, transport of Creosote/Fuel Oil Area COPCs via the stormwater system is not considered a significant potential pathway for migration of COPCs at the Site.

5.2.5 CLIMATE CHANGE AND EARTHQUAKES

The potential effects of climate change and sea level rise are discussed in Section 3.4 of this report. Potential treatment technologies for the vadose zone within the timeframe for implementation and operation are discussed in the FS section of this report. For the Creosote/Fuel Oil Area, it is anticipated that sea level rise will result in a corresponding rise in the groundwater table, reducing the thickness of the vadose zone, potentially limiting the effectiveness of remediation treatment technologies targeting the vadose zone. Two- and three-phase partition modeling of creosote and oils in the vadose zone (water, air, and residual oil) within a soil matrix indicate that rising sea levels will increase the oil holding capacity of the soil matrix while reducing the residual oil mobility.

A large magnitude earthquake could cause liquefaction of the silty, sandy soil identified in the Creosote/Fuel Oil Area. The City of Everett's GIS maps gateway (Map Everett (everettwa.gov)) depicts the whole site as a "Seismic Hazard". The liquefaction susceptibility is shown as "High" on the eastern portion of the site near Marine View Drive. An earthquake analysis/soil liquefaction analysis was not performed as part of this RI. The Creosote/Fuel Oil Area is generally flat and significant land displacement is not expected during a liquefaction event; although a loss of bearing-capacity, settlement, and associated damage to on-site structures and roadways would be expected. Paved areas, and areas with overburden soil underlain by saturated sandy soil, could see upwelling of sandy soils into pavement base rock or onto the ground surface. The upwelling is expected to be limited to shallow depths and localized.

5.2.6 NATURE AND EXTENT OF CONTAMINATION

Soil contamination at the Creosote/Fuel Oil Area includes TPH, PAHs, and VOCs primarily under the historical pole treating operations area with dimensions of approximately 650 feet by 385 feet (Figure 5.2-1). Soil impacts in the Creosote/Fuel Oil Area are bounded laterally to the north, east, south and west by existing RI sampling data. Soil contamination is primarily located between approximately 5 and 15 feet bgs. Deep soil contamination was observed to a maximum depth of approximately 50 feet.

Deep monitoring well MW-8B was installed to a depth of 50 feet bgs and one year after installation, DNAPL has accumulated in the sump that was constructed at the bottom of the well. Based on previous observations at the Site, DNAPL is present in discontinuous ganglia and small pockets in the deep subsurface. A continuous DNAPL plume or lens has not been identified. Additional data collection during remedial design will bound the vertical extent of naphthalene contamination and the lateral extents of contamination at the Creosote/Fuel Oil Area.

Shallow groundwater contamination in the Creosote/Fuel Oil Area includes TPH, PAHs, VOCs, and SVOCs. The distribution of COPCs in groundwater is spatially consistent with the distribution observed for COPCs in soil. Shallow TPH, PAH, SVOC, and VOC contamination is limited to the historical pole treatment area and proximate to the historical fuel ASTs in the central portion of the Creosote/Fuel Oil Area.

RI groundwater data bounds groundwater contamination in the Creosote/Fuel Oil Area to the north, south, and west. Groundwater samples collected from hand-auger locations on the east

edge of the Site were considered to represent the eastern edge of groundwater impacts because no known releases occurred in the marsh area and groundwater flows predominantly to the west.

Soil vapor is contaminated proximate to the area of shallow groundwater impacts. Neither soil nor groundwater contamination associated with the Creosote/Fuel Oil Area extend to the marine "finger area" or into freshwater in Maulsby Marsh. No Creosote/Fuel Oil Area COPCs were found in the adjacent Maulsby Marsh freshwater sediments.

5.2.7 AFFECTED MEDIA AND POTENTIAL EXPOSURE PATHWAYS

Results of the RI indicate that affected media at the Creosote/Fuel Oil Area include soil, soil vapor, and groundwater and potentially complete exposure pathways related to these media in the Creosote/Fuel Oil Area are described below.

Soil

The Property is zoned as industrial use and it is likely that industrial activities will continue to occupy the on-property portion of the Creosote/Fuel Oil Area for the foreseeable future. Potentially complete exposure pathways for soil in the Creosote/Fuel Oil Area include:

- Direct exposure by construction workers (e.g. dermal, incidental ingestion) associated with future on-site work or development work to a maximum depth of 15 feet or less.
- Terrestrial ecological exposure (e.g. dermal, ingestion, bio accumulative) to shallow soil in the unpaved areas only.

Shallow groundwater conditions are likely to limit potential future construction worker exposure to soil within less than approximately 5 feet from the ground surface. Due to the presence of asphalt caps, roadways, and structures on the Site, the terrestrial ecological exposure pathway is limited to a small landscaped area to the east of the main manufacturing building and the area in the BNSF ROW.

Due to the presence of shallow groundwater, surface structures, and the relatively conductive hydrogeology at the Site, no reasonable scenario exists for human or terrestrial ecological exposure to soil contamination greater than 15 feet bgs; therefore, no exposure pathway for deep soil is considered complete.

Soil Gas

Concentrations of naphthalene and benzene in soil gas samples exceeded applicable screening criteria under the existing main manufacturing building on the Site. Therefore, indoor air exposure pathway for workers on-Site is considered complete. Exposure to soil gas outside of existing buildings is unlikely due to immediate dilution by ambient air and lack of confinement to allow buildup of COPCs in the vapor phase

Groundwater

Groundwater at the Site is not considered potable because:

- It is not currently used as a source of drinking water; and,

- It contains natural background concentrations of constituents that make use of the water as a source of drinking water not practicable (brackish conditions).

Elevated Total Dissolved Solids (TDS) and/or salinity have been measured at monitoring wells MW-2, MW-3, MW-6, MW-8A, MW-9A, and MW-15, with a maximum TDS concentration of 15,490 mg/L (see Appendix G for field measurements from quarterly groundwater sampling events). Per MTCA, a TDS concentration in excess of 10,000 mg/L indicates that the groundwater contains natural background concentrations of organic or inorganic constituents that make use of the water as a drinking water source not practicable (173-340-720 (2)(b)(ii)).

In addition, according to MTCA the department recognizes that there may be sites where there is an extremely low probability that the groundwater will be used for domestic purposes because of the site's proximity to surface water that is not suitable as a domestic water supply (173-340-720 (2)(d)). While deep groundwater appears less saline than shallow groundwater, future use of deep groundwater is highly unlikely due to the potential for saltwater intrusion, difficulty of access, and the proximity to the marine waters of Puget Sound.

Groundwater impacts are currently contained under existing surface caps, buildings, and roadways, further limiting potential exposure. Sampling of adjacent shoreline seeps and Maulsby Marsh sediments indicates that groundwater COPCs are not a concern in either media. Therefore, no complete exposure pathways were identified for shallow or deep groundwater associated with the Creosote/Fuel Oil Area.

5.2.8 CREOSOTE/FUEL OIL AREA PROPOSED CLEANUP LEVELS

Site wide COPCs that exceed selected PCLs within the Creosote/Fuel Oil Area are co-mingled with Creosote/Fuel Oil Area COPCs. Based on the potentially complete exposure pathways listed above the following IHS have been selected for the Creosote/Fuel Oil Area:

- TEQ cPAHs in soil;
- Naphthalene in groundwater; and
- Naphthalene in soil gas.

While TPH-Dx and cPAH groundwater impacts have been identified throughout the Creosote/Fuel Oil Area (including in the deep zone), these impacts are comparatively less mobile, less widespread, and less volatile, and are therefore not appropriate IHS.

Proposed Creosote/Fuel Oil Area PCLs are:

- Saturated Soil Protective of Groundwater (soil);
- Groundwater Method B Protection of Vapor Intrusion (groundwater); and,
- Method B Sub Slab Soil Gas Screening Levels (soil gas).

Exceedances of selected PCLs for the IHS are presented in Table 5.2-1 to Table 5.2-3.

5.3 WOODLIFE AREA

A CSM including discussion of suspected points of release, contaminant fate and transport, and exposure pathways for the Woodlife Area is provided below.

5.3.1 HISTORICAL USE

Characterization data and history indicate that the primary source of COPCs in soil and groundwater in the Woodlife Area is attributed to an approximately 10,000-gallon AST containing Woodlife wood treatment solution (which contained PCP) that was formerly located northeast of the main manufacturing building (see Figure 5.3-1). The use of the Woodlife AST was discontinued prior to JELD-WEN's purchase of the Site in 1986, and the AST was removed in 1991.

Woodlife use at the former E.A. Nord ended before JELD-WEN's purchase. Woodlife contained PCP and a mineral spirits solution. Dioxin contamination is found in PCP mixtures. Waste associated with lumber preservation processes is considered a Resource Conservation and Recovery Act (RCRA) hazardous waste based under waste classification code F032. The F032 hazardous waste listing is defined in Title 40 of the Code of Federal Regulations (CFR) Chapter 462 and includes wastewater, process residuals, preservative drippage, and discarded spent formulations from wood preserving processes at facilities that currently use or have previously used chlorophenolic formulations. This definition only applies to wood preservation waste, not waste associated with wood surface protection operations at the Site. The F032 waste code was promulgated on December 6, 1990 at CFR Vol. 55 No. 235, Page 50450.

The wood preservation process is distinct from wood surface protection measures, which involve a superficial application of preservative to the wood surface to protect against mold and sap stain. According to 53 Federal Register 53287, most wood surface protection takes place at sawmills and manufacturing facilities like the former Nord Door site, where cut lumber is dip-or spray-treated to prevent sap stain formation during short-term storage. It notes that the distinction between wood preservation and surface protection is not only the process used, but also the depth to which the preservation penetrates and the duration of the process. The USEPA studied this issue before concluding that wastes from wood surface protection processes should not be considered a "listed" waste under F032. On January 4, 1994, the USEPA issued a final hazardous waste listing determination for wastes generated from the use of chlorophenolic formulations in wood surface protection processes. The 59 FR 458 Federal Register notice states in the summary section that: Upon reviewing the public comments received on its proposal of April 27, 1993, the Agency decided not to list wastes from the use of chlorophenolic formulations in wood surface protection processes as a listed hazardous waste.

Under the USEPA's "contained-in" policy, contaminated soil can become subject to regulations under RCRA if soil "contains" hazardous waste by exhibiting characteristics of hazardous waste or containing certain concentrations of listed hazardous waste. Under RCRA, contaminated soil is subject to the RCRA requirements until the soil no longer contains hazardous waste or, in the case of listed hazardous waste, until the agency determines that the soil no longer contains listed hazardous waste. The identified dioxin impacts identified in the Woodlife Area at the Site are associated with historical sap stain PCP formulations used in the manufacturing process. As dip-or spray-process to prevent sap stain formation during short-term storage is a wood surface

protection process, it does not meet the F032 waste classification for wood preserving processes and therefore, dioxin impacted soil at this site is not considered hazardous waste.

5.3.2 PHYSICAL SETTING

The physical setting of the Woodlife Area is similar to the physical setting described in Section 5.2.2 for the Creosote Area.

5.3.3 SUSPECTED AND CONFIRMED RELEASES

Because of the historical use of PCP, soil and groundwater sampling was completed for PCP, dioxins/furans and TPH. PCP was not measured above the laboratory reporting limit in any groundwater sample on the Site and was only detected above the laboratory reporting limit in 3 soil samples from the Woodlife Area (GP-5, GP-29, and GP-501). TPH was detected above the reporting limit in some soil and groundwater samples from the Woodlife Area but were limited in extent and therefore appears to be some crossover with impacts associated with the former National Pole treating operations and fuel oil storage (discussed in Section 5.2, Creosote/Fuel Oil Area CSM). Dioxin/furan TEQ analytical results indicate that impacts from the Woodlife AST are localized and it is likely that residual dioxins/furans are more persistent than the PCP that was used in the solution and is an apt constituent to trace the horizontal and vertical extent of Woodlife-associated impacts.

5.3.4 CONTAMINANT FATE AND TRANSPORT

Soil

COPCs identified for the Site have relatively high partition coefficients and migrate slowly in soil through natural processes including density-driven flow, capillary draw, advection, and diffusion into the subsurface. RI data indicate that the migration pathway from soil to groundwater is complete at the Site; however, additional transport associated with groundwater flow through contaminated soil is also limited (see below).

Groundwater

Groundwater sampling data has demonstrated that dioxin/furan impacts to soil and groundwater are localized around the former operation areas in the Woodlife Area. Given the substantive groundwater data available for the Site, the distance between the areas of impact and surface water, and the passage of time since these former operations, groundwater migration/seepage to surface water does not appear to be a significant release mechanism for dioxin/furan impacts in the Woodlife Area. Dioxins/furans have a low solubility and tend to bind to soil particles making it comparatively less mobile.

Surface Water and Stormwater

Dioxin/furan impacts in the Woodlife Area are located beneath buildings or pavement; therefore, overland transport/surface runoff is not considered a significant release mechanism for the dioxin/furan impacts in the Woodlife Area. Historical stormwater discharges from the NTD sump, surface flow from off-site properties, including West Marine View Drive, or infiltration of

groundwater into the NTD sump and/or drainage from the sump to the subsurface via the apparent sump weep holes were assessed during the source control evaluation and are described below.

5.3.5 NATURE AND EXTENT OF CONTAMINATION

Investigations at the Woodlife Area to further characterize dioxin/furan impacts found that soil and groundwater impacts were generally shallow (less than 5 feet bgs) and appeared to be localized. This assessment work was completed under an Ecology approved Work Plan (SLR, 2013a). Sentry groundwater monitoring wells MW-6 and MW-7 were installed downgradient of the Woodlife Area and the adjacent surface water and sediment (i.e. the "finger area"). Groundwater data collected during the RI/FS and groundwater seep data collected during the SCE show no migration of dioxins/furans above PCLs to surface water or sediments in the adjacent "finger area". Assessment of a stormwater sump in the NTD identified weep holes. Following the investigation, the current property owner plugged the weep holes, re-routed the discharge line to an existing stormwater line that discharges to the "finger area", and removed accumulated solids from within the North Truck Dock sump and from the truck dock ramp area.

Surface water flow during storm events has been observed migrating from portions of West Marine View Drive to the NTD area, and eventually to the sump via the trench drain located in the rear of the dock ramp.

An investigation related to the NTD sump was performed as part of the SCE activities in 2018, as presented in the Summary of North Truck Dock Stormwater Sump Investigation (SLR, 2018d) and the Soil Sampling Summary – Port of Everett Property (SLR, 2018c) reports submitted to Ecology and the Port of Everett. Line tracing was completed on the inlet piping to the NTD sump. A 3" line was found to be connected to the adjacent strip drain at the bottom of the truck ramp and also tied to a roof downspout at the corner of the main manufacturing building. An 8" line was found to be connected to a roof downspout within the main manufacturing building. In addition, two weep holes or ring lift holes were observed discharging water into the NTD sump when the sump pump was activated, drawing down the water level in the sump. Stormwater may have flowed from the NTD sump out the weep holes to the subsurface when the stormwater sump filled and during periods when the sump pump was not working. Inlet water sampling from the stormwater lines and weep holes was completed during a storm event. Low concentrations of some COPCs were measured in the stormwater inlet samples. Dioxin/furan TEQ concentrations were measured below the PCL based on the laboratory PQL and were comparable in both stormwater inlet samples and the two weep hole samples.

One grab sample of sump solids was also collected. Concentrations of COPCs measured below PCLs. Dioxin/furan TEQ concentrations were measured above the PCL based on the laboratory PQL. Ecology requested a follow-up assessment of soil adjacent to the discharge line of the NTD sump. Two composite soil samples were collected at a disconnected portion of the discharge line, as well as the original terminus of the discharge line. The original terminus of the discharge line was approximately 80' from the edge of the "finger area." COPCs were measured below PCLs with the exception of cPAHs and dioxins/furans. The concentration of dioxin/furan TEQ in the discharge line soil samples was comparable to the dioxin/furan TEQ concentration measured from the solids within the NTD sump. Total PCB congeners measured between approximately 30,000 pg/g to 50,000 pg/g and were elevated compared to other composite soil samples collected at the Site; however, Total PCB congeners were below the MTCA Method B direct

contact screening level and concentrations were consistent (or lower) than the results of a stormwater source tracing investigation performed by the City of Seattle which measured a median concentration for in-line solids of 98,000 pg/g (King Co, 2016). Potential sources of PCBs identified in the King County research that can enter a stormwater system include: vehicle cleaners/degreasers, vehicle fuels, road paint, asphalt-related products, pesticides/herbicides, hydroseed, and street/sidewalk caulk.

5.3.6 AFFECTED MEDIA AND POTENTIAL EXPOSURE PATHWAYS

Results of the RI indicate that affected media at the Woodlife Area include soil and groundwater and potentially complete exposure pathways for these media in the Woodlife Area are described below.

Soil

The Property is zoned as industrial use and it is likely that industrial activities will continue to occupy the Woodlife Area for the foreseeable future. Potentially complete exposure pathways for soil in the Woodlife Area include:

- Direct exposure by construction workers and industrial workers (e.g. dermal, incidental ingestion) associated with future on-site work or development work to a maximum depth of 15 feet or less.

Shallow groundwater conditions are likely to limit potential future construction worker exposure to soil within less than approximately 5 feet from the ground surface. Due to the presence of asphalt caps, roadways, and structures in the Woodlife Area, the terrestrial ecological exposure pathway is not considered complete.

Groundwater

Groundwater at the Site is not considered potable, as described in Section 5.2.7.

Groundwater impacts are currently contained under existing surface caps, buildings, and roadways, further limiting potential exposure. Sampling of shoreline seeps in the “finger area” indicate that groundwater COPCs are not present in surface water or sediment. Therefore, no complete migration pathways were identified for impacts in the Woodlife Area.

5.3.7 WOODLIFE AREA PROPOSED CLEANUP LEVELS

Site wide COPCs that exceed selected PCLs within the Woodlife Area are co-mingled with Creosote/Fuel Oil Area COPCs. Based on the potentially complete exposure pathways listed above the following IHS have been selected for the Woodlife Area:

- Dioxin/furan TEQ in soil and groundwater.

Soil and groundwater analytical results for the IHS in the Woodlife Area are presented on Table 5.3-1 and Table 5.3-2.

5.4 KNOLL FILL AREA

A CSM including discussion of suspected points of release, contaminant fate and transport, and exposure pathways for the Knoll Fill Area is provided below.

5.4.1 HISTORICAL USE

Lands west of the railroad were created by filling of the tidal delta at the confluence of Snohomish River and Possession Sound. The earliest fill records are not available; however, historical aerial photographs show activity along the shoreline to the south of the former Nord Door facility from at least 1938 through the 1960s. Based on a review of historical aerial photographs (see Appendix A), in 1938, the area was developed with one rectangular building (labeled in a 1957 Sanborn map as “fish net storage”), seven longer buildings running perpendicular to the fish net storage building, and a smaller building located to the west and extending out into Port Gardner Bay. By 1947, only the fish net storage building extending into Port Gardner Bay remained. Between 1955 and 1967, a majority of the southern portion of the Site had been cleared and filled. Additional fill activities occurred between 1967 to 1978 that included development of the southern shoreline to its current extent and additional fill in the Knoll Area to create the existing “knoll” feature. This CSM for the Knoll Fill Area encompasses the area of fill placement shown on Figure 5.4-1.

5.4.2 PHYSICAL SETTING

Most of the fill material placed between 1955 and 1967 appears to be dredged sediments composed of sands with shell fragments. The aerial photography shows that the Nord Door plant areas had structures or was paved when the filling along the southern side occurred while the Knoll Area was unpaved and vegetation is not seen in the aerial photographs. Prior to filling in 1965, a historical on-grade work surface and associated structures extended from Marine View Drive over a portion of the historical tide flats prior to Knoll Area fill events. That historical “working surface” is apparent at a depth of approximately 13 feet above mean sea level (aMSL) within the Knoll Area and is now overlain by dredged sediment fill. For reference groundwater seep sample S-16 was surveyed at approximately 7 feet aMSL. A cross section of the Knoll Area is included as Figure 5.4.2-1. No subsurface confining layer or perched groundwater table was observed in groundwater wells to date. During the 2019 transducer study, the tidal influence in the Knoll Area wells was observed to be approximately 0.11 feet at MW-14 (near shoreline) and no change was observed at MW-12 (approximately 100 feet from shoreline). A summary of the 2019 transducer study is included in the 2019 Data Gap Assessment Report (SLR, 2019a). The measured overall groundwater flow is in a west-southwest direction (see Appendix G).

Both Knoll Fill Area upland areas and offshore marine areas were characterized as part of RI activities.

5.4.3 SUSPECTED AND CONFIRMED RELEASES

There is no available information supporting historical suspected or confirmed releases in the Knoll Fill Area, and the likely source of impacts appear related to historical fill activities.

5.4.4 CONTAMINANT FATE AND TRANSPORT

Upon confirming the bluff overburden soils were not a source, an alternative hypothesis was developed that groundwater transport to seeps could be the source to sediments from the Knoll Area. A work plan was developed and groundwater seep survey and groundwater seep sampling were completed at the Site as part of SCE activities in 2018, including adjacent to the Knoll Fill Area (SLR, 2018a; SLR, 2018b). Groundwater monitoring wells were installed and additional dissolved phase groundwater and seep sampling (via SPME samplers) was completed during the 2019 RI and SCE data gap assessment based on the findings of the initial groundwater seep sampling (SLR, 2018b) The SPME study design included two pairs of groundwater seeps and upgradient groundwater wells in addition to 3 unpaired seep stations, allowing for characterization of transport mechanisms (Appendix H). The paired SPME sample results reveal that the sediment porewater total dissolved PCB congener concentrations were on average 17 times higher than the groundwater concentrations. This analysis indicates that the groundwater transport pathway is probably not the primary cause of PCB impacts identified in Knoll Area sediment.

Combined characterization data and fill history indicate that the likely source of PCBs in groundwater and in the sediments adjacent to the Knoll Area are associated with buried fill material deposited between 1955 and 1965, prior to additional fill activities that formed the current "knoll" feature, or a surficial release directly to the sediments. As noted, previously, the source of the fill material is unknown. Based on the extensive testing conducted to date, neither of these two possible source alternatives can be ruled out and some uncertainty will be retained throughout the RI/FS process. While risks of erosion are currently low in the Knoll Fill Area, increased sea levels and wind driven waves from storms of increasing intensity could cause significant erosion that could expose an unidentified potential source area in the upland and result in recontamination of sediments after cleanup. It is unlikely that further RI characterization in the upland Knoll Area will provide further insight into the source potential. However, further characterization could be conducted in the remedial design phase, if required to address uncertainty.

5.4.5 NATURE AND EXTENT OF CONTAMINATION

Several rounds of surficial sediment testing were conducted in the marine area offshore of the Knoll Area. The testing revealed concentrations higher than the benthic protection-based SCO of 130 µg/kg for PCBs. In addition, there is a larger area that exceeds the human health based cleanup level of 30 µg/kg for PCBs. These concentration gradients are depicted in Figure 4.3-4. As a result of these exceedances, coring was conducted to determine the thickness of the PCB impacts. Three cores were placed in areas of known exceedance for PCBs allowing for comparison of concentrations from 0- to 0.33-feet, 0- to 2-ft, 2- to 4-ft and 4- to 6-ft intervals. In each completed core the highest concentration was observed in the surface sample. In the two cores immediately offshore of the Knoll Area, the 0-2 foot intervals averaged 4.5 times less than the 0 to 0.33-foot surface concentrations. At all core locations, the results were less than accepted natural background concentrations in the 2- to 4-ft and 4- to 6-ft intervals.

During initial upland RI activities, test pitting and Geoprobe drilling was completed in the Knoll Fill Area. In the uplands, a layer of apparent ash material was encountered in one Geoprobe boring, GP-334 (former "fish net storage" area) from a depth of approximately 3.5 to 7 feet bgs, possibly from historical filling activities. Subsequent test pit excavations completed in the Knoll Area did not identify ash. The observed soil in the test pit excavations and borings in the Knoll Area were

characterized as primarily sandy soil with shells and shell pieces down to the apparent underlying native mudflat layer. A portion of a concrete slab underlain by wood debris, metal, glass, and other debris was encountered at a depth of approximately 8 feet bgs in three test pits completed near the center of the Knoll Area (TP-16 to TP-18). Soil samples from the Knoll Area were collected during monitoring well installation of MW-12, MW-13, and MW-14. Zero to twelve feet composite samples were analyzed for PCB congeners. Concentrations of total PCB congeners were comparable at each location (between 320 and 770 pg/g) and were below the calculated PCL for saturated soil protective of sediment of 1,840 pg/g. Calculations used to develop this PCL are included in Appendix L.

As the initial upland investigation did not reveal a PCB source, a hypothesis was developed that the steep bluff face may be the source of contamination. A study design was planned to collect composite bank soil samples during initial RI activities in 2013 around the perimeter of the Knoll Area (JW-BL-303 to JW-BL-307). These samples were submitted for PCB congeners testing and the total PCB congener of the 5 bluff sample results ranged from 1.2 to 10.6 µg/kg dry weight. These concentrations are below the initial soil PCL, sediment human health and benthic cleanup levels, and most importantly are much lower than concentrations measured in the offshore sediments. Thus, the hypothesis was disproven and overburden soils eroding into the marine area are not a direct source of PCB contamination to the sediments adjacent to the Knoll Area.

5.4.6 AFFECTED MEDIA AND POTENTIAL EXPOSURE PATHWAYS

Results of the RI indicate that affected media at the Knoll Fill Area include groundwater and near-shore sediments. Potentially complete exposure pathways for the Knoll Fill Area are described below.

Soil

The Knoll Fill Area was primarily mudflats and material storage areas prior to the placement of fill soil in the 1960's. The Knoll Area has remained vacant and vegetated since then. The Property is zoned as industrial use and it is possible that construction and industrial activities may occupy the Knoll Area in the future. The on-site extent of the Knoll Fill Area (the Knoll Area plus the adjacent southern shoreline) is paved. It is assumed that the extent of potential exposure to soil impacts is from surface to 15 feet bgs.

Future industrial workers could potentially be exposed via incidental soil ingestion and dermal contact, inhalation of soil particulates, and inhalation of volatiles (indoor air).

Future construction workers could potentially be exposed via incidental soil ingestion and dermal contact, inhalation of soil particulates, and inhalation of volatiles (outdoor air).
Terrestrial ecological receptors could potentially be exposed via soil ingestion and ingestion of a terrestrial prey species (due to plant and animal bioaccumulation).

Groundwater

Groundwater detections of total PCBs have been observed in the shallow unconfined aquifer located within the Knoll Fill Area. Drinking water is not a current exposure route (as explained in section 5.2.7); there are no drinking water wells on the Site and the City of Everett supplies water to this area. Since this area was created through placement of fill soil over saltwater mudflats, the

shallow groundwater is expected to be brackish and unusable for drinking water. Use of the shallow groundwater is not included as a potential exposure route in this CSM. Detected PCB concentrations may be indicative of leaching of low-level PCBs from vadose and saturated zone soils or result from tidal pumping of porewater into the aquifer.

While unlikely, future construction workers could potentially be exposed via dermal contact with groundwater and inhalation of volatiles (outdoor).

Future industrial workers could potentially be exposed via inhalation of volatiles (indoor).
Terrestrial ecological receptors could potentially be exposed via groundwater ingestion at seep locations where groundwater becomes surface water.

Surface Water and Sediments

Potential exposure pathway to humans is complete as identified in the human health risk-based cleanup level and benthic exceedances.

Future industrial and construction workers could potentially be exposed via dermal contact with surface water at seeps and/or sediments.

Terrestrial ecological receptors could potentially be exposed via ingestion and dermal contact of sediments, ingestion and dermal contact with surface water, and ingestion of an aquatic prey species (due to aquatic organism bioaccumulation). This is discussed in further detail in Section 5.7.

5.4.7 KNOLL FILL AREA PROPOSED CLEANUP LEVELS

As PCB Congeners were measured above the selected PCL in most groundwater sample locations that had another COPC exceed a selected PCL, PCB congeners will be the IHS for groundwater in the Knoll Fill Area (see Table 5.4-1). Significant soil impacts were not identified and are not a driver for potential cleanup alternatives.

The selected PCL for Total PCB congeners of 1,230 pg/L was calculated by using the laboratory PQL for 123 congeners that were identified in a representative site sample, as requested by Ecology.

5.5 PRIMARY EXPOSURE ROUTES AND RECEPTORS

The exposure media are the environmental media through which human or ecological receptors could be exposed to hazardous substances. As described in the above sections and shown on Figure 5, the primary exposure routes and receptors potentially affected by released hazardous substances at the Site include the following:

- On-site soil – Dermal contact with soil, inhalation, and incidental ingestion are the major routes of exposure through which human receptors may potentially be exposed to impacted soil at the Site. Human receptors may include current and future industrial workers and current and future construction workers. The primary means in which terrestrial ecological receptors may potentially come into contact with contaminants are through direct contact with soil and through dietary ingestion. Data collected from the RI

does not show evidence of contaminant migration from soil to groundwater and then to surface water in the Creosote/Fuel Oil Area or the Woodlife Area.

- On-site groundwater – Dermal contact with shallow groundwater is the major route of exposure through which human and ecological receptors may potentially be exposed to impacted groundwater at the Site. Human receptors may include current and future industrial workers and current and future construction workers. Groundwater at the Site does not meet the definition of potable water as outlined in WAC 173-340-720(2) based on the following factors: a) the groundwater does not serve as a current source of drinking water; and b) the groundwater is not a potential future source of drinking water given the Site's proximity to surface water that is not suitable as a domestic water supply. Therefore, ingestion of groundwater is not considered a potential route of exposure.
- Air – Inhalation of soil contaminants as windblown/fugitive dust or volatilization of soil and/or groundwater contaminants to indoor air are the primary routes of exposure through which human receptors may potentially be exposed to impacted air at the Site. Human receptors may include current and future industrial workers and current and future construction workers.
- Marine Sediment – As discussed in Appendix K, comparisons of Site tissue data with ecological risk benchmarks reveal that there is unlikely to be any potential risk to wildlife exposed to Site COPCs, including foraging for clams adjacent to the Site. However, dietary ingestion of shellfish is the primary exposure route through which human receptors may potentially be exposed to sediment contaminants at the Site.
- Potential human receptors include recreational and/or tribal subsistence fishers. The following scenarios for consumption of fish and shellfish were evaluated:
  - tribal adult consumer of fish (excluding anadromous) and shellfish
  - tribal child consumer of fish and shellfish - including incorporation of early life exposure to cPAHs using Age-Dependent Adjust Factors since they are identified as having a mutagenic mode of action
  - a scenario which combines risks from both childhood and adulthood exposure (i.e. lifetime exposure risks calculated from 6 years as a child and 64 years as an adult)
- Direct contact with marine sediment impacts by human receptors poses a relatively lower risk, especially given the limited access to sediment at this industrial Site. Direct contact and incidental ingestion of sediment scenarios evaluated using Ecology (2019) default values were:
  - tribal adult clam diggers
  - tribal adult net fishers
  - child beach play scenario
- Human health risk assessment calculations are summarized in Appendix K.

5.6 TERRESTRIAL ECOLOGICAL EVALUATION

With the exception of the Knoll Area, the Site is almost entirely covered by buildings and pavement. Maulsby Marsh is located across the road and BNSF railroad tracks to the east of the

Site. Exposed soil on the main portion of the Site is limited to small landscaped areas around buildings and around the perimeter of the paved areas; therefore, terrestrial ecological receptors (wildlife, soil biota, and plants) are not considered to be potential receptors within these areas. Analytical results from samples located in unpaved areas did not measure COPCs above the values listed in MTCA Table 749-2 (Priority Contaminants of Ecological Concern for Sites that Qualify for the Simplified Terrestrial Ecological Evaluation Procedure).

The Site meets TEE Process – Exclusion #2 outlined in WAC 173-340-7491(1)(b) because all soil contaminated with hazardous substances is, and will be, covered by buildings, paved roads, pavement, or other physical barriers (i.e. clean fill) that will prevent plants or wildlife from being exposed, with the exceptions listed above. In addition, the cleanup planned to address human health or possible aquatic impacts will also adequately protect soil biota, plants, and animals.

5.7 SEDIMENT STABILITY

A key element of the CSM at sediment sites is sediment stability, since it can determine the point of exposure to sediment contaminants, and it is also a key factor in evaluating the long-term effectiveness of sediment cleanup actions. As discussed in Section 4.3.3.5, in sediment environments, sedimentation rates and stability characteristics can be determined by analyzing the vertical distribution of relatively short-lived radioactive isotopes in surface and near-surface core intervals. Consistent with geochronology investigations successfully performed at other areas in Puget Sound (e.g., Lefkovitz et al., 1997), geochronology sampling and analysis in the Site area focused on Cs-137, which was released to the atmosphere from nuclear tests in the 1950s/1960s.

The site-specific Cs-137 core data suggest an average contemporary net sedimentation rate (corrected for wood debris) in tidal flat areas of the Site of approximately 0.17 ± 0.08 cm/year (i.e., an average 0.6-inch accumulation over a 10-year period). This is a relatively low average sedimentation rate compared to other sediment cleanup sites in Puget Sound, and suggests that natural recovery processes have been and may continue to be relatively slow. The vertical profile of Cs-137 activity is also indicative of stable sediments (i.e., little vertical sediment mixing) over the past 60 to 70 years (Figure 4.3-9 Cs-137 profile), and suggests that bioturbation of surface sediments is less than 10 cm, and likely less than 4 cm. Thus, the SMS marine sediment default 10 cm bioactive zone is a conservative overestimate of bioturbation at the Site.

6. BASIS FOR CLEANUP ACTION

This section presents the basis for the Site cleanup action. There are two distinct elements that form the basis for the cleanup action: 1) the site-specific cleanup standards; and 2) the locations and media requiring cleanup action evaluation.

6.1 CLEANUP STANDARDS

Cleanup standards consist of: a) cleanup levels for hazardous substances present at the Site; b) the location where these cleanup levels must be met (i.e. point of compliance); and c) other applicable state and federal laws that may apply to the Site.

Under MTCA, the point of compliance is the point or location on a site where the cleanup levels must be attained. The points of compliance for affected media will be approved by Ecology and presented in a forthcoming CAP for the Site. However, it is necessary to identify proposed points of compliance in order to develop and evaluate cleanup action alternatives in the FS. This section describes the proposed points of compliance for soil, groundwater and sediment.

6.1.1 UPLAND SOIL

The process of assessing initial soil PCLs for detected contaminants and subsequent selected PCLs for soil IHS in each primary assessment area are described in Section 4.1.2 and Section 5.0 (CSMs).

6.1.1.1 SOIL CLEANUP LEVELS

Selected PCLs for IHS in soil include the following:

- 0.19 mg/kg for TEQ cPAHs (based on Method B direct contact) in the Creosote/Fuel Oil Area
- 5.2 pg/g for TEQ Dioxins/Furans (based on natural background concentration) in the Woodlife Area

6.1.1.2 UPLAND SOIL POINT OF COMPLIANCE

The standard point of compliance for the soil cleanup levels will be throughout the soil column from the ground surface to 15 feet bgs in accordance with WAC 173-340-740(6)(d) and WAC 173-340-7490(4)(b).

6.1.2 GROUNDWATER

The process of assessing initial groundwater PCLs for detected contaminants and subsequent selected groundwater PCLs for IHS in each primary assessment area are described in Section 4.1.2 and Section 5.0 (CSMs).

6.1.2.1 GROUNDWATER CLEANUP LEVELS

Selected PCLs for IHS in groundwater include the following

- 8.9 µg/L for naphthalene (based on groundwater protective of vapor intrusion) in the Creosote/Fuel Oil Area
- 72 pg/L for dioxins/furans TEQ (based on laboratory PQL) in the Woodlife Area
- 1,230 pg/L for Total PCB congeners (based on laboratory PQL calculation) in the Knoll Fill Area

6.1.2.2 GROUNDWATER POINT OF COMPLIANCE

For groundwater, the point of compliance is the point or points where the groundwater cleanup levels must be attained for a site to be in compliance with the cleanup standards. Groundwater cleanup levels shall be attained in all groundwaters from the point of compliance to the outer boundary of the hazardous substance plume. Under MTCA, the standard point of compliance for groundwater is throughout the Site from the uppermost level of the saturated zone extending vertically to the lowest depth that could potentially be affected by an activity. For groundwater potentially discharging to surface water, MTCA provides for a conditional point of compliance at the point of discharge of groundwater to surface water. The conditional point of compliance for the Site is the downgradient edge of the property, at the point of entry of groundwater to Port Gardner Bay.

6.2 MARINE SEDIMENT CLEANUP LEVELS

The cleanup standard is defined as the highest of: a) risk-based concentrations, b) natural or regional background concentrations, or c) PQLs. Cleanup standards for marine sediment indicator hazardous substances, total PCBs and dioxin/furan TEQ, are based on the conservative assumption that chemical concentrations in sediments are solely responsible for the chemical concentrations found in shellfish tissues at the Site.

Preliminary sediment cleanup levels for the Site are summarized in Table 6.2-1, and include two risk targets; the more stringent sediment cleanup objective (SCO; e.g., 10^{-6} cancer risk) and the cleanup screening level (CSL; e.g., 10^{-5} cancer risk). Following review of and public comment on this RI/FS as well as the follow-on Cleanup Action Plan (CAP), Ecology will make a final determination of site-specific cleanup levels.

While wood debris (TVS) and bioaccumulative cPAH TEQ are not identified as IHS for the Site, further characterization may be conducted in remedial design during monitoring to enable compliance determinations within the reasonable restoration timeframe.

6.2.1.1 MARINE SEDIMENT REMEDIATION LEVELS

Sediment cleanup remedies in Puget Sound have typically included a combination of remedial technologies applied to different areas of a site. Under both MTCA and SMS, when more than one method of cleanup is used at a site, it may be necessary to establish remediation levels (REL) to indicate what concentrations of IHS would be addressed using the different cleanup methods. As discussed in WAC 173-340-355, a variety of methods may be used to develop site-specific RELs under MTCA and SMS. For the purpose of this RI/FS, and specifically to assist in the development of marine sediment remediation alternatives for the FS (see Section 7), preliminary sediment RELs were derived using benthic SCOs and site-specific human health-based sediment

SCOs. A “hill-topping” analysis was used to evaluate the relationship between the REL and the resulting total PCB and dioxin/furan TEQ SWAC at the Site following remediation, assuming natural background replacement values for remediated areas (1.6 µg/kg dw and 1.8 ng/kg dw for total PCBs and dioxin/furan TEQ, respectively). The hill-topping curves presented in Figures 6.2-1 and 6.2-2, respectively, identify RELs that achieve the Site-side SWAC goal.

Higher concentration break points were determined by applying SMS benthic protection levels for total PCBs. Best professional judgement was used for higher concentration break point for dioxins/furans TEQ at 15 ng/kg, based on direct contact levels presented in SCUM (Ecology 2019).

The following concentration break points were identified that provided useful REL values and that are carried forward in the FS:

- Total PCBs:
    - 30 µg/kg dw (human health protection-based SCO)
    - 117 µg/kg (hill-topping-based REL to achieve a 30 µg/kg dw SWAC)
    - 130 µg/kg dw (benthic protection SCO)
- Dioxin/Furan TEQ:
    - 5 ng/kg dw (PQL based SCO)
    - 8 ng/kg dw (hill-topping-based REL to achieve a 5 ng/kg dw SWAC)
    - 15 ng/kg dw (best professional judgment direct contact [Ecology 2019])

6.2.1.2 MARINE SEDIMENT POINT OF COMPLIANCE

For marine sediments, the vertical point of compliance is surface sediments within the biologically active zone. The biologically active zone is the depth in surface sediments within which benthic organisms are found. For most members of the marine benthic community, a 10 cm biologically active zone is considered appropriate under SMS, and site-specific bioturbation depths are less than 10 cm (see Section 4.3.3.5). However, the soft shell clam (*Mya arenaria*) identified in tidal mudflats at the Site may burrow as deep as 30 cm below mudline (Abraham et al., 1986). Therefore, to ensure protection of human health at the Site, the preliminary point of compliance in marine sediments is 30 cm (approximately 1 foot).

The biologically active zone in Site tidal mudflats can potentially include deeper sediments that could become exposed by storms or other events that contribute to erosional forces. However, the vertical profiles of Cs-137 activity measured at the Site are indicative of stable sediments (i.e., little vertical sediment mixing) over the past 60 to 70 years (Figure 4.3-9), and thus the point of compliance does not need to be extended below 1 foot.

For bioaccumulative COPCs such as total PCBs and dioxin/furan TEQ, the horizontal point of compliance defined under SMS is based on the SWAC. SWACs are applied to the entire Site area that exceeds the site-specific sediment cleanup level. Thus, for the purpose of this RI/FS, the SWAC compliance area encompassed all surface and near-surface sediment areas (i.e., to a depth of 1 foot below mudline) with concentrations of total PCBs and/or dioxin/furan TEQ

exceeding preliminary SCO chemical criteria. The SWAC area defined in this manner is approximately 16.6 acres. Using IDW methods, the existing SWACs within the Site area are as follows:

- Total PCBs: 36 µg/kg dw (slightly greater than the 30 µg/kg preliminary SCO)
- Dioxin/Furan TEQ: 11 ng/kg dw (more than two times the 5 ng/kg preliminary SCO)

6.2.1.3 Creosote Treated Structures

MTCA Chapter 173-34-370 states that natural attenuation of hazardous substances may be appropriate at sites where source control (including removal of hazardous substances) has been conducted to the maximum extent practicable. SCUM (Ecology 2019) identifies the requirement to remove and dispose of creosote-treated piling that are in a cleanup site. Two bulkhead structures containing an unknown number of piles and lagging, a remnant wooden barge, and approximately 45 free standing piling or dolphins have been identified within the Site boundary. As depicted on Figure 3.6, some of the structures and pilings are on properties that are owned by the Wick Family Trust and Port of Everett. For the purposes of this RI/FS, it has been assumed that these structures and pilings in areas targeted for sediment removal will be removed as part of the selected marine remedial action.

7. FEASIBILITY STUDY

As stated in WAC 173-340-350, the purpose of the FS is to develop and evaluate remedial alternatives that will enable a remedial action to be selected for the Site. This section identifies Site areas requiring cleanup action evaluation, identifies cleanup action objectives, reviews potentially applicable regulatory requirements for the cleanup action, and presents a screening evaluation of general response actions and remediation technologies that are potentially applicable to the Site.

7.1 LOCATIONS REQUIRING CLEANUP ACTION EVALUATION

The following sections describe the media requiring cleanup action evaluation based on the findings of the RI.

7.1.1 UPLAND AREAS REQUIRING CLEANUP ACTION EVALUATION

Upland areas requiring cleanup action evaluation are associated with historical site activities including pole treating using creosote, fuel oil storage, wood treating using Woodlife wood treatment solution, and historical fill activities. The impacts related to fuel oil and creosote contain the same indicator substances (cPAHs and naphthalene) and are co-located along the eastern portion of the former Nord Door site and extending beneath West Marine View Drive. The impacts are generally found between 3 and 15 feet bgs, except for areas of the former creosote tank operations where impacts have been identified to 45 feet bgs and are primarily located below buildings or pavement. Figure 5.2-1 shows areas of soil and groundwater IHS that exceed selected PCLs in the Creosote/Fuel Oil Area.

Dioxin/furan impacts related to wood treatment using Woodlife solution are located in shallow soil and groundwater in the northeastern portion of the Site. These impacts are generally found at depths to 5 feet bgs and are located below buildings or pavement. Figures 5.3-1 shows areas of soil and groundwater IHS that exceed selected PCLs in the Woodlife Area.

Total PCB congener impacts related to historical fill activities are located in groundwater in the southern portion of the Site, including the Knoll Area. Figure 5.4-1 shows areas of groundwater IHS that exceed selected PCLs in the Knoll Fill Area.
Based on the upland RI findings and consultation with Ecology, the upland FS alternatives were considered for three assessment areas of the Site: 1) Creosote/Fuel Oil Area; 2) Woodlife Area; and, 3) Knoll Fill Area. As described in Section 5.4, the Knoll Fill Area cleanup alternatives are included in the marine FS alternatives.

Based upon the specifics of the above listed areas (access, depth of contamination, potential receptors, feasibility, etc.) upland cleanup alternatives have been prepared for each area of concern with detailed MTCA evaluations of each alternative. The MTCA evaluation includes a disproportionate cost analysis (DCA) that compares the relative costs and benefits of each alternative presented for the cleanup areas.

7.1.2 MARINE SEDIMENT AREAS REQUIRING CLEANUP ACTION EVALUATION

For purposes of the FS, the marine area was subdivided into sediment management areas (SMAs) so that alternatives could be assembled and evaluated. Exhibit 7.1.2 below describes the various cleanup levels that were used to define the boundaries of the SMAs, which were based on both the preliminary SCO chemical criteria summarized in Table 6.2-1, along with RELs as described in Section 6.2.1.1. Figure 7.1 depicts the layout of SMAs in accordance with the scheme described above.

Exhibit 7.1.2
SMA Designations

DESIGNATION	DIOXIN/FURAN TEQ (NG/KG DW)	TOTAL PCBS (µG/KG DW)	BASIS FOR SELECTION
SMA 1	5	>30 (SCO based on human health risk)	1. Dioxin/Furan TEQ level set by the PQL. 2. Total PCB Level set by the human-health seafood consumption risk level.
SMA 2	8	117 (level at which the SWAC of 30 µg/kg is achieved)	Levels set to achieve a post-construction surface weighted average concentration of 5 ng/kg for Dioxin/Furan TEQ and 30 µg/kg for total PCBs.
SMA 3	15	130 (predicted bulk sediment toxicity SMA)	1. Best professional judgement: Dioxin/Furan TEQ level set at SCUM-defined (Ecology 2019) direct contact. 2. Total PCB level based on the benthic protection sediment management standard dry weight sediment quality objective equivalent.

Notes:
µg/kg = microgram per kilogram
dw = dry weight
ng/kg = nanogram per kilogram
PCB = polychlorinated biphenyl
PQL = practical quantitation limit
SCO = sediment cleanup objective
SMA = sediment management area
SWAC = surface weighted average concentration
TEQ = toxic equivalent quotient

7.2 CLEANUP ACTION OBJECTIVES

Cleanup action objectives consist of chemical- and media-specific goals for protecting the environment. The cleanup action objectives specify the media and contaminants of interest, potential exposure routes and receptors, and proposed cleanup goals.

7.2.1 UPLAND AREA CLEANUP ACTION OBJECTIVES

The cleanup action objectives for the upland areas are to protect human health and the environment by eliminating, reducing, or otherwise controlling risk posed through identified exposure pathways and migration routes. The cleanup action objectives for the upland areas of the Site are to mitigate risks posed by the following exposure routes:

- Prevent direct contact (dermal, incidental ingestion, or inhalation) by industrial or maintenance workers, construction workers, or other Site occupants with hazardous substances in soil, groundwater, or soil gas (via vapor intrusion).
- Prevent contaminated groundwater migration to adjacent marine sediment and surface water via groundwater seeps.

7.2.2 MARINE SEDIMENT AREA CLEANUP ACTION OBJECTIVES

The cleanup action objective for marine sediments is as follows:

- Eliminate, reduce, or otherwise control, to the extent practicable, risks to humans from direct contact with contaminated sediments and ingestion of seafood containing COPCs that exceed risk-based concentrations.
- Meet the cleanup objectives within 10 years of completion of construction.
- Protection of benthic organisms.
- To the extent required under MTCA/SMS, protection and maintenance of the physical environment, habitat and aquatic conservancy areas (see Section 3.6).

7.3 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

In addition to the cleanup standards developed through the MTCA process, WAC 173-340-710 requires cleanup actions to comply with applicable state and federal laws and those requirements identified as applicable or relevant and appropriate requirements (ARARs). Under WAC 173-340-700(6)(a), MTCA requires cleanup standards to be “at least as stringent as all applicable state and federal laws.” Besides establishing minimum requirements for cleanup standards, applicable state and federal laws may also impose certain technical and procedural requirements for performing cleanup actions. These requirements are described in WAC 173-340-710. Applicable state and federal laws are discussed below.

The cleanup action at the Site will likely be performed pursuant to MTCA under the terms of a Consent Decree. Accordingly, the anticipated cleanup action will likely meet the permit exemption provisions of MTCA, obviating the need to follow procedural requirements of the various local and state regulations that would otherwise apply to the action. Similarly, the anticipated cleanup action qualifies for a United States Army Corps of Engineers (Corps) Nationwide Permit 38 (NWP 38). Nevertheless, federal consultation under the Endangered Species Act, Section 401 Water Quality Certification, and other substantive requirements must still be met by the cleanup action. Ecology will be responsible for issuing the final approval for the cleanup action, following consultation with other state and local regulators. The Corps will separately be responsible for issuing approval of the project under NWP 38, following Endangered Species Act consultation with the federal Natural Resource Trustees, and also incorporating Ecology’s 401 Water Quality Certification.

7.3.1 MTCA AND SMS REQUIREMENTS

The primary law that governs the cleanup of contaminated sites in the state of Washington is MTCA. The MTCA cleanup regulation (WAC 173-340) specifies criteria for the evaluation and conduct of a cleanup action, including criteria for developing cleanup standards for soil. When contaminated sediments are involved, the cleanup levels and other procedures are also regulated by the SMS (WAC 173-204). The SMS were developed to establish cleanup standards for marine and other environments for the purpose of reducing and/or eliminating adverse effects on biological resources and significant health threats to humans from surface sediment contamination. The SMS cleanup standards govern the cleanup of contaminated sediment sites. Both MTCA and SMS regulations require that cleanup actions must protect human health and the environment, meet environmental standards in other applicable laws, and provide for monitoring to confirm compliance with cleanup levels.

MTCA places certain requirements on cleanup actions involving containment of hazardous substances that must be met for the cleanup action to be considered in compliance with soil cleanup standards. These requirements include implementing a compliance monitoring program that is designed to ensure the long-term integrity of the containment system and applying institutional controls where appropriate to the affected area (WAC 173-340-440). The key MTCA decision-making document for cleanup actions is the RI/FS. In the RI/FS, the nature and extent of contamination and the associated risks at a site are evaluated, and potential alternatives for conducting a site cleanup action are identified. The cleanup action alternatives are then evaluated against MTCA remedy selection criteria, and one or more preferred alternatives are selected. After reviewing the RI/FS, and after consideration of public comment, Ecology then selects a cleanup action for the site and documents the selection in a CAP. Following public review of the CAP, the site cleanup process typically moves forward into design, permitting, construction, and long-term monitoring.

This RI/FS report was prepared consistent with the requirements of MTCA and the SMS.

7.3.2 STATE ENVIRONMENTAL POLICY ACT

The State Environmental Policy Act (SEPA; RCW 43.21C; WAC 197-11) and the SEPA procedures (WAC 173-802) are intended to ensure that state and local government officials consider environmental values when making decisions. The SEPA process begins when an application for a permit is submitted to an agency, or an agency proposes to take some official action such as implementing a MTCA CAP. Prior to taking any action on a proposal, agencies must follow specific procedures to ensure that appropriate consideration has been given to the environment. The severity of potential environmental impacts associated with a project determines whether an Environmental Impact Statement (EIS) is required. A SEPA checklist would be required prior to initiating remedial construction activities. Because the Site cleanup action will be performed under a Consent Decree, SEPA and MTCA requirements will be coordinated, where possible.

7.3.3 SOLID AND HAZARDOUS WASTE MANAGEMENT

The Washington Hazardous Waste Management Act (RCW 70.105) and the implementing regulations, the Dangerous Waste Regulations (Chapter 173-303 WAC), would apply if

dangerous wastes are generated during the cleanup action. Related regulations include state and federal requirements for solid waste handling and disposal facilities (40 CFR) 241, 257; Chapter 173-350 and 173-351 WAC) and land disposal restrictions (40 CFR 268; WAC 173-303-340).

7.3.4 SHORELINE MANAGEMENT ACT

The Shoreline Management Act (RCW 90.58) and its implementing regulations establish requirements for substantial developments occurring within water areas of the state or within 200 feet of the shoreline. Local shoreline management master programs are adopted under state regulations, creating enforceable requirements. Because the Site cleanup action will likely be performed under a Consent Decree, compliance with substantive requirements would be necessary, but a shoreline permit would not likely be required.

7.3.5 PUGET SOUND DREDGED MATERIAL MANAGEMENT PROGRAM

In Puget Sound, the open water disposal of sediments is managed under the Dredged Material Management Program (DMMP). This program is administered jointly by the Corps, EPA, Washington Department of Natural Resources (DNR), and Ecology. The DMMP developed the Puget Sound Dredged Disposal Analysis protocols, which include testing requirements to characterize whether dredged sediments are appropriate for open-water disposal. The results of this characterization are formalized in a written suitability determination from the Dredged Material Management Office. The DMMP has also designated disposal sites throughout Puget Sound. If DMMP disposal of sediments dredged from the Site were to be included as part of the final cleanup remedy, dredged material characterization would be required to complete the suitability determination. Use of DMMP open-water disposal facilities would need to comply with other DMMP requirements including material approval, disposal requirements, and payment of disposal site fees.

7.3.6 WASHINGTON HYDRAULICS CODE

The Washington Hydraulics Code (WAC 220-110) establishes regulations for the construction of any hydraulic project or the performance of any work that will use, divert, obstruct, or change the natural flow or bed of any of the salt or fresh waters of the state. The code also creates a program requiring Hydraulic Project Approval (HPA) permits for any activities that could adversely affect fisheries and water resources. Timing restrictions and technical requirements under the hydraulics code are applicable to dredging, construction of sediment caps, and placement of post-dredge residual covers if necessary. For the reasons stated above, the procedural requirements of an HPA permit would not likely be required, although the substantive requirements of an HPA must still be met by the cleanup action.

The FS has been prepared using costs and durations that recognize potential fish closure periods, during which time dredging and any in-water work will not be permitted. Exact in-water closure periods will be determined through agency consultation.

7.3.7 WATER MANAGEMENT

7.3.7.1 CLEAN WATER ACT

The Clean Water Act (CWA) is the primary federal law for protecting water from pollution. The CWA regulations provide requirements for the discharge of dredged or fill material to waters of the United States and are applicable to any in-water work. The CWA regulations also prescribe permitting requirements for point source and non-point source discharges. Acute marine criteria are relevant and appropriate requirements for discharges to marine surface water during sediment dredging, as well as for return flows (if necessary) to surface waters from dewatering operations.

Section 404 of the CWA requires permits from the Corps for discharges of dredged or fill material into waters of the United States, including wetlands. Section 404 permits depend on suitability determinations (described previously) according to DMMP guidelines. Section 404(b)(1) requires an alternatives analysis as part of the permitting process. Requirements for all known, available, and reasonable technologies for treating wastewater prior to discharge to state waters are applicable to any dewatering of marine sediment prior to upland disposal. Section 401 of the CWA requires the state to certify that federal permits are consistent with water quality standards. The substantive requirements of a certification determination are applicable.

Ecology has promulgated state-wide water quality standards under the Washington Water Pollution Control Act (RCW 90.48). Under these standards, all surface waters of the state are divided into classes (Extraordinary, Excellent, Good, and Fair) based on the aquatic life uses of the waterbodies. Water quality criteria are defined for different types of pollutants and the characteristic uses for each class of surface water. The standards for marine waters will be applicable to discharges to surface water during sediment dredging and return flows (if necessary) to surface waters from dewatering operations.

The SMS acknowledges the Washington Water Pollution Control Act as the primary authorizing legislation for establishing sediment source control standards.

7.3.7.2 CONSTRUCTION STORMWATER GENERAL PERMIT

Construction activities that disturb 1 acre or more of land need to comply with the provisions of construction stormwater regulations. Operators of regulated construction sites are required to:

- Develop stormwater pollution prevention plans;
- Implement sediment, erosion, and pollution prevention control measures; and,
- Obtain coverage under a Construction Stormwater General Permit.

The permit also requires that Site inspections must be conducted by a Certified Erosion and Sediment Control Lead. This is typically an individual who works for the contractor performing the work.

7.3.7.3 CONSTRUCTION AND MAINTENANCE OF WATER WELLS

Minimum standards for construction and maintenance of water wells are established in Chapter 18.104 RCW and WAC 173-160-101, 121, 161 to 241, 261 to 341, and 381. This regulation is

potentially applicable to wells constructed for groundwater withdrawal and monitoring or remediation system components. This regulation is also potentially applicable to the decommissioning of existing or future wells.

7.3.8 AIR CONTAMINANT SOURCES

The Washington Clean Air regulations require that owners and operators of fugitive dust sources take reasonable precautions to prevent fugitive dust from becoming airborne and to maintain and operate the source to minimize emissions under General Regulations for Air Contaminant Source, Chapter 70.94 RCW; WAC 173-400-040(8); and Puget Sound Clean Air Agency (PSCAA) Regulation 1, Section 9.15. PSCAA regulations identify specific requirements related to the control of fugitive dust, including the requirement to employ reasonable precautions to minimize emissions. Reasonable precautions include, but are not limited to, the following: a) the use of control equipment, enclosures, and wet (or chemical) suppression techniques, as practical, and curtailment during high winds; b) surfacing roadways and parking areas with asphalt, concrete, or gravel; c) treating temporary, low-traffic areas (e.g., construction sites) with water or chemical stabilizers, reducing vehicle speeds, constructing pavement or riprap exit aprons, and cleaning vehicle undercarriages before they exit to prevent the track-out of mud or dirt onto paved public roadways; or d) covering or wetting truck loads or allowing adequate freeboard to prevent the escape of dust-bearing materials. For cleanup action alternatives that could result in fugitive dust emissions, those emissions will be minimized per the Washington State and PSCAA requirements.

7.3.9 LOCAL REQUIREMENTS

The following is a list of other potentially applicable local requirements for the cleanup action:

Washington State Shoreline Management Act and City of Everett Shoreline Master Program (SMP), RCW 90.58, WAC 173-27-060, City of Everett Ordinance 3053-08 and SMP. The Shoreline Management Act and City of Everett SMP require a permit for any development or activity valued at $5,000 or as adjusted by inflation by the state legislature or where exempt under RCW 90.58.030(3)(e). Shorelines are defined as lakes (including reservoirs) of 20 acres or greater; streams with a mean annual flow of 20 cubic feet per second or greater; marine waters plus an area landward for 200 feet measured on a horizontal plane from the ordinary high water mark; and all associated marshes, bogs, swamps, and river deltas. Cleanup actions under MTCA are exempt from Shoreline Management Act permitting under MTCA and WAC 173-37-040(3). For upland cleanup action alternatives that include activities within 200 feet of the shoreline and marine cleanup action alternatives, this requirement will meet the substantive requirements. Consultation with the City of Everett will be conducted to meet the substantive requirements.

City of Everett Stormwater and Storm Drainage, Ordinance 2196-96, amending Title 14.28, Effective February 15, 2010; City of Everett Stormwater Management Manual, dated February 2010. The City of Everett ordinance specifies requirements for the management of stormwater and development of storm drainage systems for new and redeveloped properties. These requirements include meeting Minimum Technical Standards, which may include some or all of the following based upon the size of the addition of the impervious surface: erosion and sediment control for all sized projects, for projects adding more than 5,000 square feet of impervious surface: 1) development of a Stormwater Site Plan, Construction Stormwater Pollution

Prevention Plan, Large Parcel Erosion and Sediment Control Plan and Drainage Plan; 2) apply erosion and sediment controls; 3) preserve natural drainage; 4) apply source control Best Management Practices (BMPs); 5) apply runoff treatment BMPs where the project creates 5,000 square feet or more of net additional pavement; treatment BMPs shall be sized to capture and treat a 6-month, 24-hour return period storm; 6) off-site analysis and mitigation; and 7) operation and maintenance. The applicability of the substantive requirements of the stormwater and storm drainage ordinance will be determined through consultation with the City of Everett during the design phase of the selected cleanup action and any substantive requirements will be incorporated into the design documents.

City of Everett Grading Code, Title 18.28.200 Everett Municipal Code (EMC); Title 18.28 EMC, Land Division Evaluation Criteria and Development Standards. The City of Everett requires a grading plan to be submitted to the city engineer "before any site modification where existing natural features would be disturbed or removed" (EMC 18.28.200(A)). The EMC establishes minimum standards for clearing and grading, generally based on following "sound engineering techniques." The EMC states, in relationship to environmentally sensitive areas, that "Clearing and grading limits shall be established so as to not impact environmentally sensitive areas, the required buffers, and adjacent properties" (EMC 18.28.200(E)(4)) and that "on projects that have environmentally sensitive features and in critical drainage areas, clearing and grading and other significant earth work may be limited to a specific time period as determined by the city" (EMC 18.28.200(F)). The applicability of the substantive requirements of the grading code will be determined through consultation with the City of Everett during the design phase of the selected cleanup action and any substantive requirements will be incorporated into the design documents.

City of Everett Traffic Code, Title 46 EMC. Construction activities such as haul truck operations or installation of remediation systems within the public roadway may require that traffic be directed by flaggers and signage. The applicability of the substantive requirements of the traffic code will be determined through consultation with the City of Everett during the design phase of the selected cleanup action and any substantive requirements will be incorporated into the design documents.

City of Everett Discharge to POTW Title 14.40 EMC. Dewatering activities associated with the cleanup action alternatives involving hydraulic dredging will require a wastewater discharge permit to discharge water to the publicly owned treatment works (POTW). The applicability of the substantive requirements of the Title 14.40 EMC will be determined through consultation with the City of Everett during the design phase of the selected cleanup action and any substantive requirements will be incorporated into the design documents.

7.3.10 OTHER POTENTIALLY APPLICABLE REGULATORY REQUIREMENTS

The following is a list of other potentially applicable regulations for the cleanup action:

Archeological and Historical Preservation. The Archeological and Historical Preservation Act (16 USC 496a-1) would be applicable if any subject materials are discovered during Site grading and excavation activities.

Health and Safety. Site cleanup-related construction activities would need to be performed in accordance with the requirements of the Washington Industrial Safety and Health Act (RCW

49.17) and the federal Occupational Safety and Health Act (29 CFR 1910, 1926). These applicable regulations include requirements that workers are to be protected from exposure to contaminants and that excavations are to be properly shored.

Endangered Species Act. The Endangered Species Act (16 USC 1531-1543, 50 CFR 402, 50 CFR 17) protects fish, wildlife, and plants that are threatened or endangered with extinction.

These requirements are not specifically addressed in the detailed analysis of cleanup action alternatives because they could be met by each of the alternatives.

8. SCREENING OF GENERAL RESPONSE ACTIONS

This section presents a screening evaluation of potentially applicable response actions and remediation technologies to be considered for the cleanup action. As described in WAC 173-340-350 8(b), an initial screening of alternatives may be appropriate to reduce the number of alternatives for the final detailed evaluation. Alternatives that may be eliminated from the FS include: a) alternatives for which costs are clearly disproportionate under WAC 1730340-360 (3)(e); and b) alternatives or components that are not technically possible at the site.

The screening evaluation is carried out for each of the environmental media (soil, groundwater, soil gas, and sediment) requiring cleanup action evaluation. Based on the screening evaluation, selected response actions and technologies are carried forward for use in the development of cleanup action alternatives (Section 8.4).

8.1 UPLAND CLEANUP ACTIONS

This section summarizes various remediation technologies that were screened and evaluated in various combinations as alternatives for the upland areas of the Site. In Section 8.4, alternatives and the key components are described, including conceptual-level corrective actions.

The remediation technologies considered or employed in those alternatives are described below.

8.1.1 NO ACTION

The No Action alternative would consist of refraining from conducting response actions or applying any remedial technology to the upland soil, groundwater, or soil gas impacts identified at the Site. The No Action alternative would not achieve the threshold remedial action requirements of protecting human health and the environment by eliminating, reducing, or otherwise controlling risk posed through identified exposure pathways and migration routes and was not retained for further evaluation.

8.1.2 MONITORED NATURAL ATTENUATION/LONG-TERM MONITORING (MNA)

The MNA alternative relies on naturally occurring attenuation processes to reduce the toxicity, mobility, and volume of contaminants in soil and groundwater at the Site to supplement alternatives that include full removal of impacted soil. Long-term monitoring would be performed for alternatives that do not include full removal of impacted soil or partial removal to demonstrate that contaminant reduction is occurring and that the remedial action objectives are being achieved. The use of MNA/long-term monitoring in combination with other remediation technologies is retained for further evaluation.

8.1.3 INSTITUTIONAL CONTROLS (IC)

Institutional controls are non-engineered instruments, such as administrative and legal controls, that help minimize the potential for human exposure to contamination and/or protect the integrity of the remedy. Institutional controls can play an important role in the cleanup process by reducing potential exposure to contamination and preventing activities that pose exposure risk. Institutional

controls are typically used in conjunction with the overall cleanup remedy. Zoning and deed restrictions, public property notices, soil management plans, and other administrative and legal notices are examples of institutional controls. The use of institutional controls is a technology retained for further evaluation.

8.1.4 ENGINEERING CONTROLS

8.1.4.1 SURFACE CAPPING

This alternative consists of constructing an engineered cap to provide a physical barrier to direct contact with contaminated materials for human and ecological receptors. The cap would also prevent infiltration of stormwater that may potentially cause leaching and migration of contaminants. Potential capping materials could include a variety of low-permeability materials including asphalt, concrete, clay, synthetic materials, or a combination of one or more of these materials. The presence of the capping material can provide a warning to avoid excavation in areas where contamination is present. Capping is a technology retained for further evaluation for controlling risk posed through identified exposure pathways.

8.1.4.2 HYDRAULIC BARRIER

This alternative consists of constructing an engineered containment barrier to prohibit the migration of contaminated groundwater. Potential containment barriers could be constructed of impermeable materials such as high-density polyethylene (HDPE) or concrete/slurry which provides hydraulic control. Given the relatively high cost of this alternative and that the main objective is to limit the migration of contaminated groundwater, which is not identified as a significant exposure pathway, this technology is not retained for further evaluation for upland Site conditions.

8.1.5 IN-SITU TREATMENT

8.1.5.1 IN-SITU CHEMICAL OXIDATION (ISCO)

This alternative consists of the injection of oxidizing chemical compounds into the groundwater to treat the contaminated groundwater through chemical reactions (i.e. sodium persulfate mixed with water). The effectiveness of ISCO treatment is dependent on the local hydrogeology, contaminant concentration, concentrations of other organics in the subsurface, and chemical make-up. Long term monitoring would be performed to demonstrate that contaminant reduction is occurring and that the remedial action objectives are being achieved. The amount of chemical oxidant demand and residual product in the subsurface can significantly reduce the effective radius of injections during ISCO. ISCO is a treatment technology retained for further evaluation.

8.1.5.2 BIODREMEDIATION (ISB)

This technology involves injecting electron acceptors – such as oxygen, sulfate, and nitrate along with other nutrients to stimulate the existing subsurface bacterial community that is degrading hydrocarbons present in the groundwater. In-situ bioremediation (ISB) can be accomplished aerobically using oxygen or anaerobically using sulfate or nitrate. Aerobic bioremediation is more efficient and typically will proceed faster than anaerobic bioremediation, however the amount of

oxygen that can be added to the subsurface is limited by the solubility of oxygen. Although anaerobic degradation proceeds slower than aerobic degradation, the solubility of sulfate and nitrate in water is much higher than oxygen. This allows a greater concentration of electron acceptor to be injected and hence reduces the number of injections that are required to degrade a given hydrocarbon mass. However, the complexities and cost of adding these alternate electron acceptors may be much higher than using oxygen from injected air.

A hybrid approach using air injection wells that operate similarly to an air sparging system along with recirculating a nitrate based nutrient solution along with surfactants is anticipated to be the most successful methodology for bioremediating the contaminants at the Site (absent site-specific pilot testing to test mixtures). The injected air would provide a large amount of oxygen (in air) to the subsurface at a relatively low cost, while the recirculating nitrate system would provide higher concentrations of electron acceptor to areas of higher hydrocarbon concentrations that are likely to remain anaerobic.

This technology typically introduces the electron acceptor through injection points, horizontal recirculation well fields, or vertical recirculation wells. With the relatively coarse-grained materials at this Site the use of horizontal and vertical injection wells would likely be an effective method to introduce the electron acceptors into the groundwater. This alternative is retained for further evaluation.

8.1.6 PERMEABLE REACTIVE BARRIER (PRB)

This alternative consists of injecting a mixture of micron-sized activated carbon that is combined with a blend of sulfate material and micronutrients designed to encourage remediation through biological and microbial processes into the formation downgradient of a groundwater plume. Dissolved contamination in the subsurface would be sorbed by the activated carbon and then the added electron acceptors enhance the degradation of the contamination. The treatment occurs through a biological process that can work with or without the presence of subsurface oxygen. The effectiveness of this technology is dependent on the local hydrogeology and the ability to distribute the mixture, contaminant concentration, and chemical make-up. Long term monitoring would be performed to demonstrate that contaminant reduction is occurring and that the remedial action objectives are being achieved. Depending on the amount of oxygen (or other electron acceptors) and hydrocarbons in the groundwater, the carbon barrier would require additional applications of electron acceptors every few years.

This technology performs similarly to a hydraulic barrier in that it will prevent migration of contaminants in groundwater, but can also destroy hydrocarbons that bind to the activated carbon; however, given the that the main objective of this technology is to limit the migration of contaminated groundwater, which is not identified as a significant exposure pathway, this technology is not retained for further evaluation.

8.1.7 PUMP AND TREAT

Pump and treat involves extraction of groundwater from an aquifer and treatment of the water above the ground. The extraction step is usually conducted by pumping groundwater from wells or a trench. The treatment step can involve a variety of technologies such as adsorption, air stripping, bioremediation, chemical treatment, filtration, and ion exchange. The effectiveness of

pump and treat technology is dependent on the local hydrogeology, contaminant concentrations and distribution in the subsurface, and chemical make-up. Long term monitoring would be performed to demonstrate that contaminant reduction is occurring and that the remedial action objectives are being achieved. Pump and treat treatment technology was retained in conjunction with other alternatives (i.e. removing contaminated groundwater that enters excavation areas) but was not retained for further evaluation as an independent option because of the observed low mobility of the contaminants in soil and groundwater at the Site.

8.1.8 SOIL VAPOR EXTRACTION (SVE)

SVE is used to remediate unsaturated (vadose) zone soil. A vacuum is applied to the soil to induce a controlled flow of air and remove volatile and some semi-volatile organic contaminants from the soil. The vacuum is typically applied with a blower or vacuum pump connected to soil vapor extraction wells, trenches, or horizontal piping installed in the subsurface. SVE may be used in conjunction with air sparging (describe below), serving to remove contaminated vapors produced by the air sparging process. An often-used variant of SVE is sub-slab depressurization (SSD) which is used to prevent vapors from migrating from the subsurface into an indoor space. SSD is retained for further evaluation and SVE is not retained as a standalone alternative but may be used in conjunction with other technologies.

8.1.9 AIR SPARGING (AS)

Air sparging (AS) is used to remediate volatile and biodegradable contaminants in the saturated zone. Air is injected directly into the groundwater to volatilize contaminants into the vadose zone, which can then be removed with SVE. It also is a means of adding oxygen to the subsurface which can accelerate the biological degradation of hydrocarbons. Nutrients and surfactants can be added through sparge wells or injected separately to further enhance biological degradation of the hydrocarbons. Air sparging is performed in-situ with injection wells. Use of air sparging where there is significant separate phase product may cause unpredictable migration of the product. Air sparging treatment technology is not retained as a standalone treatment technology but is considered for use in conjunction with other treatment technologies.

8.1.10 REMOVAL

This alternative consists of excavation and off-site disposal of impacted soil at an off-site engineered facility. To access areas of soil impacts, this alternative could potentially include removal of select areas of surface pavement, private and public roadways and sidewalks; or building floor slabs. Components of soil removal would include excavation and off-site disposal of contaminated soil; confirmation sampling; replacement of excavated material with clean fill; and regrading and repaving excavated areas. Due to the construction of the existing main manufacturing building (wall and interior support columns on pilings) it is likely that demolition of the building would be required to excavate soil below the groundwater table. Building demolition may necessitate abatement of potential asbestos-containing material (ACM), and/or potential lead-based paint.

Due to the shallow groundwater table, the potential for flowing sands, and the highly transmissive nature of the sands beneath the Site, technically practicable excavation depths are limited to approximately 15 feet below ground surface or less. Removal of contaminated soil below the

groundwater table by excavation will likely require removal and backfilling in wet conditions (digging in an open pit through the water). Even at excavations depths less than 15 feet bgs, excavation practices would require additional shoring, ground improvement, or other support (e.g. ground freezing) to prevent settlement and/or damage to adjacent roadways, utilities, and structures. Constructing an encircled excavation area with sheet-piling and dewatering areas could result in bottom-heave of sand flows, resulting in soil failures outside the excavation area. Contaminated soil removal was retained for further evaluation.

8.1.11 STABILIZATION / SOLIDIFICATION

This alternative reduces the mobility of contaminants in the environment through either physical or chemical means. This class of treatment technologies may not reduce toxicity, but they control risk by eliminating exposure pathways or migration routes. Typical field applications may include large auger or grout-injection systems to mix impacted soil with stabilizing agents for solidification. Soil stabilization technology may be implemented below the water table.

Solidification and/or stabilization ranks above average for inorganic COPCs and average for SVOCs[2]. Stabilization technologies require significant disturbance at the Site in order to implement, would likely require demolition of the building, can alter groundwater flow in the subsurface, impede future installation of subsurface utilities, and can carry high per cubic yard unit cost for soil treated. For shallow soils, these technologies may not be cost effective when compared against soil excavation and disposal. In-situ soil stabilization/solidification (ISS) treatment technology is retained for further evaluation, specifically for on-site impacts to 15 feet bgs. It should be noted that stabilization/solidification is also taken into consideration for ISCO/ISB options as the in-situ processes in those technologies will likely preferentially remediate the lighter phase hydrocarbons, leaving a comparatively even less soluble and less volatile source, in essence leaving it stable and solidified in place.

8.1.12 THERMAL TREATMENT (TT)

In-situ thermal technology uses a heater system (e.g. electrical resistive heating [ERH] or steam injection [SI]) to increase the volatilization rate of volatile and semi-volatile constituents to facilitate extraction with a multi-phase extraction system. Heavier contaminants that are heated by contact with heated groundwater or steam become more mobile and are captured by multi-phase extraction points as vapor or liquid.

In-situ thermal treatment rates are above average for all organic COPCs and below average for metals. In-situ thermal treatment typically responds to large and continuous areas of subsurface contamination that allows for the effects of the treatment technology to be transmitted with minimal required infrastructure. ERH performs well at sites where contaminants are trapped in fine grained units (e.g. silt and clay) that are more electrically conductive. At the Site, where there are few fine-grained units, SI would likely be the preferred method of thermal treatment. Although costly, installation of a SI system under West Marine View Drive and near the BNSF railroad corridor is possible with temporary road closures, construction of temporary roadways, and protection of utilities. Installation of a SI system on-property would likely not require full removal of the building

[2] Federal Remediation Technologies Roundtable Table 3-2, Treatment Technologies Screening Matrix, March 2007.

but would require protection of utilities and structures and careful planning for vapor recovery. In-situ thermal treatment technology via SI was retained for further evaluation.

8.1.13 HIGH VACUUM MULTI PHASE EXTRACTION

Multi-phase extraction is a combined system that uses both a high vacuum system and dewatering to remove contaminated groundwater and treat soil through vapor extraction. Extracted liquids and vapor are treated and collected for disposal or treated and re-injected where permitted.

Multi-phase extraction is rated above average for all COPCs except inorganics, which are rated below average. A multi-phase system at the Site is not expected to perform well compared to other available treatment technologies due to the low vapor pressure of the creosote and PAHs present in the subsurface. In addition, considering the highly transmissive sands at the Site and the proximity to a surface water, it is unlikely that the Site could be significantly dewatered without pumping and treating at very high rates. Also, the sands beneath the site are so transmissive that it is unlikely that a high vacuum could be maintained during extraction which would be necessary to promote volatilization of the target organics. High Vacuum Multi-Phase Extraction (HVMPE) is used during SI as a means to capture vapor, product, and water driven by the steam injections. HVMPE is not retained as a standalone treatment alternative but would be used in conjunction with thermal treatment technologies.

8.2 SEDIMENT CLEANUP ACTIONS

This section presents a screening evaluation of potentially applicable general response actions and remediation technologies for marine sediments at the Site. Based on the screening evaluation, selected response actions and technologies are carried forward for use in the development of cleanup action alternatives for sediments. Table 8.2 provides a summary of this screening evaluation.

8.2.1 NO ACTION

The No Action alternative for sediments does not achieve the sediment cleanup action objective of protecting human health; thus, it is not retained for further evaluation.

8.2.2 INSTITUTIONAL CONTROLS

For any aquatic construction project (e.g., dredging), environmental reviews are conducted by permitting agencies including the Corps, Ecology, and other resource agencies. These reviews include a review of area files relating to sediment conditions and requirements to address materials management and water quality.

Additional institutional controls may be implemented as appropriate, depending on the selected cleanup action alternative. Such additional controls could include restricting activities with potential for human exposure using site security measures, physical barriers, restrictive covenants for platted tidelands, use authorizations for state-owned aquatic lands, and/or documenting the Site cleanup action in Corps and regulatory agency permit records and records maintained by the State of Washington for state-owned aquatic lands.

Institutional controls can be an effective, implementable, and cost-effective method to control potential exposure and protect human health, provided that the cleanup action for which the institutional controls are implemented is consistent with marine land and navigation uses. In cases where the proposed cleanup action is incompatible with land use or navigation uses, conflicts can result, which can jeopardize the effectiveness of institutional controls or require mitigation.

While the use of institutional controls is not carried forward in this FS as an independent remedial alternative for detailed evaluation, the use of institutional controls may be appropriate in combination with other general response actions for sediments, and thus would be considered as an additive requirement where appropriate.

8.2.3 MONITORED NATURAL RECOVERY

Monitored natural recovery (MNR) relies on net sedimentation as well as natural biodegradation processes to reduce risks following source control, while monitoring recovery over time to verify remedy success (Magar et al., 2009). MNR lines of evidence can be developed from analysis of Site data that characterize the role of natural processes in reducing risk. Key factors for determining whether MNR is an appropriate remedy include the ability to achieve and sustain an acceptable level of risk reduction through natural processes within an acceptable period of time (within 10 years of completion of construction, in accordance with SMS).

Predicting future natural recovery rates requires site-specific inputs to numerical models, such as the net sedimentation rate (which averages approximately 0.17 ± 0.08 cm/year, as described in Section 4.3.2.2.6), to quantify processes described in the CSM and associated lines of evidence. Numerical models can be used to develop estimates of time to recovery using baseline data to determine the likely effectiveness of MNR implementation.

A key element of MNR as a sediment remediation technology is ensuring effective source control. As discussed in Section 5, the RI/FS data reveal that the recontamination potential of current Site upland areas is not significant. Sediment dioxin/furan concentrations that exceed cleanup levels are due to historical legacy releases (e.g., hog fuel burner emissions from historical wood products manufacturing operations in the Site vicinity).

The Site has relatively low average sedimentation rates compared to other sediment cleanup sites in Puget Sound, suggesting that natural recovery processes have been and may continue to be relatively slow. As such, MNR may be more appropriate within certain areas of the Site than in others. The following areas may be most suited to MNR:

- Areas where recontamination from source areas is not a significant concern
- Areas where COC concentrations are low enough that natural recovery can be achieved within 10 years under natural net sedimentation and biodegradation rates (i.e., where SWACs would meet human health or PQL-based RELs, assuming post-construction replacement values for remediated areas)
- Areas where restrictions associated with certain institutional controls are not compatible with future land use, property ownership, or navigation requirements.

8.2.4 ENHANCED MONITORED NATURAL RECOVERY

Enhanced monitored natural recovery (EMNR) involves active measures, such as the placement of a thin layer of suitable sand or sediment, to accelerate the natural recovery process. EMNR is often applied in areas where natural recovery may appear to be an appropriate remedy, yet the rate of sedimentation or other natural processes is insufficient to reduce potentially unacceptable risks within an acceptable timeframe (EPA, 2005). The acceleration of natural recovery most often occurs due to burial and/or incorporation and mixing of the clean material into the contaminated surface sediments through bioturbation and physical mixing processes. Other recovery processes can also occur, such as binding of contaminants to organic carbon in the clean material, particularly if the material is from a clean sediment source with naturally occurring organic carbon. Placement of such EMNR materials is typically different than capping because it is not designed to provide long-term isolation of contaminants. Clean sand or sediment can be placed in a relatively uniform thin layer over a contaminated area, or it can be placed in berms or windrows, allowing natural sediment transport processes to distribute the clean material over wider areas. As with MNR, EMNR includes both monitoring and contingency plan components to verify that recovery is occurring as expected, and to respond accordingly.

EMNR can be highly effective where natural recovery is occurring, but at a slower rate than desired. Given the relatively low net sedimentation rates in the Site area (i.e., approximately 0.17 ± 0.08 cm/year; see Section 4.3.2.2.6), EMNR may be particularly applicable to much or all of the tidal mudflat area. EMNR is also been used throughout Puget Sound as an effective strategy for managing dredge residuals, as discussed below. EMNR has been retained as a general response action for this FS and would include placement of a nominal 6- to 12-inch-thick layer of clean sediment.

EMNR material would be obtained from a clean upland source or marine beneficial reuse sediment source. A specific source for this material has not been identified for this FS. Prior project experience suggests that the availability of clean material from local or regional beneficial reuse projects changes over time, and thus the availability of sources would need to be more fully understood and evaluated during remedial design. If material is only available on a limited basis each year, this could extend the implementation timeline of those projects that require larger volumes of EMNR sediments.

EMNR placement is more appropriate for certain areas than others. It is particularly applicable to much of the tidal mudflats within the Site because it is best suited to the following:

- Areas where recontamination from source areas is not a significant concern
- Areas where COC concentrations are low enough that natural recovery can be achieved within 10 years when accelerated by the addition of a thin, clean layer of EMNR material
- Areas where restrictions associated with institutional controls are not compatible with future land use, property ownership, or navigation requirements
- Flat or shallow sloping areas with stable sediments
- Areas where EMNR material can be placed in the dry, minimizing water quality impacts and ensuring placement accuracy

8.2.5 IN-SITU TREATMENT

In-situ treatment via contaminant immobilization is an innovative sediment remediation approach that involves introducing sorbent amendments into contaminated sediments to alter sediment geochemistry, increasing contaminant binding and therefore decreasing bioavailability. As discussed in Section 4.3.3.2, the existing sequestering capacity of Site sediments can be augmented through the placement of engineered black carbons such as activated carbon to further reduce bioavailability in-situ. Bench- and field-scale application of activated carbon at other sediment sites suggests that porewater concentrations and bio-uptake of hydrophobic contaminants such as PCBs and dioxins/furans can be reduced between 70% and 99% at activated carbon doses similar to the native organic carbon content of sediment (Ghosh et al., 2011). More than 25 field-scale demonstration or full-scale activated carbon sediment in-situ sediment treatment projects spanning a range of environmental conditions have now either been completed or are currently underway in the United States and Norway (Patmont et al., 2015).

Field-scale projects have demonstrated the efficacy of full-scale in-situ sediment immobilization treatment technologies to reduce the bioavailability of hydrophobic contaminants such as PCBs and dioxins/furans. The basic technology involves placement of targeted amendments using a range of options, all of which have now been demonstrated at the field scale, including:

- Direct application of activated carbon, with or without binder and weighting agents
- Mixing amendments with sediment or sand either in-situ or as an amended cover/cap
- Placement of amendments below cover materials or caps

In-situ immobilization treatment can be a permanent sediment cleanup remedy that rapidly and sustainably addresses bioaccumulation exposures, and becomes more effective over time (Ghosh et al., 2011). In-situ treatment is also less energy-intensive, less disruptive to the environment, and can be significantly less expensive than conventional remedial technologies such as engineered containment or removal. For example, a field demonstration of this technology was recently completed in San Francisco Bay by applying approximately 2% to 3% activated carbon and mechanically mixing the material into the top 1 foot of tidal mudflat sediments during low tide conditions, successfully reducing PCB bioavailability with relatively minimal construction-related impacts (Cho et al., 2009). In-situ sediment treatment using activated carbon placement may be particularly promising in sensitive habitat areas such as the Site tidal mudflats.

In-situ treatment is most effective in areas with higher bioavailability of contaminants. The bioavailability of PCBs and dioxins/furans in sediments at the Site has been determined to be relatively low based on low site-specific BSAFs (see Section 4.4.1). Due to the low site-specific bioavailability calculated for PCBs and dioxins/furans in sediments at the Site, in-situ treatment was not retained as a general response action for this FS.

8.2.6 ENGINEERED CONTAINMENT

Engineered containment for sediments involves placing a suitable cap to isolate contaminated material to protect biological receptors of interest (e.g., soft shell clams) that may be consumed by humans. In the aquatic environment, the containment must be designed to withstand erosive

forces generated by wave action and propeller wash, and must be thick enough to provide the required isolation of the material contained by the cap. Engineered caps can be constructed on-grade or be used in combination with excavation (constructed at grade). Monitoring results at other sites in the Puget Sound region have shown that containment can provide effective sediment remediation without the risks involved in removing contaminants by dredging (Sumeri, 1996). Engineered capping on-grade and engineered capping at grade were retained for further evaluation in this FS. Consideration for altering the physical environment by raising mudline elevations and increasing the grain size distribution of the sediment substrate has been incorporated into the evaluation and scoring of the alternatives that include capping on-grade.

Placing a layer of cap material (1 to 2 feet thick, depending on location-specific environmental requirements) can provide isolation of potentially contaminated sediments. Aggregate caps (e.g., with a gravel surface) may potentially be appropriate for consideration in sediment areas with high potential for disturbance (e.g., from wind-generated wave forces) or in higher intertidal zones at the Site where the natural habitat is relatively coarse-grained. Long-term monitoring and maintenance would be a requirement of any capping remedy. This would include accessing the physical integrity of the cap over time using visual inspections and surveys. Analytical sampling may also be performed to verify the chemical isolation protectiveness. Alternatively, complete removal would not require physical integrity monitoring and would have lower costs and uncertainty associated with long-term monitoring. Ecology considers that capping on-grade may be subject to additional long-term maintenance and monitoring, relative to capping at grade, because on-grade caps may be more susceptible to erosive forces and climate change considerations.

Sediment caps would be constructed of clean silt/sand and/or sand and gravel materials and could be placed by a number of mechanical and hydraulic methods. Cap material would either be provided from a beneficial reuse marine dredging project or from a commercial quarry in cases where beneficial reuse material would not provide the appropriate grain size. The grain size requirements would be determined during remedial design based on consideration of erosive forces (e.g., wind/wave) and habitat compatibility, and would likely vary depending on elevation and location. Beneficial reuse of Snohomish River maintenance dredged material or other suitable sediments would be considered during remedial design and is generally preferred over quarried material.

Caps designed according to the EPA and Corps guidance have been demonstrated to be protective of human health and the environment (EPA, 2005). Design specifications for in-situ engineered caps would be further refined during remedial design based on detailed analysis of the following components:

- Bioturbation
- Habitat compatibility
- Erosion (e.g., tidal currents, waves, and wakes)
- Chemical isolation
- Consolidation
- Operational considerations (e.g., placement inaccuracies)

During remedial design, appropriate cap designs for different SMAs would be determined individually for each component based on location-specific design parameters. For the purposes of this FS, a conceptual-level average 2-foot-thick cap design was considered to be applicable across the Site based on a review of engineered caps designed, approved, and successfully constructed and monitored in other areas of Puget Sound, also taking into consideration site-specific habitat conditions. While a 2-foot-thick cap is expected to provide an appropriate representation for the capping technology, actual cap thicknesses developed during remedial design could range from 1 to 3 feet for various areas of the Site depending on area-specific environmental factors such as elevation, habitat, and erosion. While in-situ treatment was not retained as a general response action for the Site, the potential use of a sequestering agent as an amendment in caps for various areas of the Site will be evaluated during design.

Containment may be more appropriate within certain areas of the Site than in others. It is best suited to the following:

- Areas with deeper contamination or where higher concentrations are found at depth and where the risk of recontamination from dredging residuals is higher
- Areas adjacent to steep slopes where removal poses a higher risk and where shoring would likely be required
- Areas where restrictions associated with institutional controls are compatible with future land use, property ownership, and navigation
- Areas with flat or shallow sloping fine-grained substrate where cap material can be placed accurately and will be retained at the sediment surface where placed
- Areas where cap material can be placed in the dry, minimizing water quality impacts

8.2.7 REMOVAL

Removal of sediments from the aquatic environment is a common approach to addressing materials that require remedial action. If selected as a part of the final remedy, tidal mudflat sediments could be excavated under lower tide conditions using low ground-pressure upland-based equipment and mud mats. The use of standard water-based dredging equipment would be limited due to the elevation of tidal mudflat sediment and typical drift requirements for marine dredging equipment. Removal using upland-based equipment was retained as a response action for more detailed evaluation in this FS.

A number of site-specific operational conditions influence the effect of environmental dredging of contaminated sediment on aquatic systems. Experience documented on other sediment cleanup projects shows that resuspension of contaminated sediment and release of contaminants occur during dredging and that contaminated sediment residuals will remain following operations. This can affect the magnitude, distribution, and bioavailability of the contaminants and the exposure and risk to receptors of concern. Dredging residuals have been shown to be particularly problematic at sites with considerable debris (Patmont and Palermo, 2007). Because of the historical use of the Site tidal mudflats for log rafting, considerable subsurface logs and other debris are anticipated to be encountered during removal, complicating the excavation operations.

Because contaminated sediments at the Site are located in intertidal areas, resuspension and release of contaminated sediments through the water column during removal could be mitigated by using upland-based equipment at low tide. To the extent that contaminated sediments are excavated when the water level has dropped below the sediment surface, migration through the water column would be limited. Excavated areas would then be backfilled with clean material before the tide comes in. Best management practices such as booms and silt fences could further control off-site migration of contaminated sediments. A debris sweep ahead of primary sediment removal activities may be considered to reduce complications.

Where removal is considered, residuals management strategies would need to be considered. Considerable experience from prior removal projects shows that the historical approach of using multiple cleanup passes to address residuals is ineffective. More recently, sediment remedies have incorporated a residuals management strategy that includes placement of a post-removal clean cover. For Site sediment cleanup alternatives that include a removal component, residuals would be managed by backfilling the removal footprint to the existing grade.

For each removal alternative, the horizontal extent of removal was defined either by the boundary of the SMA or sub-area specific to that alternative. The vertical extent of removal was defined based on the results of sediment coring, supplemented as appropriate with the surface sample results. For surface samples where core data are not available, a preliminary removal depth of 2 feet has been incorporated into the volume estimates. Should removal be selected as part of the final remedy, the extent of the removal prisms would be refined by performing additional core sampling during remedial design.

The current sediment FS practice is to “scale up” estimated removal volumes from the preliminary removal prism neatlines summarized above. Based on a review of similar sediment cleanup projects, appropriate scaling factors range from 1.2 to 2 times the neatline estimate of removal volumes, depending on-site understanding at the time of the FS, and the level of engineering that was used in developing the volume estimate. Removal volumes calculated in this FS are based on the horizontal and vertical extents as described above and include a 0.25-foot overdepth allowance on the neatline removal volumes. This volume is then further scaled up by an additional factor of 20% to accommodate potential uncertainty in actual distribution of potential contamination, and considering engineering factors such as side slopes and level cuts that would be implemented during remedial design development, consistent with recent Corps guidance (Palermo et al., 2008).

Removal may be more appropriate within certain areas of the Site than in others. It is best suited to the following:

- Areas where contamination is relatively shallow and where removal could be done in the dry, posing a lower risk of recontamination
- Areas with higher contaminant concentrations
- Areas with flatter adjacent slopes that would not require shoring
- Areas where restrictions associated with institutional controls are compatible with future land use, property ownership, and navigation

8.2.7.1 DISPOSAL OPTIONS

There are several options for disposal of marine sediments removed through excavation. For those sediments that are determined by the DMMP to be suitable for open-water disposal, such sediments may be transloaded onto a barge for transport and disposal at an unconfined open-water disposal site, including the Port Gardner DMMP disposal site. Some of the tidal mudflat sediment areas adjacent to the Knoll Area that contain elevated total PCB concentrations but relatively low dioxin/furan TEQ levels appear to be within DMMP suitability criteria for open-water disposal and could potentially be pursued further during remedial design.

For debris and other sediments that are not suitable for open-water disposal, upland beneficial reuse and/or disposal at a permitted municipal or private landfill (e.g., construction debris landfill or Subtitle D landfill) may be needed for alternatives that include a removal component.

Sediments excavated using land-based equipment could be transloaded from the upland area of the Site onto a barge, and shipped directly to a commercial landfill, or to a barge-truck-rail transloading facility for shipment to a United States landfill with rail access. Alternately, an on-site staging and truck loading area could be set up to process sediments and debris and load this material into trucks for off-site transport and disposal. Where chemistry results allow for potential beneficial reuse, additional alternatives for managing excavated material may be available as discussed below.

8.2.7.2 REUSE OPTIONS

There may be practicable opportunities to reuse some of the excavated materials beneficially, including as backfill for potential upland excavation areas, or as surface fill in other upland areas of the Site (e.g. in the Woodlife Area). As discussed above, some of the tidal mudflat sediments adjacent to the Knoll Area contain total PCB concentrations and dioxin/furan TEQ levels that may be below final upland soil cleanup standards, even for unrestricted use sites. For these materials, there may be opportunities to protectively manage the materials at the Site for beneficial reuse. In this case, debris would need to be screened out prior to reuse, and the geotechnical suitability of the material for reuse addressed to ensure that the reuse is compatible with potential future site uses. For purposes of this FS, on-site beneficial reuse was considered to be a potential component of Site-wide cleanup alternatives; however, a specific volume was not assumed and cost estimates do not include on-site beneficial reuse. This option will be evaluated further during remedial design.

8.2.7.3 EX-SITU TREATMENT

Ex-situ treatment entails additional processing steps that are taken with site sediments after they have been excavated and removed from the marine area. Ex-situ treatment could be used as part of a treatment train to support off-site disposal by adding dewatering reagents to sediments prior to shipment. In this case, ex-situ treatment would not be an independent response action.

Other ex-situ treatment technologies such as thermal desorption and incineration could potentially be applied to Site sediments; however, such technologies are substantially more expensive than off-site landfill disposal, and many of these technologies have limited effectiveness for sediments with a high organic content.

Ex-situ treatment is best suited for scenarios where treatment to reduce contaminant concentrations is needed prior to beneficial reuse or where pre-treatment is needed to meet upland disposal requirements. It is not anticipated that material from any sediment cleanup areas will require pre-treatment prior to upland disposal. While beneficial reuse is considered a potential option for material meeting suitability criteria, ex-situ treatment of PCBs and dioxins/furans to allow for beneficial reuse would not be cost-effective given the relatively small quantity of material that could be disposed of in potential upland excavations. Thus, no ex-situ treatment technologies are retained as independent general response actions. Ex-situ treatment through the addition of dewatering reagents, to the extent that they might be required, is retained for consideration as part of the off-site disposal process.

8.3 SUMMARY OF RETAINED REMEDIATION TECHNOLOGIES

This section summarizes the retained remediation technologies for the uplands and the marine area.

8.3.1 UPLAND SITE AREAS

Table 8.4.1-1 presents the retained remediation technologies for the identified upland assessment areas.

8.3.2 MARINE SEDIMENT AREAS

Exhibit 8.3.2 summarizes the retained remediation technologies for the marine area, including the estimated unit cost (on a per acre or per cubic yard basis) for each technology, based on recent regional project experience.

Exhibit 8.3.2
Retained Marine Area Remediation Technologies

ACTION	ESTIMATED UNIT COST
Institutional Controls	$16,500 See Note 1
Monitored Natural Recovery (MNR)	$22,000/acre
Enhanced Monitored Natural Recovery (EMNR)	$75,000 to $130,000/acre
Engineered Containment	$145,000 to $260,000/acre (technology retained in Feasibility Study, some alternatives in combination with removal)
Removal	$327,000 to $835,000/acre (2-foot-thick removal, disposal, and cap) $50 to $190/cubic yard (removal and disposal)

Notes:

1. The costs for implementing and maintaining institutional controls are highly location- and alternative-specific and would be refined during remedial design.
2. Unit cost range for removal is based on a low-range cost that includes on-site upland beneficial reuse and a high-range cost that includes offsite landfill disposal.
3. Unit costs do not include indirect construction costs (design, permitting, project management, etc.)
4. Unit costs do not include contingency. For FS level costs, a contingency of 30% is typically applied, and has been included in the total cost for the remedial alternatives described in this report.

8.4 DEVELOPMENT OF UPLAND CLEANUP ACTION ALTERNATIVES

Cleanup action alternatives were developed and evaluated based on the requirements and the criteria specified in WAC 173-340-360, Selection of Cleanup Actions and WAC 173-340-370, Expectations for Cleanup Action Alternatives. This section summarizes the remedial alternatives for each selected area that were developed and evaluated for the Site. For each alternative, the key components are described. Components and unit pricing were developed based on prior experience and current vendor information, as available. These data were used to develop conceptual scenarios and to estimate costs associated with each of the listed alternatives.

All proposed cleanup action alternatives include provisions for compliance monitoring that will meet the requirements identified in WAC 173-340-410 including protection of human health and the environment; performance of the cleanup action; and conformational monitoring. A final compliance monitoring program will be included as part of the CAP. Where appropriate, specific monitoring requirements are included as part of the cleanup action alternative.

8.4.1 CREOSOTE/FUEL OIL AREA REMEDIAL ACTION ALTERNATIVES

The following alternatives have been assembled to address the Creosote/Fuel Oil Area including on- and off- property impacts to soil, soil vapor, and groundwater to approximately 15 feet bgs, and deeper soil and groundwater. A summary table listing each alternative and the specific technology that is being used to address the different areas of impacts is included as Table 8.4.1-1.

8.4.1.1 ALTERNATIVE 1: SSD, ENGINEERING CONTROLS, AND INSTITUTIONAL CONTROLS

Alternative 1 consists of on-property SSD, engineering controls (establishing surface capping on unpaved portions of the on-property area and the maintenance of all existing surface capping), long-term monitoring of groundwater, and institutional controls.

The purpose of the SSD would be to limit the potential for migration of volatile and semi-volatile compounds from soil and groundwater to indoor air of the existing main manufacturing building via vapor intrusion. SSD would be accomplished for on-property impacts by installing several suction pits within the building. The exact number of pits and their spacing would be determined based on the results of pilot testing but the corresponding cost estimate for Alternative 1 assumed four. These pits would be approximately 2 feet square and 2 feet deep. A 3-inch PVC pipe will be installed to withdraw vapors from the pit. The piping will be run along existing columns to a common header that exits through a building wall to a blower system. Activated carbon treatment of the SSD system effluent would be installed, if required. Sub-slab vapor monitoring points would

be installed around the suction pits to confirm that a vacuum compared to building pressure is being maintained under the building.

The purpose of the engineering controls (surface capping) would be to limit groundwater infiltration as well as to create a barrier to the direct exposure pathway. A portion of the contaminated area is currently covered by existing building slabs and surface pavements. An approximately 6,000 square foot unpaved landscaped area is located along the southeast side of the main warehouse adjacent to West Marine View Drive. After installing appropriate erosion control measures, surface capping activities would begin with the excavation and on-site stockpiling of approximately two feet of clean overburden in currently unpaved areas (approximately 450 cubic yards). Under this alternative, a colored polyurethane liner would be installed throughout the excavated area at two feet bgs. The stockpiled soil would be placed atop the polyurethane liner and compacted. Additional clean backfill material would be imported, as necessary. Imported material, if necessary, would be analytically tested prior to placement. The soil cover would be seeded with native grasses. The integrity of the existing building slabs and surface pavements would be inspected on an annual basis for 20 years, and repairs would be completed as necessary to provide contiguous surface capping throughout the area.

The purpose of the long-term monitoring would be to confirm the stability and natural attenuation of the existing groundwater contamination over the course of an estimated 20 years to confirm stability of the groundwater plume. After completion of the surface capping activities, an estimated five groundwater monitoring wells would be installed to monitor the subsurface conditions of the contaminated area. In addition, five existing monitoring wells would be monitored and sampled on a quarterly basis from year one to year five and on an annual basis from year six to year 20. After year 20, the groundwater monitoring wells would be decommissioned, pending the analysis of groundwater samples confirming a stable or shrinking groundwater plume.

Institutional controls including a deed restriction would be placed on the property to restrict the types of future development. A soil management plan would be developed to control potential exposure risks posed by direct exposure to subsurface contamination and to protect the integrity of the remedy.

8.4.1.2 ALTERNATIVE 2: ISB AND SSD

Alternative 2 includes installation and operation of a hybrid ISB system on- and off-property, engineering controls (establishing surface capping on unpaved portions of the on-property area and the maintenance of all existing surface capping), and short-term institutional controls (see Figure 8.4.1.1-A).

The ISB system will be installed both on- and off-property to address soil and groundwater impacts to a depth of approximately 50 feet bgs (deep zone treatment at select areas). Prior to installing the system, approximately 10 monitoring wells and 20 temporary Geoprobe points will be completed to further refine the final system size and treatment interval (Figure 8.4.1.1-a). It is expected that some of these wells will be used for performance monitoring of the system. Pilot testing of the ISB system will be performed on-property to determine injection and extraction rates, the rate of nutrient consumption, the performance of vertical recirculation wells, and the performance of deep air injection wells. This data will be used to finalize the design parameters for the system.

The ISB system will consist of several components as follows: 1) a series of recirculation wells (horizontal and vertical) for injection of the nitrate/nutrient/surfactant (NNS) solution; 2) a conveyance system for the recirculation system; 3) a water treatment and chemical addition system; 4) a series of wells to inject air in the shallow and deep zones; 5) an air collection system to capture the injected air; and 6) compressors and blowers to operate the air injection system. These components are described in the following paragraphs.

The NNS injection system will consist of a series of wells throughout the shallow impacted area to a depth of approximately 15 feet spaced approximately 100 feet on center. Approximately half of the wells would be operated as extraction wells and the other half would function as injection points. All the wells constructed for this system would have sumps to collect and recover any DNAPL that might accumulate during treatment. The screen pack for treatment wells will be designed to be as coarse as possible to facilitate the collection of DNAPL and to minimize losses during extraction or injection. Wells located off-property would be installed just west of the railroad as shown on Figure 8.4.1.1-A. Deeper impacts would be addressed through vertical recirculation wells. Three vertical recirculation wells would be located on-property and two would be located off-property as shown on Figure 8.4.1.1-A. These wells would extract groundwater from the deeper zone from 45 to 50 feet, pump it to the NNS addition system and the treated water would be reinjected at a depth of 15 to 20 feet.

Treatment wells would be connected to two sets of PVC or HDPE piping – injection and extraction – so that each well could be configured to run as an injection or extraction well. Perforated piping to capture injected air would also be installed in the same trench.

Groundwater will be pumped from the extraction points by submersible pumps and conveyed to the NNS addition system at a total rate of approximately 60 gpm (actual pumping rate to be obtained during pilot testing). The system would consist of an influent settling tank to allow for settling of solids and separation of product, followed by a nitrate/nutrient addition tank. Nitrate, other nutrients, and surfactants would be added to the addition mix tank. After the nitrate addition the water would be pumped through sand filters to remove any undissolved materials prior to injection. The filtered water would then be directed to the various wells in the injection field. It is expected that the NNS solution will only be added periodically, but the recirculation will continue without NNS additions to enhance the contact of the NNS solution and injected air within the formation.

Air injection will be performed through a series of 1-inch diameter wells installed on a roughly 80 foot spacing over the area of shallow impacts. The deep zone would be addressed by the installation of 6 deep wells on-property and 4 deep wells off-property as shown on Figure 8.4.1.1-a. Injected air will be recovered by a series of perforated pipes installed in the trenches containing the NNS and air injection piping. The air recovery system on property will also function to mitigate vapors that could migrate into the building. The compressors, blowers, and emission controls for the air injection system will be installed in the same compound as the NNS system.

The system will initially be operated similarly to an AS/SVE system that will focus on removal of more volatile hydrocarbons. When the concentration of hydrocarbons in the extracted vapor begins to significantly decrease (which is expected in the first six months of operation), the NNS will begin operation. The air injection system will continue to operate, but it is expected that over time the system would run in a pulsed mode, assisting with in-situ groundwater mixing. Two NNS

injection events are anticipated – one near the end of the first year of AS/SVE operation and the second after nitrate is no longer detected in the extracted groundwater, which is expected to occur two years after the first injection. However, recirculation using the NNS system will continue between chemical additions.

It is estimated that the ISB system would be in operation for approximately 5 years based on results of groundwater monitoring. Performance monitoring will be completed semi-annually during operation of the system at approximately 4 downgradient locations and 6 locations within the plume. After decommissioning the ISB system, 10 wells will be monitored annually for five years to confirm that any residual impacts remaining are stable or decreasing in concentration.

The air recovery component of the ISB system on-property will serve as an SSD system for the existing main manufacturing building. Pilot testing for an SSD system will be conducted to ensure the ISB air recovery configuration and specifications adequately abate the potential vapor intrusion pathway.

Engineering controls (surface capping) will be completed as described for Alternative 1.

Short-term institutional controls, including development of a soil management plan, will be completed as described for Alternative 1.

8.4.1.3 ALTERNATIVE 3: ISCO AND SSD

Alternative 3 includes ISCO on-property, engineering controls (establishing surface capping on unpaved portions of the on-property area and the maintenance of all existing surface capping), and short-term institutional controls (Figure 8.4.1.1-B).

The ISCO program will be performed on-property to address the concentrations of volatile and semi-volatile contaminants to a depth of up to 50 feet. Prior to beginning the program approximately 10 monitoring wells and 30 temporary Geoprobe points will be installed to further refine the lateral extents and the target depth interval for treatment (Figure 8.4.1.1-B). It is expected that some of these wells will be used for performance monitoring of the system. Pilot testing of ISCO would be performed by injecting in four locations. Three monitoring wells within the expected influence of the injections will also be installed. Samples from the monitoring wells before and after injections will be compared to estimate the destruction of hydrocarbons in the subsurface.

ISCO will be used to target the soils to a maximum depth of 50 feet on-property. The purpose of the on-property injections would also be to treat groundwater above PCLs with creosote/TPH impacts in-situ. The injected material would consist of sodium persulfate with water. Three injection events would be performed, approximately 6 months apart (2 years of treatment). Injection events will consist of utilizing a direct push drilling rig with specialized injection tooling to deliver the solution to the subsurface. Injection activities would necessitate a water supply, either from a nearby hydrant (pending permitting requirements) or a water-supply truck. Water and the solution will be mixed on-site prior to injecting at pre-determined injection rates based on the findings of the pilot test.

Performance monitoring will be performed 2 and 4 months after each injection event to evaluate treatment performance and identify areas that require additional injections. Soil performance monitoring and one year of quarterly performance groundwater monitoring will be performed at 10 locations following the final injection event. Compliance monitoring will be performed semiannually for 3 years and annually for 1 year following the last injection event to document that residual impacts are stable or decreasing.

ISCO is not proposed for addressing the off-property impacts because the required spacing of the injection points is estimated to be limited to 6 to 10 feet. Performing ISCO in the West Marine View Drive right of way and near many utilities would result in multiple closures of the road as well as potential damage to the road bedding and/or utilities by the injection of treatment solutions. The marsh on the eastern side precluded access for injection of treatment solution due to the soft ground and standing water. The marsh also posed additional risk releasing treatment solution to surface water through surface fracturing. Therefore, injections off-property were not considered technically practicable.

An SSD system will be pilot tested and installed as described in Alternative 1.

Engineering controls (surface capping) will be completed as described in Alternative 1.

Short-term institutional controls will be completed as described in Alternative 2.

8.4.1.4 ALTERNATIVE 4: SOIL REMOVAL & ISB

Alternative 4 includes mass excavation and off-site disposal of contaminated soil on-property to 15 feet bgs, ISB treatment for deeper on-site groundwater and shallow and deeper off-site groundwater, and short-term institutional controls (Figure 8.4.1.1-C).

To better determine the required extent of the excavation and to collect soil samples for geotechnical testing a series of 10 monitoring wells and 30 temporary Geoprobe points would be installed. This information will be used to locate and design shoring necessary for the excavation of impacted soils to a depth of 15 feet.

Excavation of contaminated soil would be removed to a maximum depth of 15 feet bgs. Due to the shallow groundwater and potential for flowing sands excavation would require shoring by sheet pile or a reinforced bentonite concrete wall to protect structures, roadways, and utilities. The excavation will proceed by sections, with shorter sections along the wall being excavated first. The wall would be braced during this phase until clean soil is backfilled and compacted behind the wall. Once the wall has been braced with clean backfill, interior cells can then be excavated.

This will require that a signification portion of the existing main manufacturing building be demolished and rebuilt after the excavation. Demolition of the building will require the potential abatement of ACM and/or lead based paint. It is expected that the shoring method (sheet pile or wall) will reduce the amount of water that must be pumped to capture groundwater in the excavation. Enough data does not exist at this point to design water handling systems, but it is assumed for cost estimating in this report that the system will operate at approximately 100 gpm to control water in the excavation. The extents of the excavation would be based on existing

analytical data supplemented with additional investigation described above. The approximate extent of the excavation is shown on Figure 8.4.1.1-C.

It is assumed that 80% of the soil to a depth of 5 feet would be clean overburden. Separating clean from impacted soils during the excavation of the saturated zone would be difficult without groundwater depression. For this report cost estimate it is assumed that 20% of the saturated soils could contain product and be considered a Persistent Waste increasing handling and disposal costs.

The excavation would be backfilled with clean stockpiled overburden and imported granular fill. The soil will be placed and compacted to allow for the reconstruction of the building. Due to the prolonged disruption and required closures that would be necessary, excavation would not include soil beneath West Marine View Drive or BNSF property. Excavation of contaminated soil is estimated to take up to a year, including building demolition, shoring installation and testing following the removal activities.

Performance groundwater monitoring would be performed semiannually for 5 years at 10 wells and annually for 5 years to evaluate reductions in concentrations in groundwater.

On-property impacts deeper than 15 feet and off-property impacts will be addressed through a ISB system as described in Alternative 2, and as applicable.

Short-term institutional controls will be completed as described in Alternative 2.

8.4.1.5 ALTERNATIVE 5: THERMAL TREATMENT

Alternative 5 includes thermal treatment (TT) using steam enhanced extraction (SEE) targeting on-property and off-property soil and groundwater (shallow and deep), and a temporary SSD system, engineering controls, and short-term institutional controls to be employed during SEE activities (Figure 8.4.1.1-D).

Prior to the installation of a TT system a series of 30 temporary Geoprobe points will be installed to better define the extent of impacts. Samples of impacted soils would also be collected for bench testing for TT. TT will focus on areas that are heavily impacted or contain DNAPL.

TT involves heating the subsurface to volatilize contaminants or liquify heavier constituents to a more mobile state so that they can be recovered though multi-phase extraction points. The heating can be achieved through different methods such as electrical resistance heating, thermal conductive heating, or steam enhanced extraction (SEE). At this site, the contaminants and sandy soils are most amenable to SEE.

The use of SEE will require the installation of a steam plant and liquid and vapor treatment equipment at the Site. In addition, existing monitoring wells, abandoned borings, or potential utility access points within the treatment area will have to be abandoned with heat resistant concrete as the heat will damage PVC wells and steam could escape through the well. Utilities that are buried shallower than five feet may not be affected by SEE but will need to be evaluated for protection measures. Deeper utilities may require relocation or the design of the SSE wells may have to be adjusted to avoid damage to critical utilities. SEE should not require the demolition of

the building and can be performed in the roadway with partial temporary closures. Because of safety concerns the sidewalks in the treatment area may need be closed during the duration of treatment activities.

SEE is typically performed using a series of steam injection wells that are installed around a central extraction point. The wells will be screened to address impacts at certain depths. Multiple wells, at different depths, will be needed to treat the soils from 5 to 50 feet bgs. Steam is injected around the periphery wells which forces contaminants in vapor and liquid form to migrate to the extraction point. At higher temperatures creosote can become less dense to the point where it will float in the groundwater. The vapors and liquids are conveyed to the treatment systems where they are cooled, liquids separated into water and product, and the vapor and water are further treated and discharged.

During SEE, monitoring of the soil temperature, energy input, and the amount of hydrocarbons being extracted are the key variables used to determine the progress of the remediation of a cell. Initially, “hot” soil samples will be collected to confirm that monitoring the system parameters were correctly predicting remediation of the cell. Thereafter, these parameters will be used as the primary indicators that remediation has been completed in a cell. A final round of confirmatory sampling will be performed shortly before the SEE work is complete and the contractor demobilizes. A total of approximately 50 locations will be sampled to confirm the remediation of the Site.

The SEE is expected to require 12 months to design and permitting, 3 months to construct, and will operate for approximately 6 months. After completion of the project and the soil has cooled, 10 new monitoring wells will be installed for performance monitoring. These wells will be sampled semi-annually for 2 years to verify the performance of the SEE.

To address potential concerns related to vapor intrusion and direct contact, a temporary SSD system, engineering controls, and short-term institutional controls (as described in Alternative 3) will be in-place during the duration of SEE activities.

8.4.1.6 ALTERNATIVE 6: IN-SITU SOIL STABILIZATION/SOLIDIFICATION AND THERMAL TREATMENT

Alternative 6 includes In-Situ Soil Stabilization/Solidification (ISS) targeting on-property impacts, TT (via SEE) targeting off-property impacts, and short-term institutional controls (Figure 8.4.1.1-E).

Prior to the installation of a TT system and performing ISS, a series of 30 temporary Geoprobe points will be installed to better define the extent of impacts both on- and off-property. Samples of impacted soils would also be collected for bench testing for TT and ISS. Both TT and ISS will focus on areas that are heavily impacted or contain DNAPL.

ISS will be performed by using a large diameter auger/paddle rig to inject cement or other amendments into soil while mixing with the auger/paddle rig. The permeability of the soil “column” is greatly reduced and the contaminants are bound into the soil with the amendments effectively becoming insoluble. To determine the best amendment for the product at the Site, soil samples with product will be collected for bench scale pilot testing.

Large diameter augers, from 4 to 12 feet in diameter would be used to inject the amendments and mix the soil. The exact diameter depends on soil type and depth of impacts, with smaller augers generally being used for deeper impacts. Demolition of the building will be required for the large cranes and augers to be able to access the target area (as described in Alternative 3). A mix plant will be assembled on the Site to store and prepare the large volumes of amendment that will be injected into the soil.

TT will be performed on the off-property areas as described in Alternative 5, as applicable. It is assumed that the ISS and TT work can proceed independently of each other, although some coordination will be required at the transition areas between ISS and TT.

After the completion of ISS and TT new wells will be installed for performance verification. For the ISS area four wells (two shallow and two deep) will be installed near both the upgradient and downgradient edge of the ISS area. Four wells (two shallow and two deep) will also be installed on the east side of West Marine View Drive to monitor the upgradient area of the TT area. These wells will be monitored semi-annually for 2 years after the completion of the work to document the performance of the remediation.

8.4.1.7 ALTERNATIVE 7: HOTSPOT SOIL REMOVAL & ISB

Alternative 7 includes excavation and off-site disposal of contaminated soil on-property to 9 feet bgs, ISB treatment for deeper on-site groundwater and shallow and deeper off-property groundwater, and short-term institutional controls (Figure 8.4.1.1-f). This excavation will address a majority of the high concentration soil impacts at depths where direct exposure is most likely and will reduce potential exposures through vapor intrusion and worker contact.

To support decision making regarding the extent of the proposed soil excavation a series of 10 monitoring wells and 30 temporary Geoprobe points will be installed during the remedial design phase. Monitoring well and Geoprobe borings will also be used for geotechnical testing to assess excavation shoring and dewatering system design. Pilot testing of the ISB system will also be performed during the remedial design phase. To minimize logistical difficulties, pilot testing will be performed on-property for the shallow and deeper zones, even though some of the shallow soils will be subsequently excavated. As described in Alternative 2, pilot testing will require approximately one year to complete. During this time designs for the building partial demolition and repair, shoring, and excavation activities will be completed.

Excavation of contaminated soil will proceed after the completion of the ISB pilot testing. Site conditions could easily lead to flowing sands that could quickly destabilize a shored excavation. Even using sheet piling to reduce water infiltration will have reduced effectiveness because there is no significant fine-grained unit that the sheet piling can key into that will reduce vertical groundwater flow through the sandy soils. Additional data will be collected during the Cleanup Action Plan phase to support a detailed design of the shoring system necessary for soil removal to 9 beet bgs. Based on available site information, the shoring system is likely to include a robust dewatering system to depress the water table outside of the excavation to below the target depth and sheet piling or a reinforced bentonite concrete wall to a depth of at least 20 feet bgs with lateral bracing or tie-backs. This level of effort will be required to protect structures, roadways, and utilities and to allow for the excavation of the impacted soils.

The excavation will likely proceed by sections, with shorter sections along the sheet pile wall being excavated first. The wall would be braced during this phase until clean soil is backfilled and compacted behind the wall. Once the wall has been braced with clean backfill, interior cells can then be excavated.

This work will require that a portion of the existing main manufacturing building be demolished. The footprint of the demolition will extend beyond the limits of the excavation to facilitate the installation of the 20-foot long sheet piles. The limits of the demolition must also consider the existing load bearing points of the structure. The demolition would extend to these load-bearing structural elements otherwise temporary walls and bracing would be required. Demolition of the building will require the potential abatement of ACM and/or lead based paint.

It is expected that the shoring method (sheet pile or wall) will reduce the amount of water that must be pumped to capture groundwater in the excavation. Enough data does not exist at this point to design water handling systems, but it is assumed for cost estimating in this report that the system will operate at approximately 100 gpm to control water in the excavation. The extent of the excavation will be based on existing analytical data supplemented with additional investigation described above. The approximate extent of the excavation is shown on Figure 8.4.1.1-f.

For this report analysis, it is assumed that soils to a depth of 3 feet will be clean overburden. Separating clean from impacted soils during the excavation of the saturated zone will be difficult without groundwater depression. For this report cost estimate, it is assumed that 10% of the excavated soil from the saturated soil zone will contain product resulting in total PAH concentrations above 1% and would be considered a Persistent Waste, increasing handling and disposal costs.

The excavation will be backfilled with clean stockpiled overburden and imported granular fill. The soil will be placed and compacted to allow for the reconstruction of the building. Due to the prolonged disruption and required closures that would be necessary, excavation would not include soil beneath West Marine View Drive or BNSF property.

After completion of the backfilling and any removal of the sheet piling, portions of the building would be rebuilt. As portions of the existing building in the area of the excavation have already failed, it is unlikely that the entire footprint of the building will be reconstructed. For cost estimating purposes it is assumed that minor portions of the building will be reconstructed in conjunction with “sealing in” the demolished edges of the building.

Excavation of contaminated soil is estimated to take up to a year, including building demolition, shoring installation, phased excavation, backfilling and testing, and partial building reconstruction following the removal activities.

Performance groundwater monitoring will be performed semiannually for 5 years wells and annually for 5 years at 10 wells to evaluate reductions in concentrations in groundwater.

Deeper on-property impacts, and shallow and deep off-property impacts will be addressed through a ISB system as described in Alternative 2, and as applicable.

Short-term institutional controls will be completed as described in Alternative 2.

8.4.2 WOODLIFE AREA REMEDIAL ACTION ALTERNATIVES

The following alternatives have been assembled to address the Woodlife Area including on property impacts to soil and the associated impacts to groundwater.

8.4.2.1 ALTERNATIVE 1: ENGINEERING CONTROLS, INSTITUTIONAL CONTROLS AND LONG-TERM MONITORING

Alternative 1 for the Woodlife Area consists of engineering controls (maintaining the existing surface caps), installing additional monitoring wells for long-term monitoring, and institutional controls (see Figure 8.4.2.1-A).

The purpose of the surface capping would be to limit groundwater infiltration as well as to create a barrier to the direct exposure pathway. The majority of the Woodlife Area is currently covered by existing building slabs and surface pavements with the exception of a small landscaped area adjacent to the NTD.

Four additional groundwater monitoring wells will be installed as part of the long-term monitoring. These monitoring wells will be installed around the perimeter of the impacts identified during RI activities focused on the Woodlife Area.

Performance monitoring for Alternative 1 includes semiannual monitoring at 6 shallow monitoring wells (existing monitoring wells MW-6 and MW-7, and four newly installed monitoring wells) for 5 years; and annual monitoring for 15 years after completion of surface capping to confirm the stability and natural attenuation of the remaining groundwater contamination. In addition, annual surface capping inspections will be performed, likely in conjunction with the scheduled groundwater monitoring events. Compromised integrity of the surface capping will be documented and repaired as needed.

Once cleanup levels are met (estimated after year 20 for costing purposes), the groundwater monitoring wells would be decommissioned.

Institutional controls will include recording an environmental covenant to restrict the future development activities in the Woodlife Area to prevent potential exposure to contaminated media.

8.4.2.2 ALTERNATIVE 2: SOIL REMOVAL

Alternative 2 for the Woodlife Area includes soil excavation, engineering controls (re-establishing the existing surface caps) and institutional controls (see Figure 8.4.2.1-B).

The purpose of the on-site soil excavation for the Woodlife Area would be to remove the impacted soil for off-site disposal.

After installing appropriate erosion control measures, approximately 22,000 square feet of the existing asphalt pavement and concrete surfaces (interior and exterior of existing building) would be removed. A portion of the existing main manufacturing building will need to be supported in anticipation of excavation activities that extend within the footprint of the building. Impacted soil to an estimated maximum depth of 5 feet bgs would be excavated and hauled to an appropriate

off-site disposal facility as special waste. Performance soil samples will be collected from the excavation extents and bottom to determine the ultimate extents of the excavation area and to document sufficient removal of contaminated soil to the cleanup level of 5.2 pg/g (based on background concentration). Based on the assumption that impacted soil extends to 5 feet bgs throughout the Woodlife Area, approximately 5,500 tons of soil would be excavated; however, results from the RI investigation activities indicate that areas of deeper soil impacts are limited (to be confirmed via performance soil sampling). The use of dewatering equipment (Banker tanks, pumps, etc.) would likely be needed as the excavation would extend into the shallow groundwater table. The water would be treated on-site with bag filters and activated carbon before being discharged to the city sanitary sewer (pending a permit). Clean backfill would be imported and placed into the excavation. Imported material would be analytically tested prior to placement.

The backfill would be compacted and the excavation area would be finished with an estimated three inches of asphalt surface capping to match the existing surface capping to ensure contiguous surface capping throughout the contaminated area (i.e. engineering control).

As the goal of the soil removal will be to remove soil impacts above the cleanup level, long-term monitoring is not proposed for this alternative; however, subsequent groundwater monitoring will be periodically performed at the existing downgradient monitoring wells MW-6 and MW-7 following soil removal activities. If the soil impacts can't be fully delineated due to site conditions or health & safety concerns (i.e. significant groundwater infiltration causing excavation/trenching concerns), and some contamination will remain in-place, JELD-WEN will work with Ecology to determine an appropriate remediation level (REL) to guide excavation limits (e.g. MTCA method B direct contact cleanup level).

Institutional controls would be implemented as detailed in Alternative 1 during the period of post removal monitoring.

8.4.3 AREA 3 (KNOLL FILL AREA) REMEDIAL ACTION ALTERNATIVES

Alternatives to address the Knoll Fill Area including impacts to groundwater and potential transport to near-shore sediments were considered; however, due to identified contaminated media and potential transport pathways, remedial action for the Knoll Fill Area contamination is included as part of Marine cleanup action alternatives (Section 8.5).
The current conceptual site model indicates that marine sediments and tidal influence may be a source of PCBs in groundwater. Implementation of Alternative M5 may result in decreased groundwater PCB concentrations. M5 has a higher degree of certainty that it will be effective over time and is deemed more permanent and protective than Alternative M4. Alternatives M3, M4, and M6 all include removal of the highest concentration PCB-impacted sediments adjacent to the Knoll area in SMA-3. Alternative M5 includes removal of the highest concentration PCB-impacted sediments adjacent to the Knoll area in SMA-3 as well as, expanded removal of PCB-impacted sediment in SMA-2.

8.5 DEVELOPMENT OF MARINE CLEANUP ACTION ALTERNATIVES

Under MTCA and SMS, sediment cleanup alternatives are evaluated on the basis of the requirements and the criteria specified in WAC 173-204-570. This section summarizes the seven

remedial alternatives that were developed and evaluated for the sediments portion of the Site. The following are included as components of each of the seven alternatives:

- Removal and disposal of piling and creosote-treated wood debris
- Demolition and disposal of two shoreline bulkheads and a remnant barge structure
- Shoreline erosion protection along the top of the bank adjacent to SMA 3 (as needed)

Work under each of the alternatives (i.e. excavation, demolition, piling removal) has the potential to destabilize the shoreline slopes adjacent to the SMAs. Alternatives that incorporate capping may require shoreline erosion protection to protect the upper shoreline edge of the cap, where it ties into the toe of the shoreline slope. Access during construction may also impact the shoreline areas. The extent of engineered caps and/or removal areas will be refined during remedial design. Requirements for shoreline protection or stabilization in demolition and piling removal areas, and in areas adjacent to engineered caps or excavations will also be refined during remedial design including considerations for climate change and seismic stability. For the purposes of the RI/FS, shoreline protection has been assumed for shoreline areas adjacent to SMA-3.

Key components for each individual alternative are described in the sections below. Components and unit pricing were developed based on prior experience and current vendor information. These data were used to develop conceptual-level designs for each alternative, and to estimate costs associated with each alternative. The seven sediment cleanup alternatives evaluated in this FS include:

- Alternative M1: Source Control and Natural Recovery
- Alternative M2: Engineered Cap On-Grade throughout SMA-3
- Alternative M3: Targeted Removal and Engineered Cap (2-foot depth) in SMA-3 Southern Shoreline and Engineered Cap On-Grade SMA-3 Inlet
- Alternative M4: Partial Removal and Engineered Cap (2-foot depth) throughout SMA-3
- Alternative M5: Expanded Partial Removal (2 to 4-foot depth SMA-3 southern shoreline and a portion of SMA-2; 2-foot depth in SMA-3 Inlet) and Engineered Cap
- Alternative M6: Removal Focus (full removal throughout SMA-3)
- Alternative M7: Full Removal (full removal throughout all SMAs)

Exhibit 8.5 provides a summary of the components of each of the marine area alternatives as they relate to the specific SMAs described in Section 7.

Exhibit 8.5
Summary of Marine Area Alternatives

ALTERNATIVE NUMBER	DESCRIPTION	ACTION FOR EACH AREA[a]				
		SMA 1	SMA 2a	SMA-2b (0.35 ac at Knoll)[c]	SMA-3a (South Shoreline)	SMA 3b (Inlet[b])
M1	Source Control and Natural Recovery	MNR	MNR		MNR	
M2	Engineered Cap On-Grade	MNR	EMNR (6- to 12-inch Cover)		Cap On-Grade	
M3	Targeted Removal and Engineered Cap	MNR	EMNR (6- to 12-inch Cover)		2-foot removal and cap	Cap On-Grade
M4	Partial Removal and Engineered Cap	MNR	EMNR (6- to 12-inch Cover)		2-foot removal and cap	
M5	Expanded Partial Removal and Engineered Cap	MNR	EMNR (6- to 12-inch Cover)	2-foot removal and backfill	4-foot removal and backfill	2-foot removal and cap
M6	Removal Focus	MNR	EMNR (6- to 12-inch Cover)		Removal to Clean and Backfill	
M7	Full Removal	Removal to Clean and Backfill				

Notes:
EMNR = enhanced monitored natural recovery
MNR = monitored natural recovery
SMA = sediment management area
[a] Post-dredging actions are assigned on a sub-SMA basis.
[b] Inlet grades may change as a result of remedial action as required for geotechnical stability.
[c] Specific area to be determined during design.

8.5.1 MARINE ALTERNATIVE M1: SOURCE CONTROL AND NATURAL RECOVERY

As discussed in Section 8.2.3, the sediment dioxin/furan concentrations that exceed cleanup levels are due to historical legacy releases and the potential upland cleanup areas are not considered a potential source for future recontamination of the Site tidal mudflats. The potential upland cleanup technologies are described in Section 8.1.

Marine Alternative 1 (Alternative M1) consists of shoreline protection and piling and structure removal described in Section 8.5, along with MNR of approximately 16.6 acres of surface sediments in SMAs 1, 2, and 3. The MNR alternative would include long-term sediment sampling to measure concentrations of total PCBs and dioxin/furan TEQ within the biologically active zone (surface to 1 foot below mudline). Typical sampling schedules at other MNR sites in Puget Sound include sampling and analysis at years 2, 5, 10, 15, 20, and 30 following construction of the shoreline stabilization action. The details of MNR sampling, including sample station locations, analytes, and sampling schedule would be determined by Ecology during development of the draft CAP. Shoreline protection would consist of appropriately sized riprap armor and filter layers on the upper, steepened, portions of the shoreline adjacent to SMA 3.

The construction duration of Alternative M1 is estimated to be 2 to 3 months. Figure 8.5-1 depicts a plan view of Alternative M1.

8.5.2 MARINE ALTERNATIVE M2: ENGINEERED CAP ON-GRADE

In addition to the shoreline protection and piling and structure removal described in Section 8.5; Marine Alternative M2 consists of the following major elements:

- Monitor the natural recovery of approximately 8.2 acres of surface sediments in SMA 1
- Place an EMNR layer as follows:
    - Procure approximately 13,325 tons of clean silty sand from a commercial upland or beneficial reuse source (dredged silty sand materials from the Snohomish River, for example).
    - Place a nominal 6-inch-thick layer of clean silty sand over 5.5 acres in SMA 2 using land-based low ground pressure equipment and placement methods as appropriate.
    - Monitor the effectiveness of EMNR actions upon completion of construction.
- Construct an engineered cap-on-grade over sediments as follows:
    - Procure an estimated 17,680 tons of material from a commercial upland source.
    - Construct a 2-foot-thick cap over 2.9 acres in SMA 3 using land-based low ground pressure equipment and placement methods as appropriate.
    - Monitor the physical integrity of the engineered cap upon completion of construction.

Placement of EMNR material and engineered caps using land-based equipment and working in the dry will allow for more accurate placement and verification than through water column subtidal placement methods. As with the MNR described in Alternative M1, long-term monitoring under

this alternative would include periodic post-construction sampling and testing of sediments within the biologically active zone to verify that cleanup standards are met and continue to be met. The scope and details of the long-term monitoring would be determined during development of the draft CAP and may be refined as part of remedial design.

The estimated construction duration of Alternative M2 is a single in-water work season (approximately 4 to 5 months).

Figure 8.5-2 depicts a plan view of Alternative M2.

8.5.3 MARINE ALTERNATIVE M3: TARGETED REMOVAL AND ENGININEERED CAP

In addition to the shoreline protection, piling and structure removal described in Section 8.5, Marine Alternative M3 would consist of the following major elements:

- Monitor the natural recovery of 8.2 acres of surface sediments in SMA 1.
- Place an EMNR layer as follows:
    - Procure approximately 13,325 tons of clean silty sand from a commercial upland or beneficial reuse source (dredged silty sand materials from the Snohomish River, for example).
    - Place a nominal 6-inch-thick layer of clean silty sand over 5.5 acres in SMA 2.
    - Monitor the effectiveness of EMNR actions upon completion of construction.
- Excavate sediments (top 2 feet) in the south shoreline area as follows:
    - Remove up to approximately 10,682 cubic yards of sediments from the top 2 feet of 2.45 acres in SMA 3 using land-based low ground pressure equipment and placement methods as appropriate.
    - Removal volumes include an assumed overdepth allowance of 0.25 feet and are scaled up by 20% to account for engineering factors (side slopes, level cuts, etc.) that would need to be considered during remedial design.
- Manage excavated material as follows:
    - Temporarily stockpile excavated material in an upland stockpile area constructed to contain all water generated from sediment dewatering and precipitation.
    - Treat water generated from temporary stockpiles for discharge as required by permits.
    - Dispose of the dewatered excavated material in an offsite Subtitle D landfill.
    - Excavations would be 2-foot thickness, matching the engineered cap thickness. No backfill would be required to match the post-excavation grades once excavated areas are capped.
- Construct an engineered cap over sediments as follows:
    - Procure an estimated 17,680 tons of material from a commercial upland source.

    - Construct a 2-foot-thick cap over 2.9 acres in SMA 3 (2-foot removal and cap southern shoreline; cap on-grade inlet area) using land-based low ground pressure equipment and placement methods as appropriate.
    - Monitor the physical integrity of the engineered cap upon completion of construction.

Removal in this alternative would entail accessing excavation areas from the shoreline at low tide using land-based equipment. Removal in SMA-3 adjacent to the Knoll area will address sediments that are potentially a source of PCBs in upland groundwater. Excavation residuals would be managed by capping or backfilling excavated areas. Placement of EMNR material and engineered caps using land-based equipment and working in the dry will allow for more accurate placement and verification than through water column subtidal placement methods.

Engineered cap-on-grade monitoring and maintenance would be conducted in accordance with an approved, long-term OMM plan, which would be developed as part of remedial design. Long-term monitoring would be subject to the same sampling scope and approval considerations as described for Alternative M2. The estimated construction duration for this alternative would span one in-water construction season (approximately 5 to 6 months).

Figure 8.5-3 depicts a plan view of Alternative M3.

8.5.4 MARINE ALTERNATIVE M4: PARTIAL REMOVAL AND ENGINEERED CAP

In addition to the shoreline protection and piling and structure removal described in Section 8.5, Marine Alternative M4 would consist of the following major elements:

- Monitor the natural recovery of 8.2 acres of surface sediments in SMA 1.
- Place an EMNR layer as follows:
    - Procure approximately 13,325 tons of clean silty sand from a commercial upland or beneficial reuse source (dredged silty sand materials from the Snohomish River, for example).
    - Place a nominal 6-inch-thick layer of clean silty sand over 5.5 acres in SMA 2.
    - Monitor the effectiveness of EMNR actions upon completion of construction.
- Excavate sediments (top 2 feet) in SMA 3 as follows:
    - Remove up to approximately 12,729 cubic yards of sediments from the top 2 feet of 2.9 acres in SMA 3 using land-based low ground pressure equipment and placement methods as appropriate.
    - Excavation in the north inlet area will also require shoring to protect the adjacent upland area where an access road and underground utilities are located at the top of the slope.
    - Removal volumes include an assumed overdepth allowance of 0.25 feet and are scaled up by 20% to account for engineering factors (side slopes, level cuts, etc.) that would need to be considered during remedial design.

    - Remove temporary shoring used to protect the slope adjacent to the upland side of the excavation.

- Manage excavated material as follows:
    - Temporarily stockpile excavated material in an upland stockpile area constructed to contain all water generated from sediment dewatering and precipitation.
    - Treat water generated from temporary stockpiles for discharge as required by permits.
    - Dispose of the dewatered excavated material in an offsite Subtitle D landfill.
    - Excavations would be 2-foot thickness, matching the engineered cap thickness. No backfill would be required to match the post-excavation grades once excavated areas are capped.
- Construct an engineered cap over SMA 3, following excavation, as follows:
    - Procure an estimated 17,680 tons of material from a commercial upland source.
    - Construct a 2-foot-thick cap over 2.9 acres in SMA 3 using land-based low ground pressure equipment and placement methods as appropriate.
    - Monitor the physical integrity of the engineered cap upon completion of construction.

Removal in this alternative would entail accessing excavation areas from the shoreline at low tide using land-based equipment. Removal in SMA-3 adjacent to the Knoll area will address sediments that are potentially a source of PCBs in upland groundwater. Excavation residuals would be managed by capping or backfilling excavated areas. Placement of EMNR material and engineered caps using land-based equipment and working in the dry will allow for more accurate placement and verification than through water column subtidal placement methods.

Engineered cap-on-grade monitoring and maintenance would be conducted in accordance with an approved, long-term OMM plan, which would be developed as part of remedial design. Long-term monitoring would be subject to the same sampling scope and approval considerations as described for Alternative M2. The estimated construction duration for this alternative would span one in-water construction season (approximately 6 to 7 months). Figure 8.5-4 depicts a plan view of Alternative M4.

8.5.5 MARINE ALTERNATIVE M5: EXPANDED PARTIAL REMOVAL AND ENGINEERED CAP

In addition to the shoreline protection and piling and structure removal described in Section 8.5, Marine Alternative M5 would consist of the following major elements:

- Monitor the natural recovery of 8.2 acres of surface sediments in SMA 1.
- Place an EMNR layer as follows:
    - Procure approximately 12,478 tons of clean silty sand from a commercial upland or beneficial reuse source (dredged silty sand materials from the Snohomish River, for example).

    - Place a nominal 6-inch-thick layer of clean silty sand over 5.16 acres in SMA 2.
    - Monitor the effectiveness of EMNR actions upon completion of construction.
- Excavate sediments in 3.27 acres (2.92 acres in SMA 3 and 0.35 acres in SMA-2) as follows:
    - Remove up to approximately 21,623 cubic yards of sediments from the top 2 to 4 feet of SMA 3 and a portion of SMA-2 using land-based low ground pressure equipment and placement methods as appropriate.
    - Excavation in the north inlet area will also require shoring to protect the adjacent upland area where an access road and underground utilities are located at the top of the slope.
    - Removal volumes include an assumed overdepth allowance of 0.25 feet and are scaled up by 20% to account for engineering factors (side slopes, level cuts, etc.) that would need to be considered during remedial design.
    - Place an estimated 29,592 tons of backfill in 2.8 acres of SMA-3 and SMA-2 where excavation depths are sufficient to remove sediment with concentrations above 8 ng/kg dw Dioxin/Furan TEQ and 117 µg/kg dw Total PCBs
    - Remove temporary shoring used to protect the slope adjacent to the upland side of the excavation.
- Manage excavated material as follows:
    - Temporarily stockpile excavated material in an upland stockpile area constructed to contain all water generated from sediment dewatering and precipitation.
    - Treat water generated from temporary stockpiles for discharge as required by permits.
    - Dispose of the dewatered excavated material in an offsite Subtitle D landfill.
- Construct an engineered cap over a portion of SMA 3 (the north inlet area 0.47 acres), following a 2-foot excavation, as follows:
    - Procure an estimated 2,843 tons of material from a commercial upland source.
    - Construct a 2-foot-thick cap over using land-based low ground pressure equipment and placement methods as appropriate.
    - Monitor the physical integrity of the engineered cap upon completion of construction.
    - Areas where 2-foot excavation depths are sufficient to remove sediment with concentrations above 8 ng/kg dw Dioxin/Furan TEQ and 117 µg/kg dw Total PCBs will be backfilled and not require an engineered cap.

Removal in this alternative would entail accessing excavation areas from the shoreline at low tide using land-based equipment. Removal in SMA-3 and portions of SMA-2 adjacent to the Knoll area will address sediments that are potentially a source of PCBs in upland groundwater. Excavation residuals would be managed by capping or backfilling excavated areas. Placement of EMNR material and engineered caps using land-based equipment and working in the dry will allow for

more accurate placement and verification than through water column subtidal placement methods.

The SMA-3 inlet area engineered cap monitoring and maintenance would be conducted in accordance with an approved, long-term OMM plan, which would be developed as part of remedial design. Long-term monitoring would be subject to the same sampling scope and approval considerations as described for Alternative M2. The estimated construction duration for this alternative would span multiple in-water construction seasons (approximately 7 to 8 months).

Figure 8.5-5 depicts a plan view of Alternative M5.

8.5.6 MARINE ALTERNATIVE M6: REMOVAL FOCUS

In addition to the shoreline protection and piling and structure removal described in Section 8.5, Marine Alternative M7 would consist of the following major elements:

- Monitor the natural recovery of 8.2 acres of surface sediments in SMA 1.
- Place an EMNR layer as follows:
    - Procure approximately 13,325 tons of clean silty sand from a commercial upland or beneficial reuse source (dredged silty sand materials from the Snohomish River, for example).
    - Place a nominal 6-inch-thick layer of clean silty sand over 5.5 acres in SMA 2.
    - Monitor the effectiveness of EMNR actions upon completion of construction.
- Excavate sediments (estimated depths 2, 4, 9 feet) in all of SMA 3 as follows:
    - Remove up to approximately 24,371 cubic yards of sediments from the top 2, 4, or 9 feet of 2.9 acres in SMA 3 using land-based low ground pressure equipment and placement methods as appropriate.
    - Excavation in the inlet area will also require shoring to protect the adjacent upland area where an access road and underground utilities are located at the top of the slope.
    - Removal volumes include an assumed overdepth allowance of 0.25 feet and are scaled up by 20% to account for engineering factors (side slopes, level cuts, etc.) that would need to be considered during remedial design.
    - Remove temporary shoring used to protect the slope adjacent to the upland side of the excavation.
- Manage excavated material as follows:
    - Temporarily stockpile excavated material in an upland stockpile area constructed to contain all water generated from sediment dewatering and precipitation.
    - Treat water generated from temporary stockpiles for discharge as required by permits.
    - Dispose of the dewatered excavated material in an offsite Subtitle D landfill.

    - Excavations would target all sediment exceeding RELs in SMA 3. No capping would be necessary in SMA 3; excavations would be backfilled to match the post-excavation grades.
- Backfill sediments in the SMA 3 excavation footprint:
    - Procure an estimated 24,371 cubic yards of material from a beneficial use and/or commercial source.
    - Place backfill over the removal footprint using land-based low ground pressure equipment and placement methods as appropriate to bring grades in the excavation footprint to match the original grades.
    - Remove temporary shoring used to protect the slope adjacent to the upland side of the excavation.

Removal in this alternative would entail accessing excavation areas from the shoreline at low tide using land-based equipment. Removal in SMA-3 adjacent to the Knoll area will address sediments that are potentially a source of PCBs in upland groundwater. Excavation residuals would be managed by capping or backfilling excavated areas. Placement of EMNR material and engineered caps using land-based equipment and working in the dry will allow for more accurate placement and verification than through water column subtidal placement methods.

Long-term monitoring would be subject to the same sampling scope and approval considerations as described for Alternative M2. The estimated construction duration for this alternative could span multiple in-water construction seasons (approximately 7 to 8 months).

Figure 8.5-6 depicts a plan view of Alternative M6.

8.5.7 MARINE ALTERNATIVE M7: FULL REMOVAL

In addition to the shoreline protection and piling and structure removal described in Section 8.5, Marine Alternative M5 would consist of the following major elements:

- Excavate sediments (estimated depths 2, 4, 9 feet below mudline) in SMA 1, SMA 2, and SMA 3 as follows:
    - Remove up to approximately 103,000 cubic yards of sediments from the top 2, 4, or 9 feet of 16.6 acres including SMA 1, SMA 2, and SMA 3 using land-based low ground pressure equipment and placement methods as appropriate.
    - Excavation in the inlet area will also require shoring to protect the adjacent upland area where an access road and underground utilities are located at the top of the slope.
    - Removal volumes include an assumed overdepth allowance of 0.25 feet and are scaled up by 20% to account for engineering factors (side slopes, level cuts, etc.) that would need to be considered during remedial design.
    - Remove temporary shoring used to protect the slope adjacent to the upland side of the excavation.
- Manage excavated material as follows:

    - Temporarily stockpile excavated material in an upland stockpile area constructed to contain all water generated from sediment dewatering and precipitation.
    - Treat water generated from temporary stockpiles for discharge as required by permits.
    - Dispose of the dewatered excavated material in an offsite Subtitle D landfill.
    - Excavations would target all sediment throughout the Site (SMA 1, SMA 2, and SMA 3). No capping, MNR, or EMNR would be necessary following remediation; excavations would be backfilled to match the post-excavation grades.
- Backfill sediments in the SMA 3 excavation footprint:
    - Procure an estimated 103,000 cubic yards of material from a beneficial use and/or commercial source.
    - Place backfill over the removal footprint using land-based low ground pressure equipment and placement methods as appropriate to bring grades in the excavation footprint to match the original grades.
    - Remove temporary shoring used to protect the slope adjacent to the upland side of the excavation.

Removal in this alternative would entail accessing excavation areas from the shoreline at low tide using land-based equipment. Removal in SMAs adjacent to the Knoll area will address sediments that are potentially a source of PCBs in upland groundwater. Excavation residuals would be managed by backfilling excavated areas. Long-term monitoring would be subject to the same sampling scope and approval considerations as described for Alternative M2. The estimated construction duration for this alternative could span multiple in-water construction seasons (approximately 19 months).

Figure 8.5-7 depicts a plan view of Alternative M7.

9. EVALUATION BASIS FOR CLEANUP ACTION ALTERNATIVES

This section presents a description of the threshold requirements for cleanup actions under MTCA and the additional criteria used to evaluate the cleanup action alternatives.

9.1 MTCA THRESHOLD REQUIREMENTS

Cleanup actions are subject to the threshold requirements set forth in WAC 173-340-360(2)(a). Under the threshold requirements, the cleanup action shall:

- Protect human health and the environment
- Comply with cleanup standards
- Comply with applicable state and federal laws
- Provide for compliance monitoring

9.1.1 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

Cleanup actions performed under MTCA must ensure that both human health and the environment are protected as a result of the action.

9.1.2 COMPLIANCE WITH CLEANUP STANDARDS

Compliance with cleanup standards requires, in part, that cleanup levels are met at the applicable points of compliance. Where a cleanup action involves containment of soils and sediments with hazardous substance concentrations exceeding cleanup levels at the point of compliance, the cleanup action may be determined to comply with cleanup standards, provided the requirements specified in WAC 173-340-740(6)(f) are met, specifically:

- The remedy is permanent to the maximum extent practicable
- The remedy is protective of human health
- The remedy is protective of terrestrial ecological receptors
- Institutional controls are implemented
- Compliance monitoring is provided (also a threshold requirement) with periodic reviews
- The type and amount of hazardous substance remaining on-site, and measures to prevent migration of, and contact with, these substances are specified.

9.1.3 COMPLIANCE WITH ARARS

Cleanup actions under MTCA must comply with applicable state and federal laws. The term “applicable state and federal laws” includes legally applicable requirements, and those requirements that Ecology determines to be relevant and appropriate as described in WAC 173-340-710.

9.1.4 PROVISION FOR COMPLIANCE MONITORING

The cleanup action must allow for compliance monitoring in accordance with WAC 173-340-410. Compliance monitoring consists of protection monitoring, performance monitoring, and confirmation monitoring. Protection monitoring is conducted to confirm that human health and the environment are adequately protected during construction and the operation and maintenance period of a cleanup action. Performance monitoring is conducted to confirm that the cleanup action has attained cleanup standards and, if appropriate, remediation levels or other performance standards. Confirmation monitoring is conducted to confirm the long-term effectiveness of the cleanup action once cleanup standards and, if appropriate, remediation levels or other performance standards have been attained.

9.2 ADDITIONAL MTCA REQUIREMENTS

For cleanup actions that meet the threshold requirements, the selected action shall:

- Use permanent solutions to the maximum extent practicable;
- Provide for a reasonable restoration time frame; and
- Consider public concerns.

9.2.1 USE PERMANENT SOLUTIONS TO THE MAXIMUM EXTENT PRACTICABLE

MTCA requires that when selecting from cleanup action alternatives that fulfill the threshold requirements, the selected action shall use permanent solutions to the maximum extent practicable (WAC 173-340-360[2][b][i]). MTCA specifies that the permanence of these qualifying alternatives shall be evaluated by balancing the costs and benefits of each of the alternatives using a DCA in accordance with WAC 173-340-360(3)(e).

9.2.2 PROVIDE FOR A REASONABLE RESTORATION TIME FRAME

In accordance with WAC 173-340-360(2)(b)(ii), MTCA places a preference on those cleanup action alternatives that, while equivalent in other respects, can be implemented in a shorter period of time. MTCA includes a summary of factors to be considered in evaluating whether a cleanup action provides for a reasonable restoration timeframe (WAC 173-340-360[4][b]).

9.2.3 CONSIDER PUBLIC CONCERNS

Ecology will consider public comments submitted during the RI/FS process in making its preliminary selection of an appropriate cleanup action alternative. This preliminary selection is subject to further public review and comment when the proposed remedy is published by Ecology in a draft CAP. While public concerns are addressed by Ecology through the review process, they are also expressly considered as an element of the DCA evaluation for each alternative.

9.2.4 ADDITIONAL SMS EVALUATION CRITERIA

Remedy selection criteria under SMS regulations are generally the same as those required under MTCA. The SMS evaluation criteria are specified in WAC 173-204-560(4)(f) through (k). While

most of the requirements have a direct correlation to MTCA criteria, three additional SMS criteria are not specifically addressed by MTCA:

- Use of recycling, reuse, and waste minimization
- Consideration of environmental impacts
- Alternatives that achieve cleanup standards within 10 years of completion of construction of the active components of the cleanup are presumed to have a reasonable restoration timeframe

These criteria are discussed in more detail in Section 9.3.

9.3 MTCA DISPROPORTIONATE COST ANALYSIS AND OTHER CRITERIA

The MTCA/SMS DCA described in WAC 173-340-360(3)(e) is used to evaluate which of the alternatives that meet the threshold requirements are protective to the maximum extent practicable. This analysis involves comparing the costs and benefits of alternatives and selecting the alternative whose incremental costs are not disproportionate to the incremental benefits. The evaluation criteria for the DCA are specified in WAC 173-340-360(3)(f), and include protectiveness, permanence, effectiveness over the long term, management of short-term risks, implementability, consideration of public concerns, and costs.

In order to favor the benefits of criteria associated with the primary goals of the remedial action, a weighting system was used in this FS for the DCA. That is, the criteria associated with environmentally based benefits are more highly weighted than other criteria that are associated with non-environmental factors. Each of the MTCA/SMS criteria used in the DCA and the weighting factors ascribed to the criteria are described below.

9.3.1 PROTECTIVENESS

The cleanup action alternatives are evaluated for overall protectiveness of human health and the environment, including the degree to which existing risks are reduced, time required to reduce risk at the facility and attain cleanup standards, on-site and off-site risks resulting from implementing the alternative, and improvement of the overall environmental quality. For this FS, a weighting factor of 30% was applied toward the overall benefit analysis. The high weight placed on protectiveness relative to the other factors is warranted due to the overall importance of protection of human health and the environment as a primary goal of cleanup at the Site.

9.3.2 PERMANENCE

The permanence of a cleanup action is defined as the degree to which the alternative permanently reduces the toxicity, mobility or volume of hazardous substances, including the adequacy of the alternative in destroying the hazardous substances, the reduction or elimination of hazardous substance releases and sources of releases, the degree of irreversibility of waste treatment process, and the characteristics and quantity of treatment residuals generated. A weighing factor of 20% was assigned to the numeric values associated with this evaluation criterion.

9.3.3 EFFECTIVENESS OVER THE LONG TERM

Long-term effectiveness includes the degree of certainty that the alternative will be successful, the reliability of the alternative during the period of time hazardous substances are expected to remain on-site at concentrations that exceed cleanup levels, the magnitude of residual risk with the alternative in place, and the effectiveness of controls required to manage treatment residues or remaining wastes. The MTCA and SMS regulations provide guidelines for ranking cleanup action components when assessing the relative degree of long-term effectiveness. These elements are, in descending order: reuse or recycling; destruction or detoxification; immobilization or solidification; on-site or off-site disposal in an engineered, lined and monitored facility; on-site isolation or containment with attendant engineering controls; and institutional controls and monitoring. The MTCA preference ranking must be considered along with other site-specific factors in the evaluation of long-term effectiveness. The site-specific factors included in the long-term effectiveness evaluation include climate change and seismic vulnerabilities. A weighting factor of 20% was assigned to the long-term effectiveness criterion.

9.3.4 MANAGEMENT OF SHORT-TERM RISKS

This criterion considers potential risk to human health and the environment associated with the alternative during construction and implementation, and the effectiveness of measures that will be taken to manage such risks. Examples of risks include potential exposure to hazardous substances by site workers during implementation, mobilization of contaminants during construction, or general safety risks and construction hazards. A weighting factor of 10% was assigned to this criterion. This lower rating is based on the limited timeframe associated with the risks and the general ability to correct short-term risks during construction without significant effect on human health and the environment.

9.3.5 TECHNICAL AND ADMINISTRATIVE IMPLEMENTABILITY

This criterion considers the ability of a selected remedy to be implemented, including consideration of whether the alternative is technically possible, the availability of necessary off-site facilities, services and materials, administrative and regulatory requirements, scheduling, size, complexity, monitoring requirements, access for construction operations and monitoring, and integration with existing facility operations and other current or potential remedial actions. The weighting factor for implementability is 10%. Implementability is less associated with the primary goal of the cleanup action—protection of human health and the environment—and therefore has a lower weighting factor. In addition, the issues associated with the implementability are reflected in the remedy costs.

9.3.6 CONSIDERATION OF PUBLIC CONCERNS

The public involvement process under MTCA and SMS is used to identify potential public concerns regarding cleanup action alternatives. The extent to which an alternative addresses those concerns is considered as part of the evaluation process. This includes concerns raised by individuals, community groups, local governments, tribes, federal and state agencies, and other organizations with an interest in the Site. The weighting factor used for this criterion was 10%. Similar to the applied factor for implementability, the low weighting of public concerns prevents duplication of issues that are addressed with other criteria. Historically, public concerns for most

sites are typically related to environmental concerns and performance of the cleanup action, which are addressed under other MTCA/SMS criteria such as protectiveness and permanence.

9.3.7 COST

The costs to implement the cleanup action alternatives are evaluated, including the direct and indirect cost of construction, the long-term monitoring costs, and agency oversight costs that are cost recoverable. Long-term costs include cap maintenance costs, monitoring costs, and the cost of maintaining institutional controls. The design life of the cleanup action has been estimated and the cost of replacement or repair of major elements has been included in the cost estimate. Costs were compared against benefits to assess cost-effectiveness and practicability of the cleanup action alternatives. No weighting factor was applied to this quantitative category.

9.3.8 ADDITIONAL SMS CRITERIA

The following additional criteria are considered under SMS. While not specifically incorporated as a score under the DCA, these criteria can be used to help differentiate alternatives that otherwise score similarly under the DCA, and thus are given a relative ranking compared to the other alternatives, as opposed to an absolute score.

9.3.8.1 USE OF RECYCLING, REUSE, AND WASTE MINIMIZATION

The use of recycling, reuse, and waste minimization for a given alternative considers whether materials can effectively be beneficially reused. Opportunities include beneficial reuse of tidal mudflat sediments that may be excavated or dredged during cleanup actions as backfill for upland excavations, and beneficial reuse of suitable dredged sediments for residuals cover, backfill or cap materials generated by another project that would otherwise be disposed of in a DMMP open-water disposal site. Beneficial reuse of suitable sediments for cover and cap material can result in significant cost efficiency and is desirable from a resource standpoint. Depending on the final cleanup actions selected, Ecology and JELD-WEN would continue to explore opportunities and sources of beneficial reuse materials in greater detail during remedial design.

9.3.8.2 CONSIDERATION OF ENVIRONMENTAL IMPACTS

This criterion considers potential risk to human health and the environment associated with the alternative during construction and implementation, and the effectiveness of measures that will be taken to manage such risks. Examples of risks include potential exposure to hazardous substances by Site workers during implementation, mobilization of contaminants during construction, or general safety risks and construction hazards. As described in the SMS regulations, this evaluation criterion considers the following for sediment remedies:

- Significant short-term environmental impacts
- Significant long-term environmental impacts
- Significant irrevocable commitments of natural resources
- Significant environmental impacts that cannot be mitigated

Short term-impacts to habitat functions and water quality, including turbidity associated with dredging and capping, are considered under this criterion. In addition, emissions related to the construction activity, both on the water and off-site (through transloading and shipment of materials) are also considered. Irrevocable commitments of natural resources are also considered, such as the use of aggregates from commercial or other sources for cap material and the use of fossil fuel for construction equipment.

Typically, longer-duration construction projects will have the highest potential environmental impacts due to air quality issues associated with greenhouse gas emissions from construction equipment. Furthermore, sediment remedies that include dredging will have relatively higher environmental impacts due to dredging releases and turbidity.

10. EVALUATION OF CLEANUP ACTION ALTERNATIVES

This section provides detailed evaluation of the upland and marine area cleanup action alternatives. Each alternative is discussed independently relative to the MTCA criteria used in the DCA, and a raw score is provided for the alternative, on a scale of 1 to 10. In this scheme, a raw score of 10 is the highest (i.e. the most favorable) potential ranking, and a raw score of 1 represents the least favorable potential raking. Raw scores are carried forward into the DCA, where they are weighted according to the factors discussed in Section 9.

10.1 UPLAND AREAS

Consistent with MTCA regulations and Ecology guidance, the upland remedial alternatives were evaluated for the seven criteria listed in WAC 173-340-360(3)(f). These criteria include protectiveness, permanence, effectiveness over the long term, management of short-term risks, technical and administrative implementability, consideration of public concerns, and cost. The minimum requirements for cleanup actions (WAC 173-340-360(2)) were also considered in the evaluation.

The results of the evaluation are summarized below by area and presented as a numeric scoring system in Table 10.1-1 (Creosote/Fuel Oil Area) and Table 10.1-2 (Woodlife Area). Figure 10.1-1 (Creosote/Fuel Oil Area) and Figure 10.1-2 graphically depict the costs and benefits based on the discussion and scoring described in this section. For reference, a summary of the treatment technologies by area (on-property vs off-property, shallow vs deep, etc.) for each alternative are presented in Table 8.4.1-1.

10.1.1 CREOSOTE/FUEL OIL AREA

The seven cleanup action alternatives for the Creosote/Fuel Oil Area described in Section 8.4.1 were evaluated in detail using the MTCA threshold and additional criteria, and the DCA criteria provided in WAC 173-340-360 as described above. The evaluation is provided in Table 10.1-1 and described in detail below. The criterion scoring for the upland alternatives and weighting factors are those provided by Ecology via email on June 19, 2020 (included in Appendix O).

Alternative 1 does not meet minimum MTCA requirement for cleanup as this alternative leaves contamination in place with long-term engineering and institutional controls, does not use permanent solutions to the maximum extent practicable and does not provide for a reasonable restoration timeframe (WAC 173-340-360(2)). Therefore, Alternative 1 is not scored for any benefits criteria and is not presented in the DCA process.

PROTECTIVENESS

Protection of human health and the environment is a threshold requirement. As such, protectiveness criterion is one of the main criteria in the DCA that weighs the most. MTCA (WAC 173-340-360(3)(f)(i)) provides factors to be considered for overall protectiveness of human health and the environment. These are: the degree to which existing risks are reduced, time required to

reduce risk at the facility and attain cleanup standards, on-site and off-site risks resulting from implementing the alternative, and improvement of the overall environmental quality.

Alternative 4 and 7 score highest due to the greater degree of certainty associated with removal and the quicker risk reduction. Alternative 4 scores higher than 7 because of more contaminant mass removal resulting in shorter restoration timeframe. Alternative 6 reduces the mobility of contaminants but leaves them in place and removes contamination through thermal treatment from off property areas. Alternatives 2, 3, and 5 treat the majority of contamination at the Site with different degree of certainty and restoration timeframe with thermal treatment (Alternative 5) scoring relatively higher due to being more effective and with a shorter restoration timeframe. Alternative 2 has a lesser degree of certainty and requires more active treatment time than alternative 5 and therefore scores lower among these. Alternative 3 addresses on property contamination but does not effectively address off property contamination and therefore scores the lowest.

PERMANENCE

Permanence is another principal criteria that defines which alternatives permanently removes contaminants from the site. This criteria is used to select the baseline cleanup alternative (WAC 173-340-360(3)(e)(ii)(B)). MTCA requires using the following factors to evaluate the permanence criteria: the degree to which the alternative permanently reduces the toxicity, mobility or volume of hazardous substances, including the adequacy of the alternative in destroying the hazardous substances, the reduction or elimination of hazardous substance releases and sources of releases, the degree of irreversibility of waste treatment process, and the characteristics and quantity of treatment residuals generated.

Alternatives 4, 5 and 7 permanently remove or treat the majority of contamination on the Site. Alternative 4 and 7 involve soil removal that removes most on-site contamination from source areas permanently and score the highest. Due to the nature the technology, these alternatives are irreversible and does not produce any treatment residuals. Alternative 4 scores slightly higher than 7 because of more soil mass removal resulting in a more permanent solution. Alternative 5 provides more complete treatment of the volatile and semivolatile contaminants and therefore scores the next highest. Alternatives 2 and 6 also provide treatment or immobilize contamination but Alternative 2 has less degree of certainty regarding effectiveness on higher ring PAHs. Biological treatment sometimes produces residuals. Alternative 6 scores higher due to the thermal treatment of the off property areas. Alternative 3 scores lowest as it leaves contamination in the off property soils and chemical treatment could produce other residuals.

EFFECTIVENESS OVER THE LONG-TERM

The following factors are considered to score effectiveness over the long term as provided in MTCA: the degree of certainty that the alternative will be successful, the reliability of the alternative during the period of time hazardous substances are expected to remain on-site at concentrations that exceed cleanup levels, the magnitude of residual risk with the alternative in place, and the effectiveness of controls required to manage treatment residues or remaining wastes. (WAC 173-340-360(3)(f)(iv)). Proven treatment technologies, site-tested treatment technologies, and technologies with a shorter restoration timeframe generally receive a higher ranking. Complex treatment technologies and technologies requiring longer durations generally

are ranked lower. Scores reflect MTCA's preferences for (in order) recycling/reuse, destruction/detoxification, immobilization/solidification, off-site disposal, isolation/containment, and institutional and engineering controls.

Alternative 4, 5, and 7 have similar higher scores for long term effectiveness than other alternatives. Alternative 5 could score very high due to more complete destruction of hazardous substances on Site but some degree of uncertainty exists whether this Alternative will be successful. Alternative 4 and 7 rely on off-site disposal which is a mature and proven technology used at most sites with Alternative 4 scoring slightly higher than 7 because of less magnitude of residual risk remaining on-site. Alternative 6 also scores very high due to immobilization and destruction technology but suffers from complexity. Alternative 2 destroys contamination over a longer period that requires longer monitored natural attenuation and suffers from the lack of certainty. Alternative 3 destroys contaminants quicker than Alternative 2 but it is not practical for off-property contamination and therefore receives the lowest score.

MANAGEMENT OF SHORT-TERM RISKS

This criterion takes into account the risk to human health and the environment when a particular alternative is implemented and how effectively those risks can be managed during construction. Scoring for management of short-term risks uses a relative scale to evaluate construction risks to human health and safety; larger and more complex projects are considered to carry greater risk than smaller and simple projects. Technology-specific risks have been considered (e.g. thermal treatment has temperature related risks, excavation has cave-in, heave, and shoring risks, ISCO has chemical handling risks, etc.).

Alternative 2 includes modest installation risks for the ISB system (pumps and piping) and operates for a longer period of time (cumulative health and safety consideration). This Alternative still receives a higher score compared to alternatives with more construction risk. Alternative 3 (ISCO treatment) poses an elevated risk of worker injury handling and injecting high-ionic strength solution, as well as potential risk to near-surface utilities. Alternatives 4, 5, 6, and 7 can pose some short-term risks that include high risks of worker injury that may include excavation failures, potential burns or damage associated with high pressure steam, injuries associated with building demolition, and/or damage to near surface utilities.

TECHNICAL AND ADMINISTRATIVE IMPLEMENTABILITY

Scoring evaluates the overall difficulty of implementation for each of the proposed alternatives. MTCA requires to consider the following factors for technical and administrative implementability: 1) whether the alternative is technically possible, 2) availability of necessary off-site facilities, services and materials, 3) administrative and regulatory requirements, 4) scheduling, 5) size, 6) complexity, 7) monitoring requirements, 8) access for construction operations and monitoring, and 9) integration with existing facility operations and other current or potential remedial actions.

Alternatives 2, 3, & 5 use technologies that have been demonstrated to be effective for conditions observed at the Site and comprise projects of moderate size and complexity. Alternative 2 requires more active services while Alternative 3 requires chemical amendments that have become more difficult to procure and handle at the scale required for treatment. Alternative 5 also uses mature techology that has demonstrated efficacy at the Site, but may require a greater

degree of complexity to construct and execute. Alternatives 4 and 7 represent proven technology (frequenly occuring) with available offsite facilities for disposal. Alternative 7 is less invasive than Alternative 4 and, therefore, scores slightly higher. Alternative 6 requires extensive, high-risk construction and therefore scores the lowest.

CONSIDERATION OF PUBLIC CONCERNS

MTCA requires to consider public concerns as to whether the community has concerns regarding the alternative and, if so, the extent to which the alternative addresses those concerns. This process includes concerns from individuals, community groups, local governments, tribes, federal and state agencies, or any other organization that may have an interest in or knowledge of the site. Alternatives were scored based on the balance between public desire for more active clean-up actions and potentially negative impacts to the community that may include economic (prolonged shutdowns or disruption to local business), public safety (e.g. heavy haul traffic on public roads), or other nuisance (e.g. construction noise and duration) considerations. Alternatives were scored based on public concerns related to cleanup projects in the Port Gardner Bay area.

Alternative 4 and 7 offer removal of contamination with impacts related to active construction, hauling to off-site facilities, and additional traffic. These alternatives score highest from public point of view due to highest degree of certainty associated with permanent solution. Alternatives 2 and 5 offer active cleanup of contamination on Site with the least potential public impact, however, public are skeptical about biological treatment. Alternative 6 scores lower than previous alternatives due to greater public impacts including keeping contamination in place, extended construction schedules and prolonged disruption to business activity on the Subject Property. Alternatives 3 scores the lowest based on public concern about injection of chemicals in groundwater and leaves contamination off property.

COSTS

Detailed costs for each alternative are provided in Appendix M. Figure 10.1-1 provides a summary of the estimated total cost for each alternative, including construction as well as non-construction costs. This Cost Benefit Chart was provided by Ecology via email on June 19, 2020 with the Ecology-derived revised cost estimate for Alternative 7 (correspondence included in Appendix O). Alternative 1 was the lowest cost alternative, estimated to cost $1.2 million to implement; however, as previously noted Alternative 1 does not MTCA requirement for permanent solution to maximum extent practicable and reasonable restoration timeframe for cleanup actions. Alternative 2 was the least cost alternative that met threshold requirements, costing $5.5 million to implement. Costs for Alternatives 3, 5, and 7 were similar, but increased considerably from Alternative 2, ranging from $7.9 to $12 million dollars to implement. Alternatives 4 and 6 were the most expensive alternatives, costing between $166 and $18 million dollars to implement.

10.1.2 WOODLIFE AREA

The two cleanup action alternatives for the Woodlife Area described in Section 8.4.2 were evaluated in detail using the MTCA threshold and additional criteria, and the DCA criteria provided in WAC 173-340-360 as described above. The evaluation is provided in Table 10.1-2 and described in detail below.

PROTECTIVENESS

Protection of human health and the environment is a threshold requirement. Alternative 1 leaves contamination in place with long-term engineering and institutional controls and does not provide for a reasonable restoration timeframe and therefore scores the lowest possible score. Alternative 2 removes contamination, reducing mobility, toxicity, and volume to meet Site cleanup levels and therefore scores highest.

PERMANENCE

Contaminants in the Woodlife Area have low mobility; higher scoring is provided for alternatives that primarily reduce toxicity or volume. Alternative 1 does not reduce toxicity, mobility, or volume, but ensures exposure pathways remain incomplete through engineering and institutional controls and therefore scores the lowest. Alternative 2 permanently removes the majority of contamination in this area.

EFFECTIVENESS OVER THE LONG-TERM

Proven treatment technologies, site-tested treatment technologies, and technologies with a shorter restoration timeframe generally receive a higher ranking. Complex treatment technologies and technologies requiring longer durations generally are ranked lower. Scores reflect MTCA's preferences for (in order) recycling/reuse, destruction/detoxification, immobilization/solidification, off-site disposal, isolation/containment, and institutional and engineering controls. Alternative 1 includes barriers to prevent exposure to hazardous substances but requires long-term monitoring and therefore scores the lowest. Alternative 2 relies on off-site disposal for on-property contamination however is scored preferentially to Alternative 1.

MANAGEMENT OF SHORT-TERM RISKS

The scoring uses the relative scale of active construction to evaluate construction risks to human health and safety; larger more complex projects are considered to carry greater risk than simpler smaller projects. Technology-specific risks have been considered (e.g. excavation has cave-in and heave risks etc.). Alternative 1 poses minimal short-term risks, and therefore scores the highest. Alternative 2 poses significant short-term risks that include risks of worker injury that may include excavation failures and/or damage to near surface utilities and is therefore ranked the lowest.

TECHNICAL AND ADMINISTRATIVE IMPLEMENTABILITY

Scoring evaluates the overall difficulty of implementing each of the proposed alternatives considering the size and complexity of the project, maturity of the remedial technology for the Site conditions and contaminants, and availability of local experienced contractors and materials. Because it can be readily implemented with minimal difficulty Alternative 1 scores the highest. Alternatives 2 uses mature technologies that have been demonstrated to be effective for conditions observed at the Site and comprises a project of moderate size and complexity.

CONSIDERATION OF PUBLIC CONCERNS

Alternatives were scored based on the balance between public desire for more active clean-up actions and potentially negative impacts to the community that may include economic (prolonged shutdowns or disruption to local business), public safety (e.g. heavy haul traffic on public roads), or other nuisance (e.g. construction noise and duration) considerations. Alternative 1 has minimal public impact but offers the least active cleanup. Alternatives 2 includes greater public impacts including extended construction schedules, increased haul traffic on public roads, and prolonged disruption to business activity on the Site.

COSTS

Detailed costs for each alternative are provided in Appendix 10. Table 10.1-2 provides a summary of the estimated total cost for each alternative, including construction as well as non-construction costs. Total costs for the two alternatives for the Woodlife Area range from approximately $500,000 to $1.7 million.

10.1.3 AREA 3 (KNOLL FILL AREA)

Cleanup alternatives related to impacts identified for the Knoll Fill Area are included in the marine area alternative comparison (Section 10.2).

RI findings indicated PCBs in sediment could be a source to PCBs in the upland groundwater due to tidal action. The marine cleanup alternatives discussed in Section 10.2 address PCB impacts to groundwater in the Knoll fill area with sediment removal. The marine area recommended alternative (Alternative M5), which is discussed in detail in the marine FS section, would remove a greater volume of the PCB-contaminated sediment near the knoll area compared to other alternatives. Additionally, M5 has a higher degree of certainty that it will be effective over time and is deemed more permanent and protective than Alternative M4. Alternatives M3, M4, and M6 all include removal of the highest concentration PCB-impacted sediments adjacent to the Knoll area in SMA 3. Alternative M5 includes removal of the highest concentration PCB-impacted sediments adjacent to the Knoll area in SMA 3 as well as, expanded removal of PCB-impacted sediment in SMA-2. Implementation of the M5 remedy in the marine area could result in decreased PCB concentration in the groundwater. Knoll area PCBs will be reevaluated during long term monitoring and periodic review.

10.1.4 DISPROPORTIONATE COST ANALYSIS

The purpose of a DCA is to facilitate selection of the cleanup alternative that provides the highest degree of permanence to the maximum extent practicable for the conditions identified at the Site. Scores for each of the criteria, for each alternative were assigned as described in sections 10.1.1 and 10.1.2.

A MTCA Composite Benefit Score was calculated for each alternative by summing the product of the criterion score times the assigned weighting factor, the resulting Composite Benefit Score is the measure of human health and environmental benefit that would be realized with implementation for each cleanup alternative. For example, using the assigned weighting criteria of Protectiveness at 30%, Permanence at 20%, Long-Term Effectiveness at 20%, Short-Term

Effectiveness at 10%, Implementability at 10%, and Public Concerns at 10%, and corresponding scores for each of these criteria of 7.5, 7, 6, 3, 7, and 6, respectively, the Composite Benefit Score is calculated as: (7.5)*(0.3) + (7)*(0.2) + (6)*(0.2) + (3)*(0.1) + (7)*(0.1) + (6)*(0.1) = 6.5. A score of 6.5 represents moderate to good Composite Benefit on a scale of 1 to 10, with 10 having the highest Composite Benefit and 1 having the lowest Composite Benefit.

When comparing cleanup alternatives, Ecology can use a quantitative DCA test (WAC 173-340-360(3)(e)(ii)(C)), as described in the previous paragraph. Ecology uses this as a guide to determine if the baseline alternative is disproportionately costly to the next permanent alternative. Sometimes this comparison may be qualitative based on best professional judgement. WAC 173-340-360(3)(e)(ii)(C).

All seven alternatives developed for the Creosote/Fuel Oil Area met threshold requirements under MTCA. Score for Alternative 1 was not included in the DCA because Alternative 1 does not meet the other requirements (permanent solution to maximum extent practicable and reasonable restoration timeframe).

Both alternatives for the Woodlife Area meet MTCA threshold requirement but Alternative 1 does not meet other minimum requirements (permanent solution to maximum extent practicable and reasonable restoration timeframe).

Creosote/Fuel Oil Area

Alternative 1 does meet the threshold criteria but does not meet the reasonable restoration timeframe requirements in MTCA; therefore, the benefit score to Cost Ratio is not presented for Alternative 1. Alternative 2 has a Composite Benefit Score of 4.9, representing moderate to good Composite Benefit. The cost per unit of Composite Benefit Score for Alternative 2 is $1.1 million, which is lowest of the alternatives after removing Alternative 1. Alternative 2 has a Benefit Score to Cost Ratio of 0.89, the highest of the six scored alternatives. The scoring is presented in Table 10.1-1

Alternative 7 has a Composite Benefit Score of 7.9, representing a good Composite Benefit. Alternative 7 has a Benefit Score to Cost Ration of 0.88, which is essentially the same as Alternative 2, when considering significant digits and uncertainty in these numbers. The estimated cost for Alternative 7 is $9.0 million. This incremental cost increase is not significant enough to justify selection of Alternative 2. The benefits provided by Alternative 7 would still be proportionate and defensible compared to the increased costs.

Alternative 3, has lower Composite Benefit Scores than Alternative 2, and therefore is less preferable than Alternative 2 both in terms of overall benefits achieved through implementation, and benefits offered per unit cost. Alternative 4, 5, 6, and 7 have a Composite Benefit Score greater than Alternative 2; however, these Alternatives have estimated costs of $7.9 million to $18.4 million compared to the $5.5 million cost for Alternative 2.

In the DCA procedure, alternatives are ranked from most to least permanent as specified in the rule. “The alternatives evaluated in the feasibility study shall be ranked from most to least permanent”. WAC 173-340-360(3)(e)(ii)(A). The alternative with greatest degree of permanence becomes “the baseline cleanup alternative against which cleanup alternatives are compared.”

WAC 173-340-360 (3)(e)(ii)(B). That subsection goes on to state that "If no permanent solution has been evaluated in the feasibility study, the cleanup action alternative evaluated in the feasibility study that provides the greatest degree of permanence shall be the baseline cleanup action alternative." WAC 173-340-360(3)(e)(ii)(B). Accordingly, Alternative 4 is the baseline cleanup alternatives against which cleanup alternatives are considered. Ecology compared baseline cleanup alternative to the next most permanent alternative.

Using the above procedure from WAC 173-340-360(3), Ecology determined that Alternative 4 is disproportionately costly to Alternative 7 (incremental cost is 80% versus incremental benefit of 8%). However, Alternative 7 is not disproportionately costly to Alternative 5, which is the next most permanent cleanup according to permanence criteria. Cost estimate shows Alternative 7 is less costly than Alternative 5 even though Alternative 7 has higher benefit than Alternative 5. Therefore, Alternative 7 becomes the most permanent cleanup to the maximum extent practicable.

Alternative 7, which includes hotspot area soil removal and ISB for the rest of the contaminated area, provides greater degree of certainty, permanence and effectiveness over the long term compared to the least costly Alternative 2, which includes biological treatment for the whole area. In addition, Alternative 7 results in quicker risk reduction due to mass removal contaminants within a shorter timeframe compared to longer restoration timeframe necessary for biological treatment in Alternative 2, assuming that bioremediation will work effectively at the site. As such, Ecology has recommended Alternative 7 as the preferred cleanup alternative.

Woodlife Area

Both alternatives for the Woodlife Area met the threshold requirements protecting human health and the environment by controlling risks posed through the exposure pathways and migration routes; however, only Alternative 2, soil removal, provides a reasonable restoration timeframe. Since Alternative 1 does not meet MTCA minimum requirements to use permanent solution to the maximum extent practicable and provide a reasonable restoration timeframe per MTCA (WAC 173-340-360(3)(d)), Alternative 2 is the preferred alternative for the Woodlife Area.

10.2 MARINE AREA

This section describes the rationale for the scoring of the seven Marine Area alternatives. A summary of the DCA for the marine area is provided in Table 10.2-1, which includes a total weighted benefit score for each alternative, total costs, and benefit/cost ratios.

10.2.1 DETAILED EVALUATION AND COMPARISON OF MARINE ALTERNATIVES

This section describes the DCA for the Marine Area alternatives M1 through M7. Figure 10.2-1 graphically depicts the costs and benefits, as well as the benefit/cost ratio for the alternatives based on the discussion and scoring described in this section. Scoring of the alternatives is based on a qualitative evaluation where each alternative is scored relative to the specific MTCA criterion.

The delineation of SMAs was based on the following:

- SMA 1: Concentrations support SWAC-Based RELs for MNR (MNR is proposed in SMA 1 for each alternative except for Alternative M7: Full Removal)

- SMA 2: Concentrations support SWAC-Based RELs for EMNR (EMNR is proposed in SMA 2 for each alternative except Alternative M1: Source Control and Natural Recovery and Alternative M7: Full Removal.
- SMA 3: Concentrations do not support SWAC-Based RELs of MNR or EMNR; therefore, MNR or EMNR are not proposed in SMA 3 for any alternative except Alternative M1: Source Control and Natural Recovery.

10.2.1.1 MTCA THRESHOLD CRITERIA

As discussed previously, the net sedimentation rate is relatively low at the Site. At an average rate of 0.17 ± 0.08 cm/year, the recovery time frame for a 10 cm thick bioturbated surface layer would be on the order of 50 years for Marine Alternative M1, and considerably longer for a 30 cm thick biologically active zone. Because of this extended restoration timeframe, MNR and source control alone do not meet the threshold criterion of protection of human health for all areas of the Site, and do not comply with cleanup standards. Because threshold criteria would not be met under this option, Marine Alternative M1 will not be scored or selected as a preferred cleanup option but has been retained in the DCA for comparison purposes only.

All other proposed Marine Alternatives meet the threshold criteria of protection of human health and the environment and attain cleanup standards. Each of the remaining alternatives has been configured to meet the required cleanup standards. Alternatives M2 through M7 will meet the cleanup standard immediately following implementation. Finally, cleanup will be achieved in compliance with applicable laws for the Marine Alternatives M2 though M7. In consultation with Ecology the following considerations were incorporated into the qualitative scoring evaluation:

- The technologies associated with individual SMAs for were evaluated holistically (based on each alternative) not based on their applicability within an individual SMA, to account for the overall benefit for each alternative

- Alternatives that incorporate engineered capping on-grade were scored lower than engineered capping at grade (i.e. removal followed by engineered capping), to account for habitat impacts resulting from increased intertidal elevations and future risks associated with long-term maintenance and monitoring

- Alternatives that incorporate removal (full or partial) with disposal at on off-site upland disposal facility, were scored higher, to reflect the increased future protectiveness, long-term effectiveness, and permanence of removal over containment (particularly in SMA-3 where the highest contaminant concentrations are, in the southern shoreline area where contaminant concentrations are relatively shallow and potentially exposed to increased wind waves, and adjacent to the Knoll area where PCBs in sediments may be a source of PCBs in upland groundwater).

10.2.1.2 PROTECTIVENESS

MTCA defines protectiveness as:

> "Overall protectiveness of human health and the environment, including the degree to which existing risks are reduced, time required to reduce risk at the facility and attain cleanup standards, on-site and off-site risks resulting from implementing the alternative, and improvement of the overall environmental quality." (WAC 173-340-360(3)(f)(i))

Anchor QEA evaluated the protectiveness of each alternative based on its effectiveness in reducing risks to human health and the environment by achieving cleanup standards at the point of compliance (i.e., site-specific bioactive zone of 0 to 1 foot below mudline). Cleanup Levels (CUL) address human health and environmental protection end points. In sediments, human health remediation levels (RELs) are set to achieve a surface-weighted average concentration CUL, while benthic protection is required on a point-by-point CUL basis (benthic protection criteria in accordance with the Sediment Management Standards), after construction.

Alternative M1 does not include any active remediation and therefore does not meet the MTCA Threshold Criteria. The net sedimentation rate is too low to predict adequate recovery within the 10-year post-construction restoration time frame. Alternative M1 is retained for completeness but is not scored or further considered for selection.

At the highest level, Alternatives M2 through M7 remedial technologies (i.e., removal, partial removal with engineered capping, and engineered capping) entirely replace the existing bioactive zone in SMA3, achieving the remediation goal immediately following construction. Additional factors (following the rationale presented in Section 10.2.1.1) can be considered qualitatively to adjust scores for the purpose of the DCA. Removing all sediment exceeding CULs and RELs (beyond the point of compliance) provides the greatest reduction of risk to human health and the environment. As a result, Alternative M7 is scored the highest for protectiveness because it targets full removal of sediment throughout the marine areas of the Site (even beyond the point of compliance) exceeding CULs.

Alternatives M6 and M5 were scored the next highest because they both reduce existing risks through removal of contaminant mass, including PCBs in Knoll area sediment that may be a source of PCBs in upland groundwater. Although Alternatives M6 and M5 do not result in complete removal, they reduce future risks by including complete removal in SMA-3 (Alternative M6) or by presumptively including additional removal in a portion of SMA-2[3] (Alternative M5) where PCBs in sediments may be a source of PCBs in upland groundwater. Alternatives M4 and M3 were scored progressively lower than Alternatives M6 and M5 based on reduced contaminant mass removal volumes. Alternative M2 was scored lowest. Alternative M2initially achieves human health and ecological cleanup standards throughout the marine areas of the Site (i.e., CULs within the top 1 foot of sediment on a SWAC basis); however, it is scored lowest based on potential future risk resulting from leaving sediment above CULs. The protectiveness scores for each alternative are presented in Table 10.2-1. The final numerical scores were assigned by Ecology (Appendix O).

[3] The extent of SMA-2 removal discussed in Alternative M5 will be determined in remedial design.

10.2.1.3 PERMANENCE

MTCA defines permanence as:

> "The degree to which the alternative permanently reduces the toxicity, mobility, or volume of hazardous substances, including the adequacy of the alternative in destroying the hazardous substances, the reduction or elimination of hazardous substance releases and sources of releases, the degree of irreversibility of waste treatment process, and the characteristics and quantity of treatment residuals generated." (WAC-173-340-360(3)(f)(ii))

Anchor QEA evaluated the permanence of each alternative based on its effectiveness at reducing the toxicity, mobility, or volume of contaminants in the marine areas of the Site. When considering the permanence of removal, partial removal with engineered capping, and engineered capping only alternatives, alternatives that incorporate full or partial removal reduce the volume of hazardous substances, and alternatives that incorporate engineered capping reduce the mobility of hazardous substances. Both removal and engineered capping technologies are considered permanent; however, engineered capping requires long-term monitoring and potential maintenance to ensure permanence. As such, removal scores higher for permanence than engineered capping. Alternative M7 is, therefore, scored the highest for permanence because it targets full removal of sediment exceeding CULs throughout the marine areas of the Site, providing the highest reduction in contaminant volume.

Alternatives M6 and M5 were scored the next highest because they provide the next highest reduction in contaminant volume (through removal). They include removal of PCBs in Knoll area sediment that may be a source of PCBs in upland groundwater, and address contaminants remaining in the marine portion of the Site above CULs with physical and chemical isolation via engineered capping (i.e., cap design addresses climate change and seismic forces). Alternatives M4 and M3 were scored progressively lower than M6 and M5 based on reduced removal volumes; although, they both include removal of PCBs in Knoll area sediment similar to M5 and M6. Alternative M2 was scored lowest because the contamination is addressed in the other alternatives with removal, while with Alternative M2 the contaminant volume at the Site is unchanged. The permanence scores for each alternative are presented in Table 10.2-1. The final numerical scores were assigned by Ecology (Appendix O).

10.2.1.4 EFFECTIVENESS OVER THE LONG-TERM

MTCA defines effectiveness over the long term as:

> "Long-term effectiveness includes the degree of certainty that the alternative will be successful, the reliability of the alternative during the period of time hazardous substances are expected to remain on-site at concentrations that exceed cleanup levels, the magnitude of residual risk with the alternative in place, and the effectiveness of controls required to manage treatment residues or remaining wastes" (WAC 173-340-360(3)(iv))

Climate change vulnerabilities relating to increased occurrence of severe storms (winds, waves, increased precipitation, and flooding) render the long-term effectiveness uncertain for alternatives

where contamination is left in place (i.e., capping). Remedial designs for engineered caps would need to consider climate change parameters (i.e., increasing sea level and storm intensity), which have some degree of uncertainty over the life of the design.

In addition to climate change, vulnerability relating to earthquakes is also a consideration for the long-term effectiveness of alternatives that leave contamination in place. Marine contaminants at the Site are located on relatively flat intertidal zones and within a larger mudflat area that is not impacted by marine contaminants at the Site. Engineered caps placed on the flat intertidal sediments may experience some cap thinning or lateral cap movement during an earthquake; however, deformed or damaged caps can be easily repaired, and engineered caps can be designed to consider earthquake forces.

A more detailed evaluation of the potential effects of earthquakes and erosion would be conducted during design as warranted. Because the marine tideflat area SMAs are already subject to tidal inundation, they have limited vulnerability related to sea level rise. Deeper water is more protective of engineered caps because erosive forces are reduced.

The long-term effectiveness was evaluated based on the certainty that each alternative would be successful throughout the time frame that hazardous substances would be expected to remain at the Site in concentrations exceeding CULs, with considerations for climate change and seismic events. Alternative M7 is scored the highest for long-term effectiveness because it targets full removal of sediment above CULs throughout the marine areas of the Site, providing the highest degree of certainty regarding the success of the alternative. Alternatives M6 and M5 were scored the next highest because they provide the next highest reduction in contaminant volume and, therefore, the degree of certainty regarding the success of the alternative. Alternatives M4 and M3 were scored progressively lower than M6 and M5 based on reduced removal volumes. Alternative M2 was scored lowest because sediments exceeding CULs remain on Site (although isolated beyond the point of compliance via engineered capping). The long-term effectiveness scores for each alternative are presented in Table 10.2-1. The final numerical scores were assigned by Ecology (Appendix O).

10.2.1.5 MANAGEMENT OF SHORT-TERM RISKS

MTCA defines management of short-term risk as:

> "The risk to human health and the environment associated with the alternative during construction and implementation, and the effectiveness of measures that will be taken to manage such risks." (WAC 173-340-360(3)(f)(v))

Short-term risks are primarily associated with construction activities. Common to all active remediation alternatives, construction equipment operations result in greenhouse gas and particulate emissions, which present health risks to the adjacent community from degraded air quality. Construction itself is inherently dangerous, presenting a safety risk to workers at the Site and to the public during transportation of materials and equipment to and from the Site. To the extent that these short-term risks apply to all construction activities, the overall risk for shorter duration and less construction-intensive projects is comparatively lower than for longer duration and more intensive construction projects.

In addition to health and safety short-term risks, alternatives that include removal present risks to water quality because of potential releases associated with dredging, and to the benthic community due to short-term disruption of habitat, as well as generated dredging residuals. The magnitude of short-term water quality and sediment quality risks associated with removal alternatives is directly correlated with the volume of sediment removed. Based on these considerations, short-term risks are comparatively lower for shorter duration actions and for EMNR or engineered capping.

Alternative M2 scored highest based on smallest/shortest duration construction (no removal). Alternative M7 scored lowest based on the largest/longest duration construction. Alternatives M3 through M6 were given intermediate scores based on the relative size and duration of the active construction associated with each of these alternatives). The management of short-term risk scores for each alternative are presented in Table 10.2-1. The final numerical scores were assigned by Ecology (Appendix O).

10.2.1.6 TECHNICAL & ADMINISTRATIVE IMPLEMENTABILITY

MTCA defines technical and administrative implementability as:

> "Ability to be implemented including consideration of whether the alternative is technically possible, availability of necessary off-site facilities, services and materials, administrative and regulatory requirements, scheduling, size, complexity, monitoring requirements, access for construction operations and monitoring, and integration with existing facility operations and other current or potential remedial actions." (WAC 173-340-360(3)(f)(vi))

Implementability expresses the relative difficulty and uncertainty of implementing the cleanup action (Section 9.3.5). This section describes both the technical and administrative implementability considerations and scoring for the marine area alternatives.

All of the technologies included in the evaluation of alternatives incorporate well established and proven methods of remediation. As a result, materials are readily available locally, and there is a pool of qualified, experienced contractors. The technical challenges and complexities associated with the proposed technologies generally include excavation in the inlet area, slope stability and shoring, and excavation in areas with deeper cuts or cuts that are farther from the shoreline where subgrade stability and access present additional challenges.

The technical challenges for Alternatives M4 and M5 are similar because they both include similar excavation and capping depths, while Alternative M6 has additional technical challenges associated with deeper removal depths in the inlet area. Alternatives M2 and M3 may require additional long-term monitoring and maintenance challenges associated with capping on-grade. Alternative M7 is the most technically challenging because of large excavation footprints on tidally influenced mudflat, deepest cuts, and potential slope stability shoring requirements in the inlet.

There are also potential administrative challenges associated with the proposed technologies that could affect implementability. Administrative challenges include regulatory approvals, permitting requirements, and potential land use or navigational restrictions associated with remedial technologies (i.e., deed restriction or institutional controls). There are no difficult permitting requirements anticipated for Alternatives M4, M5, or M6; however, there may be some additional

permitting challenges for Alternatives M2 and M3 associated with capping on-grade. Institutional controls are assumed to be required for alternatives that include engineered caps (Alternatives M2 through M5). There may be some permitting challenges associated with Alternative M7 due to the larger disturbance area, and with alternatives that include capping on-grade. Mitigation may be required under each of the proposed alternatives.

Based on these technical and administrative challenges, Alternative M2 was scored lowest, based on potential permitting and long-term monitoring and maintenance challenges associated with capping on-grade, followed by Alternative M7, due to significant technical challenges (large excavation footprints on tidally influenced mudflat, deepest cuts, slope stability shoring requirements) and permitting challenges associated with the large disturbance area. Alternatives M4, M5 and M6 were given equal, intermediate scores. Alternatives M4 and M5 have similar technical and administrative challenges (permitting, institutional controls, and mitigation). Alternative M6 has some additional challenges associated with deeper excavation in the inlet area; however, these technical challenges are offset by fewer administrative challenges from reduced long-term monitoring and institutional control requirements associated with capping. The technical and administrative feasibility scores for each alternative are presented in Table 10.2-1. The final numerical scores were assigned by Ecology (Appendix O).

10.2.1.7 CONSIDERATION OF PUBLIC CONCERNS

MTCA defines consideration of public concerns as:

“Whether the community has concerns regarding the alternative and, if so, the extent to which the alternative addresses those concerns. This process includes concerns from individuals, community groups, local governments, tribes, federal and state agencies, or any other organization that may have an interest in or knowledge of the site.” (WAC 173-340-360(3)(f)(vii))

The public involvement process under MTCA is used to identify potential public concerns regarding cleanup action alternatives. The extent to which an alternative would address those concerns is considered as part of the evaluation process. This includes concerns raised by individuals, community groups, local governments, tribes, federal and state agencies, local businesses, and other organizations with an interest in the cleanup action. Potential impacts to cultural resources from a given remedy and potential impacts during remedy implementation are considered under this evaluation criterion. Ecology will continue to evaluate public concerns through the public involvement process as the CAP is developed.

Input from members of the community is used to shape the remedial actions with respect to timing, local or cultural considerations, and effects from disturbances including noise, light, and traffic that result from implementation methods or transportation routes. Different members of the community may have different priorities, and these priorities may or may not be aligned with the goals of the cleanup and/or the specific requirements of MTCA. Consistent with cleanup evaluations conducted by Ecology at other similar cleanup sites, preliminary consideration of public concerns for this DCA balanced two potentially conflicting public interests:

1. One interest is environmental and generally supports remedial actions that remove the maximum amount of contamination without respect to costs.

2. Another interest is economic and generally supports remedial actions that achieve regulatory requirements by consideration cost effectiveness and targeting remediation to mitigate impacts on local businesses.

The scores are based on the degree that an alternative may balance these potentially conflicting priorities. In contrast to the other DCA criteria, which tend to favor alternatives at one end of the range or the other, consideration of public concerns tends to score alternatives in the middle the highest because of these countervailing priorities. As a result, Alternative M5 was scored highest, while Alternatives M6 and M4 were each scored slightly lower. Alternative M7 would satisfy the public desire for complete removal, but high cost, economic impacts, and disruption to the community from construction would potentially also be a concern for the public. Alternative M2 may not meet the public's desire for removal but quantitatively achieves the project remedial goals. Therefore, Alternatives M7 and M2 both scored lowest. The consideration of public concern scores for each alternative are presented in Table 10.2-1. The final numerical scores were assigned by Ecology (Appendix O).

10.2.1.8 ADDITIONAL SMS CRITERIA

The use of recycling, reuse, and waste minimization was an evaluation criterion listed under the former SMS rule. However, specific reference to this criterion is not part of the revised SMS rule, which became effective in fall 2013. While the use of recycling and waste minimization in the context of cleanup is an important goal, recycling and waste minimization efforts are inherent to efficient and cost-effective construction projects, and there will be a natural tendency to maximize these efforts during project implementation. To the maximum extent possible, beneficial reuse opportunities will be explored both for the use of removed sediment, as well as for the imported clean cover and/or backfill materials as may be required for the marine area cleanup.

Consideration of environmental impacts will be evaluated for the selected marine area alternative through the SEPA process. SEPA considers impacts to air, animals, earth, energy, environmental health, land use, plants, public services, transportation, utilities, and water. Generally speaking, alternatives with shorter durations and that result in less disruption to the environment and public will be more likely to result in a determination of non-significance (DNS) or a mitigated DNS under SEPA. The sequential numeric ranking from least impact to most impact for each of the alternatives is M1 followed by M2, M3, M4, M5, M6, and M7 in that order.

10.2.1.9 COSTS

Detailed costs for each alternative are provided in Appendix N. Table 10.2-1 provides a summary of the estimated total cost for each alternative, including construction as well as non-construction costs. Total costs range from approximately $2,800,000 to $38,900,000 for alternatives M1 through M7.

10.2.2 ADDITIONAL MARINE AREA CLEANUP CONSIDERATIONS

10.2.2.1 PROTECTION OF CULTURAL RESOURCES

During the remedial design and permitting phase of the cleanup action, the implementing parties, in consultation with the Washington Department of Archaeology and Historic Preservation, the

Tulalip Tribe, and other stakeholders as appropriate, will identify areas that may be affected by the cleanup action. These areas will include locations where cleanup-related disturbance may occur, including removal areas, staging areas, transport routes, and mooring areas, as appropriate. More detailed cultural resource evaluations will be integrated with studies for the engineering design phase of the project.

The cleanup action to be selected by Ecology for the Site in the forthcoming CAP will also include appropriate compliance monitoring provisions during implementation of the action, consistent with Section 106 requirements of the National Historic Preservation Act and Washington State laws. Detailed compliance monitoring plans will be developed during the remedial design and permitting phase, consistent with regulatory requirements. Appropriate cultural resource work plans, including a cultural resources treatment plan and an inadvertent discovery plan, will be included in the engineering design reports.

10.2.3 DISPROPORTIONATE COST ANALYSIS

The purpose of a DCA is to facilitate selection of the cleanup alternative that is permanent to the maximum extent practicable, for the conditions identified at the Site. Cleanup action alternatives for marine areas that met threshold criteria were evaluated according to the methodology provided by WAC 173-340-360(3)(e) and per portions of the DCA and associated costs that were directly provided by Ecology, as described in above sections. The DCA process includes scoring each alternative using six MTCA criteria and a comparison of benefits and costs. As described in Sections 9.3 and 10.2.1 six the criteria are: protectiveness, permanence, long-term effectiveness, management of short-term risks, technical and administrative implementability and consideration of public concerns. Scores for each of the criteria, for each alternative were assigned as described in Table 10.2-1.

A MTCA Composite Benefit Score was calculated for each alternative by summing the product of the criterion score times the assigned weighting factor, the resulting Composite Benefit Score is the measure of human health and environmental benefit that would be realized with implementation for each cleanup alternative. For example, using the assigned weighting criteria of Protectiveness at 30%, Permanence at 20%, Long-Term Effectiveness at 20%, Short-Term Effectiveness at 10%, Implementability at 10%, and Public Concerns at 10%, and corresponding scores for each of these criteria of 7.5, 7, 6, 3, 7, and 6, respectively, the Composite Benefit Score is calculated as: (7.5)*(0.3) + (7)*(0.2) + (6)*(0.2) + (3)*(0.1) + (7)*(0.1) + (6)*(0.1) = 6.5. A score of 6.5 represents moderate to good Composite Benefit on a scale of 1 to 10, with 10 having the highest Composite Benefit and 1 having the lowest Composite Benefit.

When comparing cleanup alternatives, Ecology can use a quantitative DCA test (WAC 173-340-360(3)(e)(ii)(C)), as described in the previous paragraph. Ecology uses this as a guide to determine if the baseline alternative is disproportionately costly to the next permanent alternative. Sometimes this comparison may be qualitative based on best professional judgement. WAC 173-340-360(3)(e)(ii)(C).

In the DCA procedure, alternatives are ranked from most to least permanent as specified in the rule. “The alternatives evaluated in the feasibility study shall be ranked from most to least permanent”. WAC 173-340-360(3)(e)(ii)(A). The alternative with greatest degree of permanence becomes “the baseline cleanup alternative against which cleanup alternatives are compared.”

WAC 173-340-360 (3)(e)(ii)(B). That subsection goes on to state that “If no permanent solution has been evaluated in the feasibility study, the cleanup action alternative evaluated in the feasibility study that provides the greatest degree of permanence shall be the baseline cleanup action alternative.” WAC 173-340-360(3)(e)(ii)(B).

Alternative 1 does not meet MTCA minimum requirements and was therefore not scored (i.e. it is not protective of human health and the environment, cleanup standards would not be met within a reasonable restoration timeframe).

Alternative M7, which includes removal and off-site disposal of all sediments above cleanup levels, provides the greatest level of permanence of the alternatives. As such, Alternative M7 was the original baseline alternative against which other alternatives were compared to determine which is permanent to the maximum extent practicable through a disproportionate cost analysis. Through the disproportionate cost analysis, Ecology determined that Alternative M7 was disproportionality costly compared to the next most permanent, lower-cost alternatives (Alternatives M5 and M6). Because Alternative M5 provides greater overall benefits than Alternative M6, Alternative M5 became the new baseline alternative. Alternative M5 was then evaluated against the next most permanent and lower cost alternative, Alternative M4.

Alternative M5 includes greater mass removal of sediment hotspot areas than Alternative M4. The additional removal further reduces risks to humans and animals utilizing the tide flats, including future recreational and tribal subsistence shellfishers. M5 is more resilient to climate change impacts, including more frequent severe storms expected over time, than Alternative M4 as less contaminated material will be left in place along the shoreline. Ecology anticipates that contaminated sediment will be disposed of at a permitted upland disposal facility, as described in Feasibility Study sections 8.5.3 through 8.5.7 and in the cost estimate tables in Appendix N. Due to the increased removal and disposal of the most highly contaminated marine sediments in an upland engineered facility, the likelihood of subsequent releases and exposure to contaminants is reduced compared to Alternative M4. Additionally, Alternative M5 removes a greater volume of sediments contaminated with PCBs adjacent to the knoll. The current conceptual site model indicates that marine sediments may be a source of PCBs in groundwater. Implementation of Alternative M5 may result in decreased groundwater PCB concentrations.

The incremental decrease in cost between M5 and M4 is not significant enough to justify selection of Alternative M4. Therefore, Ecology has determined Alternative M5 to be permanent to the maximum extent practicable.

Alternatives M2 and M3 scored lower in permanence and overall benefits compared to Alternatives M4 through M7. The disproportionate cost analysis excluded these alternatives from consideration as the preferred alternative.

11. DCA SUMMARY AND CLOSING

This section summarizes the rationale for the selection of the preferred cleanup action alternatives for the upland areas and marine sediments at the Site.

11.1 SUMMARY OF UPLAND CLEANUP ACTION ALTERNATIVES

Under the Agreed Order (No. DE 5095) and with Ecology's oversight, JELD-WEN performed an RI that evaluated the nature and extent of contamination at the Site. The RI included collecting and evaluating environmental data and evaluating physical conditions on the Site sufficiently to develop appropriate cleanup actions that are consistent with MTCA and SMS requirements. Upland evaluations were made for the three upland assessment areas (Creosote/Fuel Oil Area, Woodlife Area, and Knoll Fill Area). The alternatives presented are based on the upland RI findings, the CSM developed for each area, the IHS present in each area, and the potential range of cleanup technologies considered in this FS. A detailed analysis of alternatives was performed, including a DCA that compared the relative costs and benefits of each alternative. Based on this evaluation, the cleanup alternative for each upland area is identified below.

11.1.1 CREOSOTE/FUEL OIL AREA

Based on the analysis presented in Section 10.1.4 and the DCA, Creosote/Fuel Oil Area - Figure 10.1-1 presents the weighted score for each alternative along with the estimated cost. Table 10.1-1 presents the total Composite Benefit Score, estimated cost, and unit cost (dollars per composite benefit score increment). Ecology provided Alternative 7, consisting of hot spot soil removal and ISB, is Ecology's preferred Alternative and Ecology has instructed JELD-WEN to use Alternative 7 as the preferred alternative for the Creosote/Fuel Oil Area (see correspondence included in Appendix O). Below is a summary of the DCA process. Details can be found in Section 10.1.4.

Alternative 1 does not meet minimum MTCA requirement for cleanup as this alternative would leave contamination in place with long-term engineering and institutional controls, would not use permanent solutions to the maximum extent practicable and would not provide for a reasonable restoration timeframe (WAC 173-340-360(2)). Therefore, Alternative 1 is not scored for any benefits criteria and is not presented in the DCA process.

Alternative 4, which would excavate and remove most contaminated soils from the subject property, provides the greatest degree of permanence and has the highest overall benefit among all the practicable alternatives evaluated. As such, Alternative 4 is the baseline cleanup alternative against which cleanup action alternatives were compared. Alternative 4 was found to be disproportionately costly to the next most permanent cleanup, Alternative 7, which would remove hotspot shallow soils from the property and employ bioremediation for the rest of the area. Alternative 7 becomes the most permanent cleanup to the maximum extent practicable as this alternative is not disproportionately costly to the next most permanent Alternative 5, which uses thermal treatment and provides less environmental benefit with higher implementation cost.

Alternative 2, which would rely on biological treatment for the entire area, is the least costly alternative. This alternative suffers from a lesser degree of certainty, permanence, and effectiveness over the long term when compared with Alternative 7. In addition, Alternative 7

results in quicker risk reduction due to mass removal contaminants within a shorter timeframe compared to longer restoration timeframe necessary for biological treatment. The other remaining alternatives (Alternative 3 & 6) are less permanent and more costly than Alternative 7. Ecology, therefore, has selected Alternative 7 as the preferred cleanup alternative.

11.1.2 WOODLIFE AREA

Based on the analysis presented in Section 10.1.5, for the Woodlife Area - Alternative 2, consisting of soil removal is the preferred cleanup alternative for the Woodlife Area. Since Alternative 1 does not meet MTCA minimum requirements for cleanup MTCA (WAC 173-340-360(3)(d)).

11.1.3 KNOLL FILL AREA

The most practicable permanent cleanup action for the Knoll Fill Area is discussed in the summary of marine cleanup action alternatives (Section 10.2).

RI findings indicated PCBs in sediment could be a source to PCBs in the upland groundwater due to tidal action. The marine cleanup alternatives discussed in Section 10.2 address PCB impacts to groundwater in the Knoll fill area with sediment removal. The marine area recommended alternative (Alternative M5), which is discussed in detail in the marine FS section, would remove a greater volume of the PCB-contaminated sediment near the knoll area compared to other alternatives. Additionally, M5 has a higher degree of certainty that it will be effective over time and is deemed more permanent and protective than Alternative M4. Alternatives M3, M4, and M6 all include removal of the highest concentration PCB-impacted sediments adjacent to the Knoll area in SMA 3. Alternative M5 includes removal of the highest concentration PCB-impacted sediments adjacent to the Knoll area in SMA 3 as well as, expanded removal of PCB-impacted sediment in SMA-2. Implementation of the M5 remedy in the marine area could result in decreased PCB concentration in the groundwater. Knoll area PCBs will be reevaluated during long term monitoring and periodic review.

11.2 SUMMARY OF MARINE CLEANUP ACTION ALTERNATIVES

Based on the marine sediment RI findings, seven FS alternatives were developed and scored based on consultation with Ecology. The FS alternatives range from MNR and source control to full removal. Except for the MNR and source control only approach, all alternatives meet the threshold criteria at the completion of construction (although a 10-year post-construction recovery period is allowed under MTCA/SMS regulations) applying proven and permanent technologies. Alternative M5 was determined to be the most permanent and protective to the maximum extent practicable in the disproportionate cost analysis (Section 10.2.3).

Alternative M5 includes greater mass removal of sediment hotspot areas than the next most permanent, Alternative M4. The additional removal further reduces risks to humans and animals utilizing the tide flats, including future recreational and tribal subsistence shellfishers. M5 is more resilient to climate change impacts, including more frequent severe storms expected over time than Alternative M4, as less contaminated material will be left in place along the shoreline.

Ecology anticipates that contaminated sediment will be disposed of at an off-site facility, as described in the Feasibility Study sections 8.5.3 through 8.5.7 and cost estimate tables in

Appendix N. Due to the increased removal and disposal of the most highly contaminated marine sediments in an upland engineered facility, the likelihood of subsequent releases and exposure to contaminants is reduced compared to Alternative M4. Additionally, Alternative M5 removes a greater volume of sediments contaminated with PCBs adjacent to the knoll. The current conceptual site model indicates that marine sediments may be a source of PCBs in groundwater. Implementation of Alternative M5 may result in decreased groundwater PCB concentrations.

The incremental decrease in cost between M5 and M4 is not significant enough to justify selection of Alternative M4 considering the additional benefits gained in permanence, protectiveness, and long-term effectiveness of selecting Alterative M5. The incremental benefits of Alternative M5 are not disproportionate to the incremental cost compared to M4. As such, Alternative M5 is preferred.

Communications related to Ecology's preferred cleanup determination are included in Appendix O.

11.3 DATA GAPS EVALUATION

No data gaps were identified for completing the RI/FS report. Additional remedial design data is needed and will be part of the pre-design investigation activities. It is anticipated that pre-remedial design investigation would include additional assessment of groundwater impacts in the Creosote/Fuel Oil Area to refine understood extent of those impacts, specialized testing for further evaluation of ISB methods, geotechnical and hydrogeological testing for hot spot soil removal, and additional sediment testing.

11.4 CLOSING

JELD-WEN and Ecology have worked cooperatively to develop this Draft Final RI/FS report. This document has been prepared for public comment.

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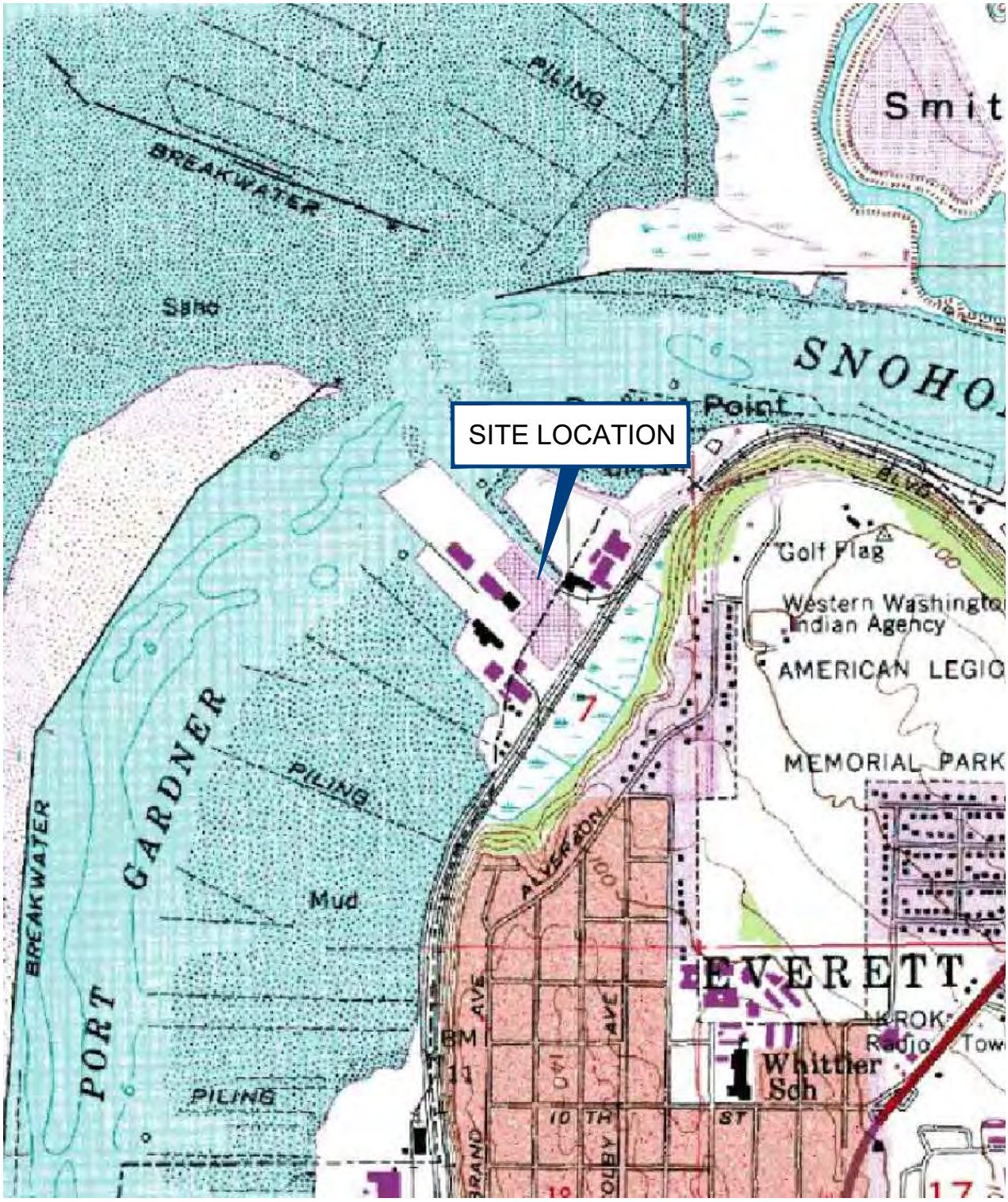
FIGURES



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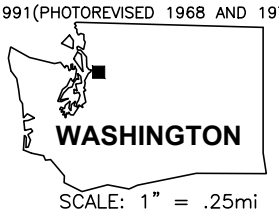

SCALE: 1" = .25mi

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SLR

JELD-WEN/FORMER NORD DOOR FACILITY
300 WEST MARINE VIEW DRIVE
EVERETT, WASHINGTON

Report
DRAFT FINAL RI/FS REPORT

Drawing
SITE LOCATION MAP

Date	MARCH 2021	Scale	AS SHOWN	Fig. No. 1-1
File Name	SITE LOCATION MAP-1	Project No.	108.00228.00061	

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LEGEND

EXISTING BUILDINGS

REMOVED BUILDINGS

NOTES

THE BUILDINGS, SURFACE UTILITIES, EDGE OF PAVEMENT, AND APPROXIMATE SHORELINE SHOWN ON THIS MAP ARE BASED ON A 2006 SURVEY PERFORMED BY WH PACIFIC.

AERIAL PHOTO FROM GOOGLE EARTH PRO, JULY 2019

0 200 400 600'

SLR ANCHOR QEA

JELD-WEN/FORMER NORD DOOR FACILITY
300 WEST MARINE VIEW DRIVE
EVERETT, WASHINGTON

Report
DRAFT FINAL RI/FS REPORT

Drawing
SITE PLAN

Date	MARCH 2021	Scale	AS SHOWN	Fig. No. 2.1-1
File Name	SITE PLAN_NEW SYMBOLS	Project No.	108.00228.00061	

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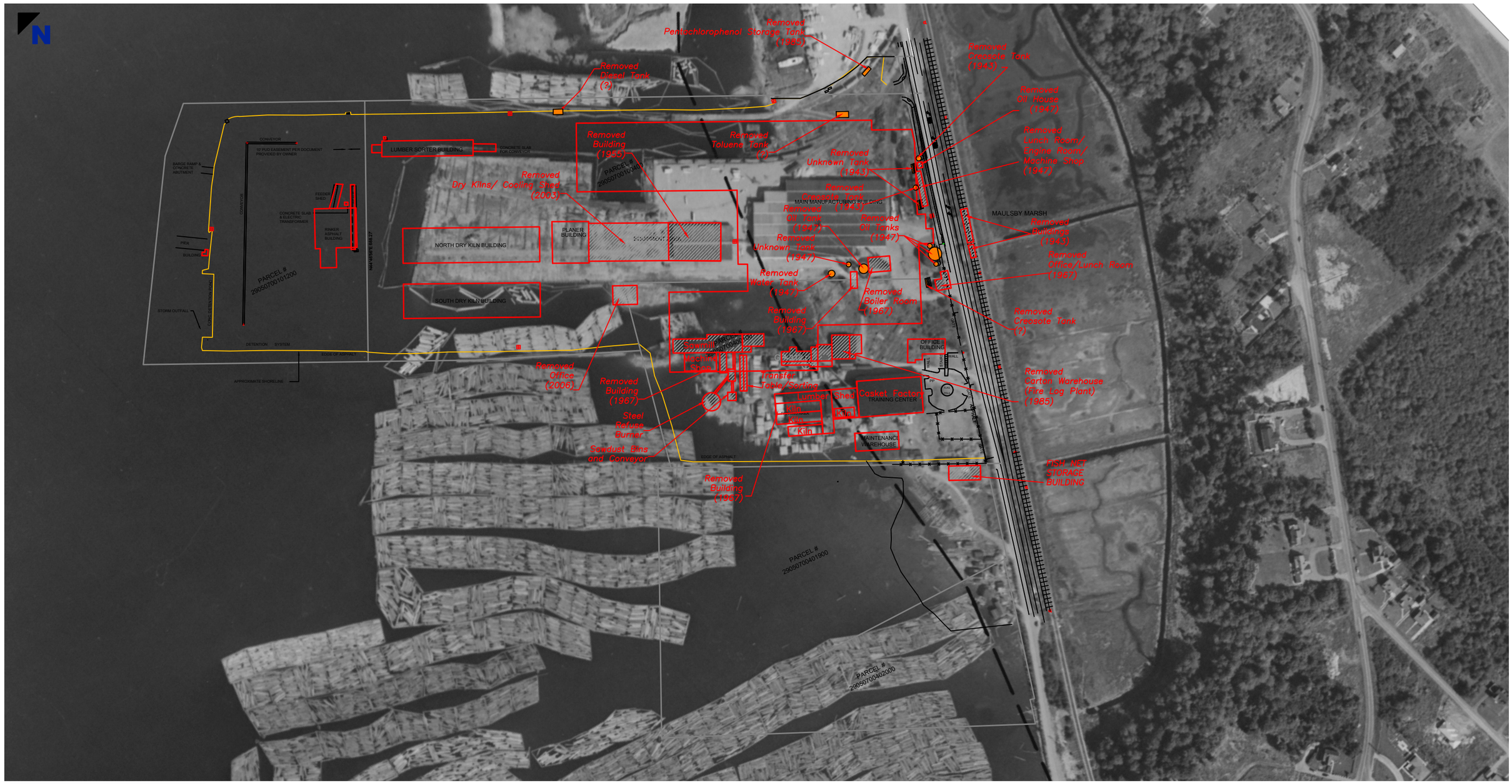
Figure 2.1-2
Parcel Ownership
Draft Final RI/FS
Jeld-Wen/Former Nord Door Facility



LEGEND

- REMOVED BUILDINGS
- REMOVED TANKS
- (1945) LAST YEAR FEATURE VISIBLE ON AERIAL PHOTOGRAPHS

NOTES

THE BUILDINGS, SURFACE UTILITIES, EDGE OF PAVEMENT, AND APPROXIMATE SHORELINE SHOWN ON THIS MAP ARE BASED ON A 2006 SURVEY PERFORMED BY WH PACIFIC.

0 250 500 750'

JELD-WEN/FORMER NORD DOOR FACILITY
300 WEST MARINE VIEW DRIVE
EVERETT, WASHINGTON

Report
DRAFT FINAL RI/FS REPORT

Drawing
1947 AERIAL PHOTOGRAPH WITH SITE FEATURES

Date	MARCH 2021	Scale	AS SHOWN	Fig. No. 2.2-1
File Name	SITE PLANS 1947-1995	Project No.	108.00228.00061	

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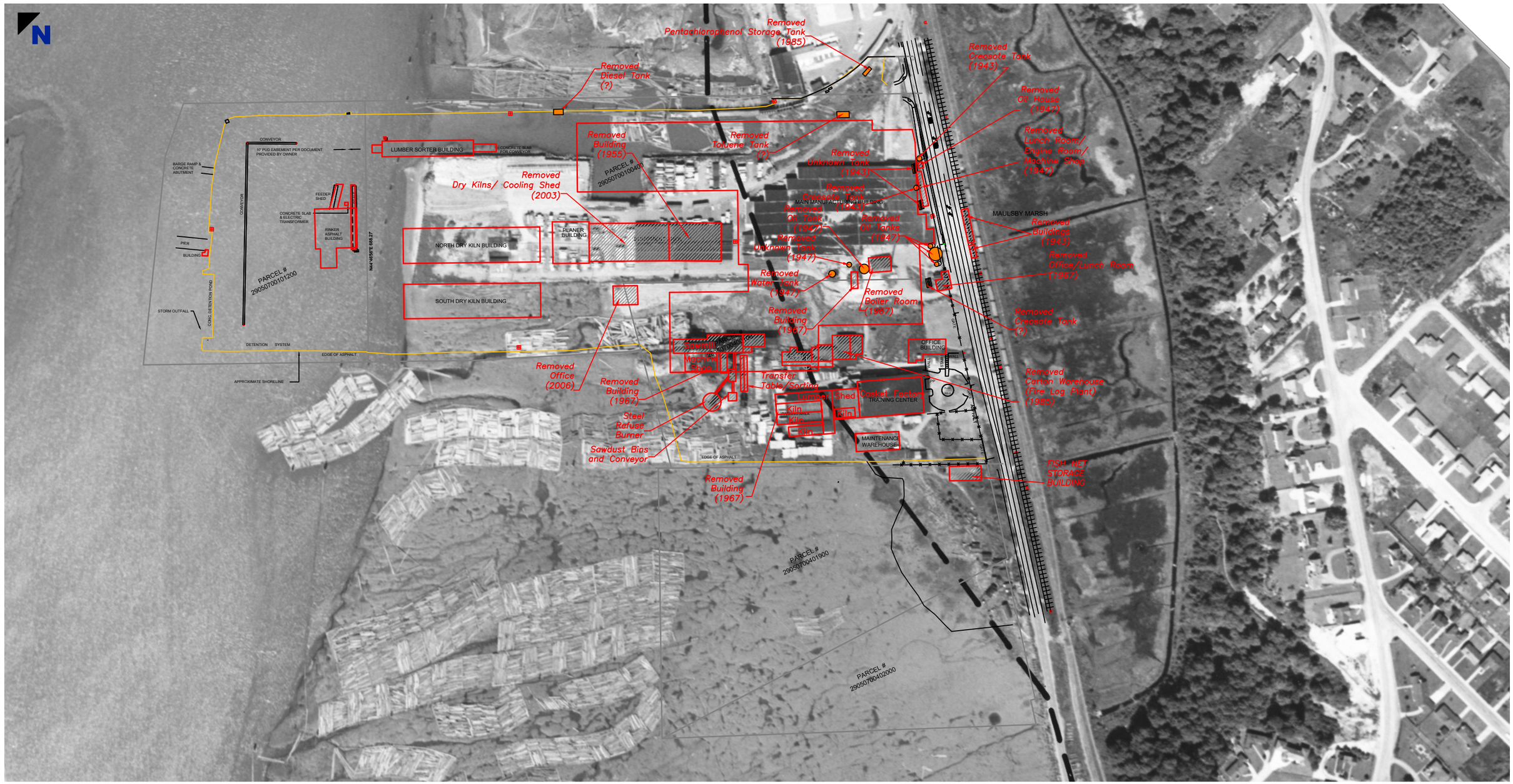

LEGEND

- REMOVED BUILDINGS
- REMOVED TANKS
- (1945) LAST YEAR FEATURE VISIBLE ON AERIAL PHOTOGRAPHS

SLR ANCHOR QEA

NOTES

THE BUILDINGS, SURFACE UTILITIES, EDGE OF PAVEMENT, AND APPROXIMATE SHORELINE SHOWN ON THIS MAP ARE BASED ON A 2006 SURVEY PERFORMED BY WH PACIFIC.

0 250 500 750'

JELD-WEN/FORMER NORD DOOR FACILITY
300 WEST MARINE VIEW DRIVE
EVERETT, WASHINGTON

Report
DRAFT FINAL RI/FS REPORT

Drawing
1955 AERIAL PHOTOGRAPH WITH SITE FEATURES

Date	MARCH 2021	Scale	AS SHOWN
File Name	SITE PLANS 1947-1995	Project No.	108.00228.00061

Fig. No. 2.2-2

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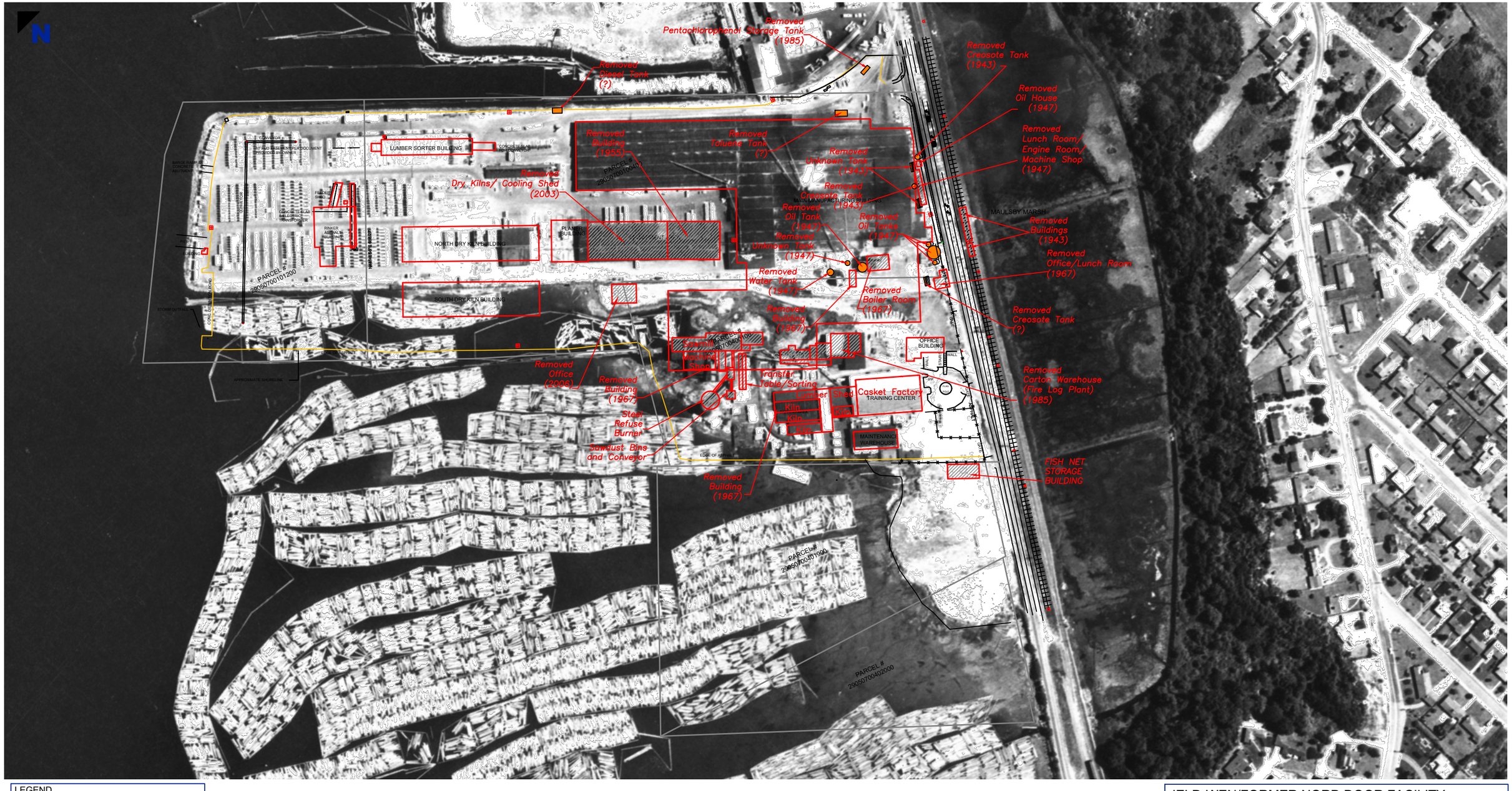

LEGEND

- REMOVED BUILDINGS
- REMOVED TANKS
- (1945) LAST YEAR FEATURE VISIBLE ON AERIAL PHOTOGRAPHS

NOTES

THE BUILDINGS, SURFACE UTILITIES, EDGE OF PAVEMENT, AND APPROXIMATE SHORELINE SHOWN ON THIS MAP ARE BASED ON A 2006 SURVEY PERFORMED BY WH PACIFIC.

0 250 500 750'

JELD-WEN/FORMER NORD DOOR FACILITY
300 WEST MARINE VIEW DRIVE
EVERETT, WASHINGTON

Report
DRAFT FINAL RI/FS REPORT

Drawing
1965 AERIAL PHOTOGRAPH WITH SITE FEATURES

Date	MARCH 2021	Scale	AS SHOWN	Fig. No. 2.2-3
File Name	SITE PLANS 1947-1995	Project No.	108.00228.00061	

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LEGEND

- REMOVED BUILDINGS
- REMOVED TANKS
- (1945) LAST YEAR FEATURE VISIBLE ON AERIAL PHOTOGRAPHS

NOTES

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0 250 500 750'

JELD-WEN/FORMER NORD DOOR FACILITY
300 WEST MARINE VIEW DRIVE
EVERETT, WASHINGTON

Report
DRAFT FINAL RI/FS REPORT

Drawing
1974 AERIAL PHOTOGRAPH WITH SITE FEATURES

Date	MARCH 2021	Scale	AS SHOWN
File Name	SITE PLANS 1947-1995	Project No.	108.00228.00061

Fig. No. 2.2-4

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LEGEND

- REMOVED BUILDINGS
- REMOVED TANKS
- (1945) LAST YEAR FEATURE VISIBLE ON AERIAL PHOTOGRAPHS

NOTES

THE BUILDINGS, SURFACE UTILITIES, EDGE OF PAVEMENT, AND APPROXIMATE SHORELINE SHOWN ON THIS MAP ARE BASED ON A 2006 SURVEY PERFORMED BY WH PACIFIC.

0 250 500 750'

JELD-WEN/FORMER NORD DOOR FACILITY
300 WEST MARINE VIEW DRIVE
EVERETT, WASHINGTON

Report
DRAFT FINAL RI/FS REPORT

Drawing
1984 AERIAL PHOTOGRAPH WITH SITE FEATURES

Date	MARCH 2021	Scale	AS SHOWN	Fig. No.	2.2-5
File Name	SITE PLANS 1947-1995	Project No.	108.00228.00061		

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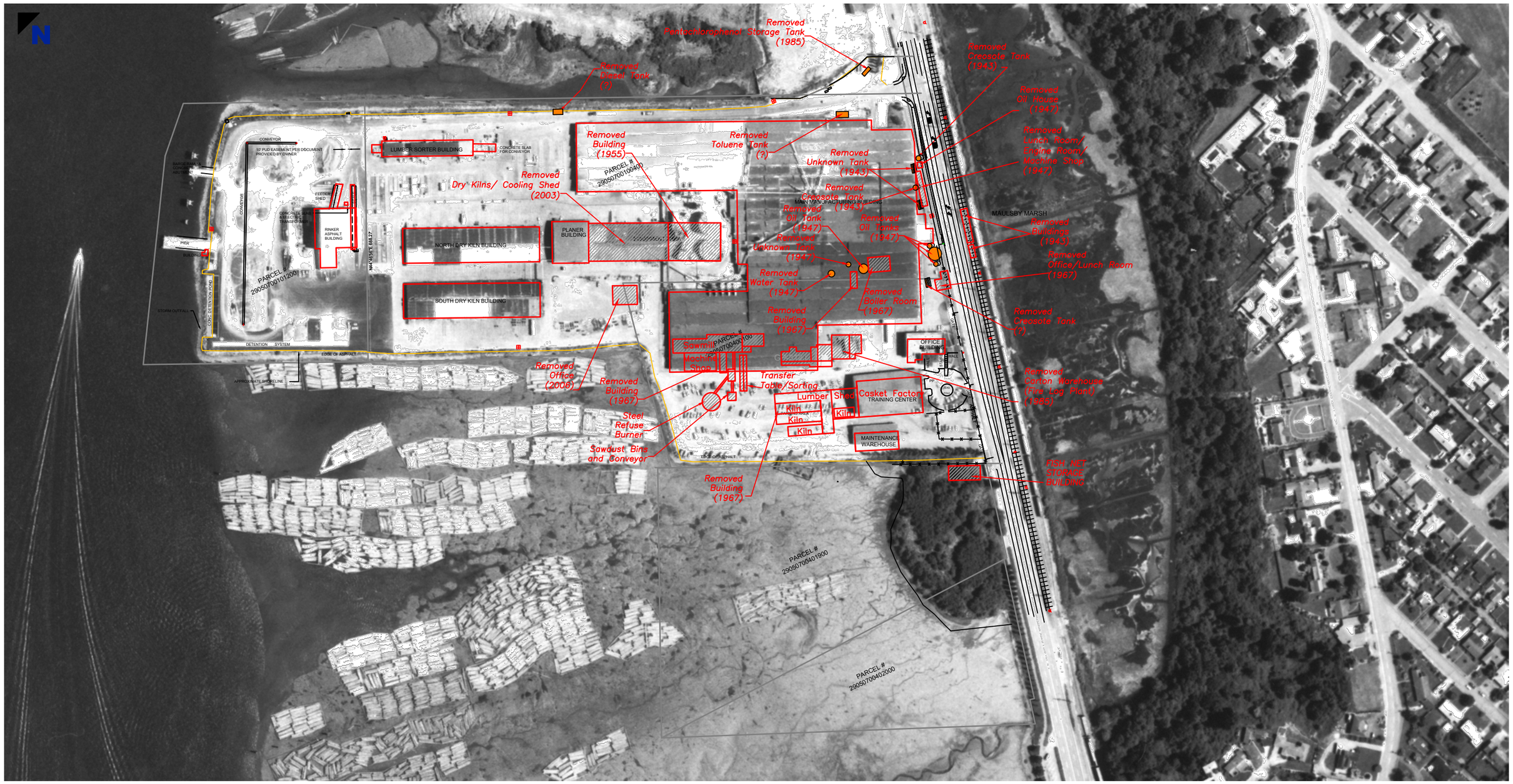

LEGEND

- REMOVED BUILDINGS
- REMOVED TANKS
- (1945) LAST YEAR FEATURE VISIBLE ON AERIAL PHOTOGRAPHS

NOTES

THE BUILDINGS, SURFACE UTILITIES, EDGE OF PAVEMENT, AND APPROXIMATE SHORELINE SHOWN ON THIS MAP ARE BASED ON A 2006 SURVEY PERFORMED BY WH PACIFIC.

0 250 500 750'

JELD-WEN/FORMER NORD DOOR FACILITY
300 WEST MARINE VIEW DRIVE
EVERETT, WASHINGTON

Report
DRAFT FINAL RI/FS REPORT

Drawing
1995 AERIAL PHOTOGRAPH WITH SITE FEATURES

Date	MARCH 2021	Scale	AS SHOWN	Fig. No. 2.2-6
File Name	SITE PLANS 1947-1995	Project No.	108.00228.00061	

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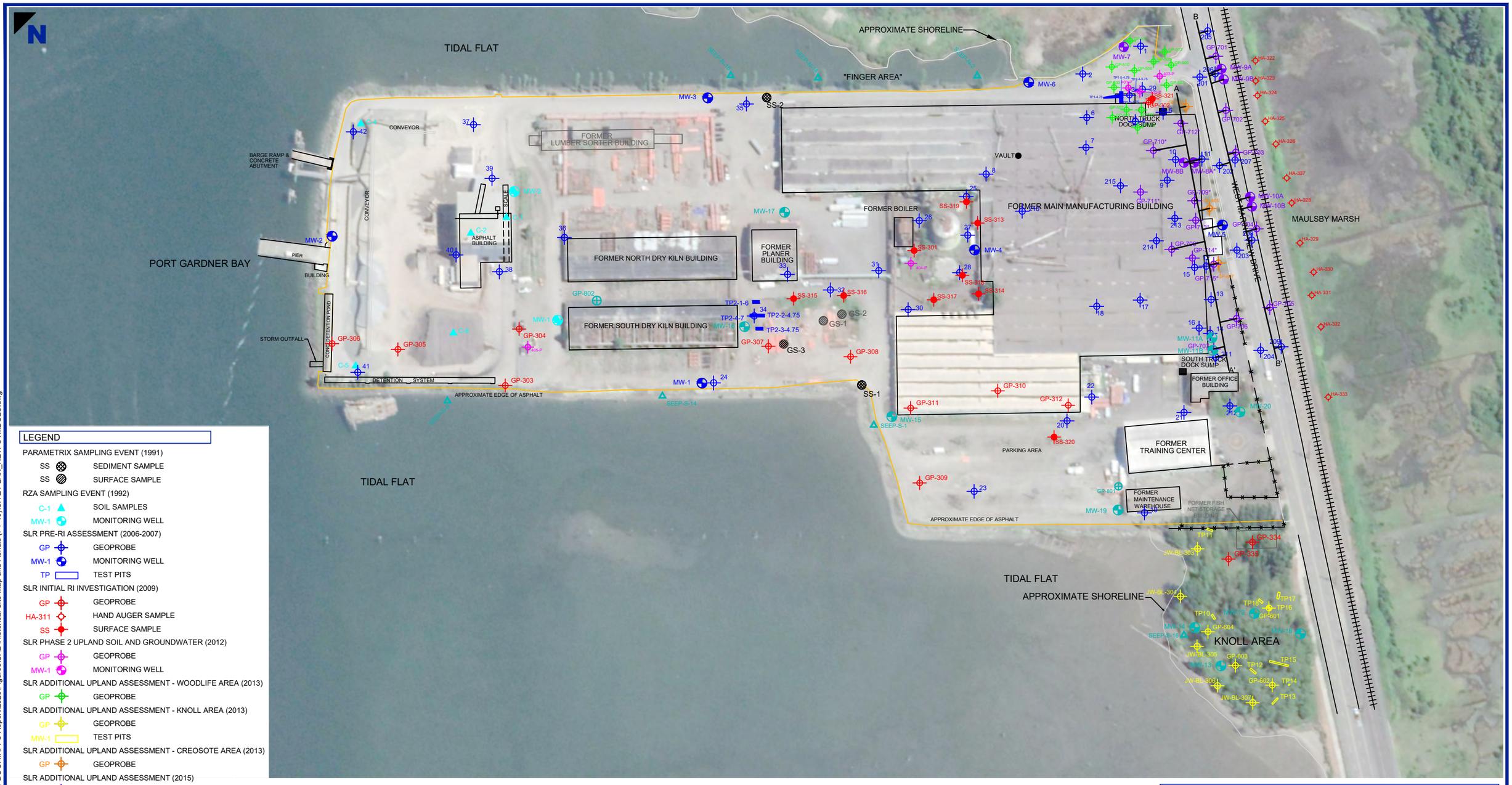

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LEGEND

PARAMETRIX SAMPLING EVENT (1991)
- SS — SEDIMENT SAMPLE
- SS — SURFACE SAMPLE

RZA SAMPLING EVENT (1992)
- C-1 — SOIL SAMPLES
- MW-1 — MONITORING WELL

SLR PRE-RI ASSESSMENT (2006-2007)
- GP — GEOPROBE
- MW-1 — MONITORING WELL
- TP — TEST PITS

SLR INITIAL RI INVESTIGATION (2009)
- GP — GEOPROBE
- HA-311 — HAND AUGER SAMPLE
- SS — SURFACE SAMPLE

SLR PHASE 2 UPLAND SOIL AND GROUNDWATER (2012)
- GP — GEOPROBE
- MW-1 — MONITORING WELL

SLR ADDITIONAL UPLAND ASSESSMENT - WOODLIFE AREA (2013)
- GP — GEOPROBE

SLR ADDITIONAL UPLAND ASSESSMENT - KNOLL AREA (2013)
- GP — GEOPROBE
- MW-1 — TEST PITS

SLR ADDITIONAL UPLAND ASSESSMENT - CREOSOTE AREA (2013)
- GP — GEOPROBE

SLR ADDITIONAL UPLAND ASSESSMENT (2015)
- GP — GEOPROBE
- MW-1 — MONITORING WELL
- * — SAMPLES WITH SOIL-GAS MEASUREMENTS

SLR SOURCE CONTROL EVALUATION (2018-2019)
- GP — GEOPROBE
- MW-1 — MONITORING WELL
- SEEP — SEEP

NOTES

THE BUILDINGS, SURFACE UTILITIES, EDGE OF PAVEMENT, AND APPROXIMATE SHORELINE SHOWN ON THIS MAP ARE BASED ON A 2006 SURVEY PERFORMED BY WH PACIFIC.

AERIAL PHOTO FROM GOOGLE EARTH PRO, JULY 2019

0 200 400 600’

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JELD-WEN/FORMER NORD DOOR FACILITY
300 WEST MARINE VIEW DRIVE
EVERETT, WASHINGTON

Report
DRAFT FINAL RI/FS REPORT

Drawing
UPLAND SAMPLE LOCATIONS

Date	March 2021	Scale	AS SHOWN
File Name	SITE PLAN_NEW SYMBOLS	Project No.	108.00228.00061

Fig. No. 2.3-1

Sea Level Rise Contours in feet (MLLW)

Innundation Levels

< 13 ft MLLW (~2 ft of Sea Level Rise)

13.1 - 15 ft MLLW (~4 ft of Sea Level Rise)

15.1 - 17 ft MLLW (~6 ft of Sea Level Rise)

NOTES:
1. Contours developed from the Snohomish River Estuary LiDAR survey from 2009.

Feet
0 125 250 375 500

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Figure 3.4-1
Sea Level Rise Projections
Draft Final RI/FS
Jeld-Wen/Former Nord Door Facility

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Figure 3.6
Critical Areas Summary
Draft Final RI/FS
Jeld-Wen/Former Nord Door Facility

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Figure 4.3-1
Surface Sediment Sampling Stations
Draft Final RI/FS
Jeld-Wen/Former Nord Door Facility

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Figure 4.3-2
Tissue Sampling and Reference Areas
Draft Final RI/FS
Jeld-Wen/Former Nord Door Facility

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Figure 4.3-3
Surface Sediment cPAH TEQ Concentrations
Draft Final RI/FS
Jeld-Wen/Former Nord Door Facility

PCB Locations

Stormwater Outfall

Jeld-Wen Outfall

Parcels

Site Boundary

PCB-dw Inverse Distance Weighting (IDW) Analysis µg/kg dw

- < 3.5
- 3.6 - 15
- 15.1 - 30
- 30.1 - 117
- 117.1 - 130
- > 130

NOTES:
1. Total Polychorinated Biphenyls (PCB) congener and aroclor surface sediment dry weight concentrations where U=0.
2. Not all stations used in interpolation are shown on figure
3. Regional background locations are not shown due to scale.
4. Where exposure area composites were analyzed discretely, composite result not included in interpolation.
5. Duplicate samples and SLR FS location results were averaged for IDW analysis.

Feet
0 125 250 375 500

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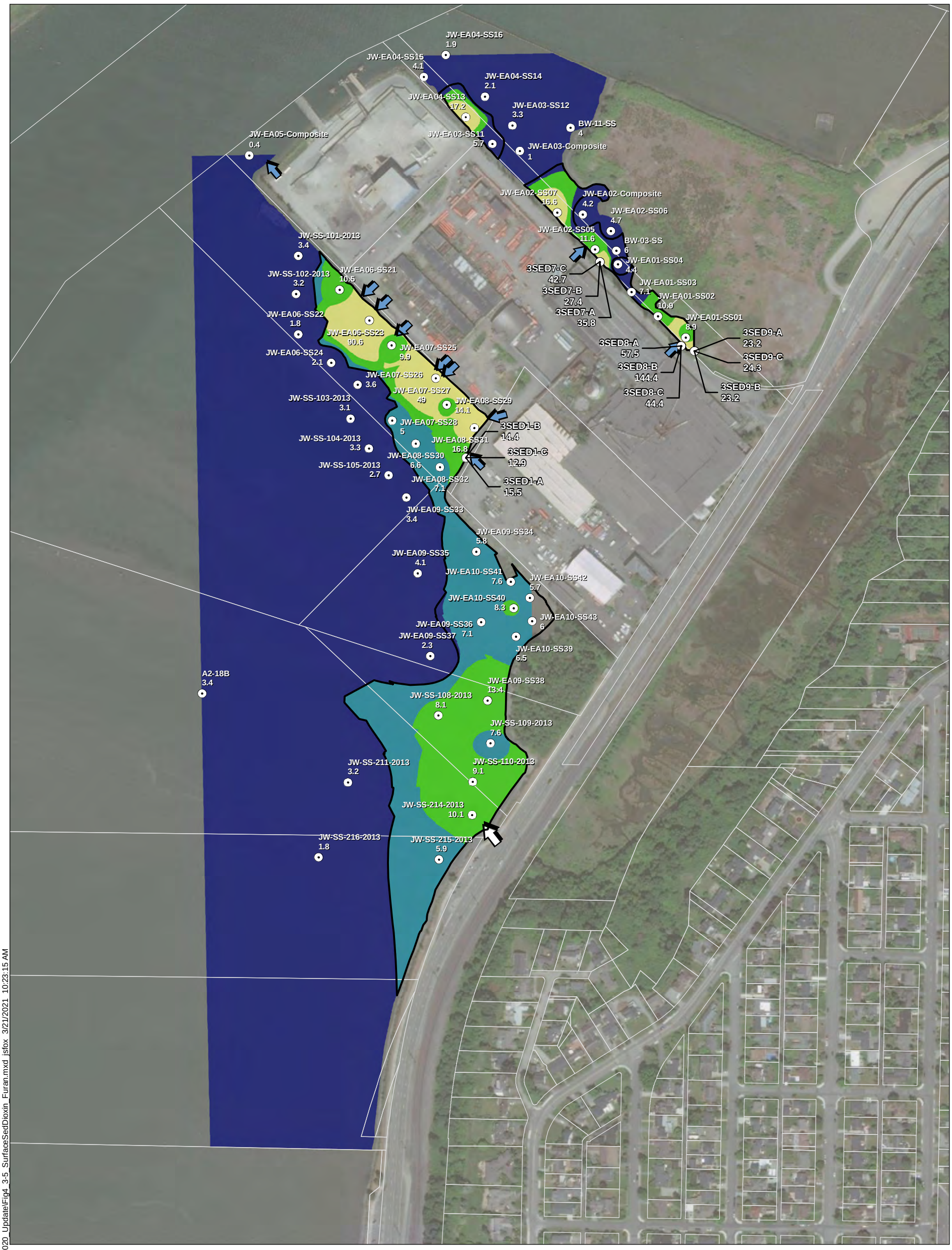
Figure 4.3-4
Surface Sediment Total PCB Concentrations
Draft Final RI/FS
Jeld-Wen/Former Nord Door Facility



Dioxin/Furan Locations

Stormwater Outfall

Jeld-Wen Outfall

Parcels

Site Boundary

Dioxin/Furan TEQ Inverse Distance Weighting (IDW) Analysis ng/kg dw

- < 5
- 5.1 - 8
- 8.1 - 15
- > 15

Feet

0 150 300 450 600

NOTES:

1. Total dioxin/furan surface sediment results 2005 Toxic Equivalency (TEQ) for mammals where U=1/2.
2. Stations shown on figure are included in IDW interpolation.
3. Where Exposure Area composites were analyzed discretely, composite result not included in interpolation.
4. Duplicate samples and SLR FS location results were averaged for IDW interpolation.
5. ng/kg = nanograms per kilograms

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Figure 4.3-5
Surface Sediment Dioxin/Furan Concentrations
Draft Final RI/FS
Jeld-Wen/Former Nord Door Facility

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Figure 4.3-6
Surface Sediment PCB TEQ Concentrations
Draft Final RI/FS
Jeld-Wen/ Former Nord Door Facility

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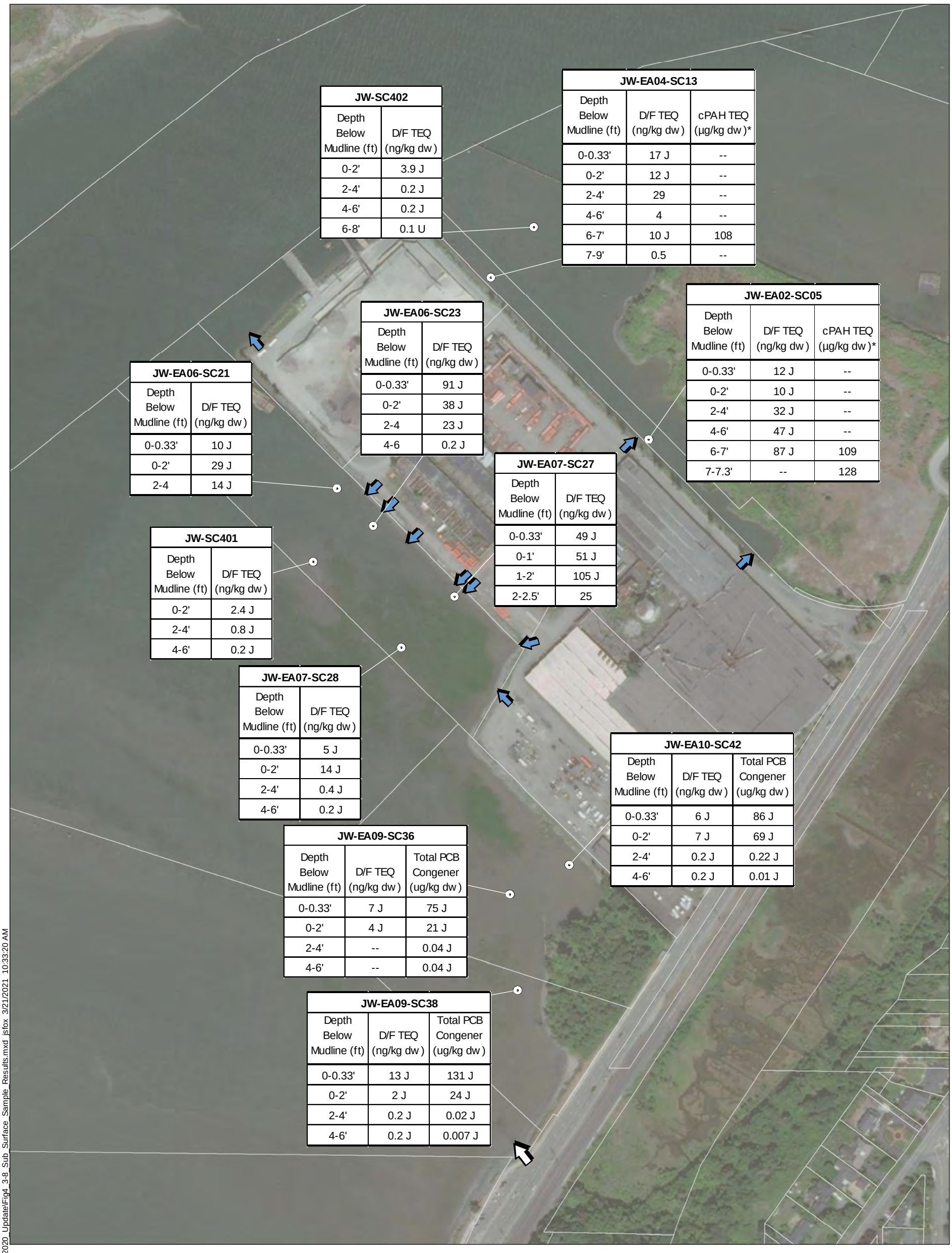
Figure 4.3-7
Subsurface Sediment Sampling Stations
Draft Final RI/FS
Jeld-Wen/Former Nord Door Facility



JW-SC402	
Depth Below Mudline (ft)	D/F TEQ (ng/kg dw)
0-2'	3.9 J
2-4'	0.2 J
4-6'	0.2 J
6-8'	0.1 U

JW-EA04-SC13		
Depth Below Mudline (ft)	D/F TEQ (ng/kg dw)	cPAH TEQ (µg/kg dw)*
0-0.33'	17 J	--
0-2'	12 J	--
2-4'	29	--
4-6'	4	--
6-7'	10 J	108
7-9'	0.5	--

JW-EA06-SC23	
Depth Below Mudline (ft)	D/F TEQ (ng/kg dw)
0-0.33'	91 J
0-2'	38 J
2-4	23 J
4-6	0.2 J

JW-EA02-SC05		
Depth Below Mudline (ft)	D/F TEQ (ng/kg dw)	cPAH TEQ (µg/kg dw)*
0-0.33'	12 J	--
0-2'	10 J	--
2-4'	32 J	--
4-6'	47 J	--
6-7'	87 J	109
7-7.3'	--	128

JW-EA06-SC21	
Depth Below Mudline (ft)	D/F TEQ (ng/kg dw)
0-0.33'	10 J
0-2'	29 J
2-4	14 J

JW-EA07-SC27	
Depth Below Mudline (ft)	D/F TEQ (ng/kg dw)
0-0.33'	49 J
0-1'	51 J
1-2'	105 J
2-2.5'	25

JW-SC401	
Depth Below Mudline (ft)	D/F TEQ (ng/kg dw)
0-2'	2.4 J
2-4'	0.8 J
4-6'	0.2 J

JW-EA07-SC28	
Depth Below Mudline (ft)	D/F TEQ (ng/kg dw)
0-0.33'	5 J
0-2'	14 J
2-4'	0.4 J
4-6'	0.2 J

JW-EA10-SC42		
Depth Below Mudline (ft)	D/F TEQ (ng/kg dw)	Total PCB Congener (ug/kg dw)
0-0.33'	6 J	86 J
0-2'	7 J	69 J
2-4'	0.2 J	0.22 J
4-6'	0.2 J	0.01 J

JW-EA09-SC36		
Depth Below Mudline (ft)	D/F TEQ (ng/kg dw)	Total PCB Congener (ug/kg dw)
0-0.33'	7 J	75 J
0-2'	4 J	21 J
2-4'	--	0.04 J
4-6'	--	0.04 J

JW-EA09-SC38		
Depth Below Mudline (ft)	D/F TEQ (ng/kg dw)	Total PCB Congener (ug/kg dw)
0-0.33'	13 J	131 J
0-2'	2 J	24 J
2-4'	0.2 J	0.02 J
4-6'	0.2 J	0.007 J

Sub-Surface Sample Locations

Parcels

Stormwater Outfall

Jeld-Wen Outfall

Feet
0 125 250 375 500

NOTES:
1. Total dioxin/furan surface sediment results 2005
Toxic Equivalency (TEQ) for mammals where U=1/2.
2.Total Polychlorinated Biphenyls (PCB) congener surface sediment concentrations dry weight where U=0.
3. Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAH) TEQ were calculated where U = 1/2
4. Duplicate results averaged.
ng/kg dw = nanograms per kilograms dry weight
µg/kg dw = micrograms per kilograms dry weight
ft = feet
* = During core collection at location SC-05, sediments in the 6- to 7-foot interval exhibited visual and olfactory characteristics (staining and hydrocarbon-like odor) indicative of potential contamination. In consultation with Ecology, select subsurface intervals were submitted for semi-volatile organic compound testing including PAHs. Core logs and comprehensive subsurface results are presented appendices to this document.

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Figure 4.3-8
Subsurface Sediment Dioxin/Furan and Total PCB Concentrations
Draft Final RI/FS
Jeld-Wen/Former Nord Door Facility

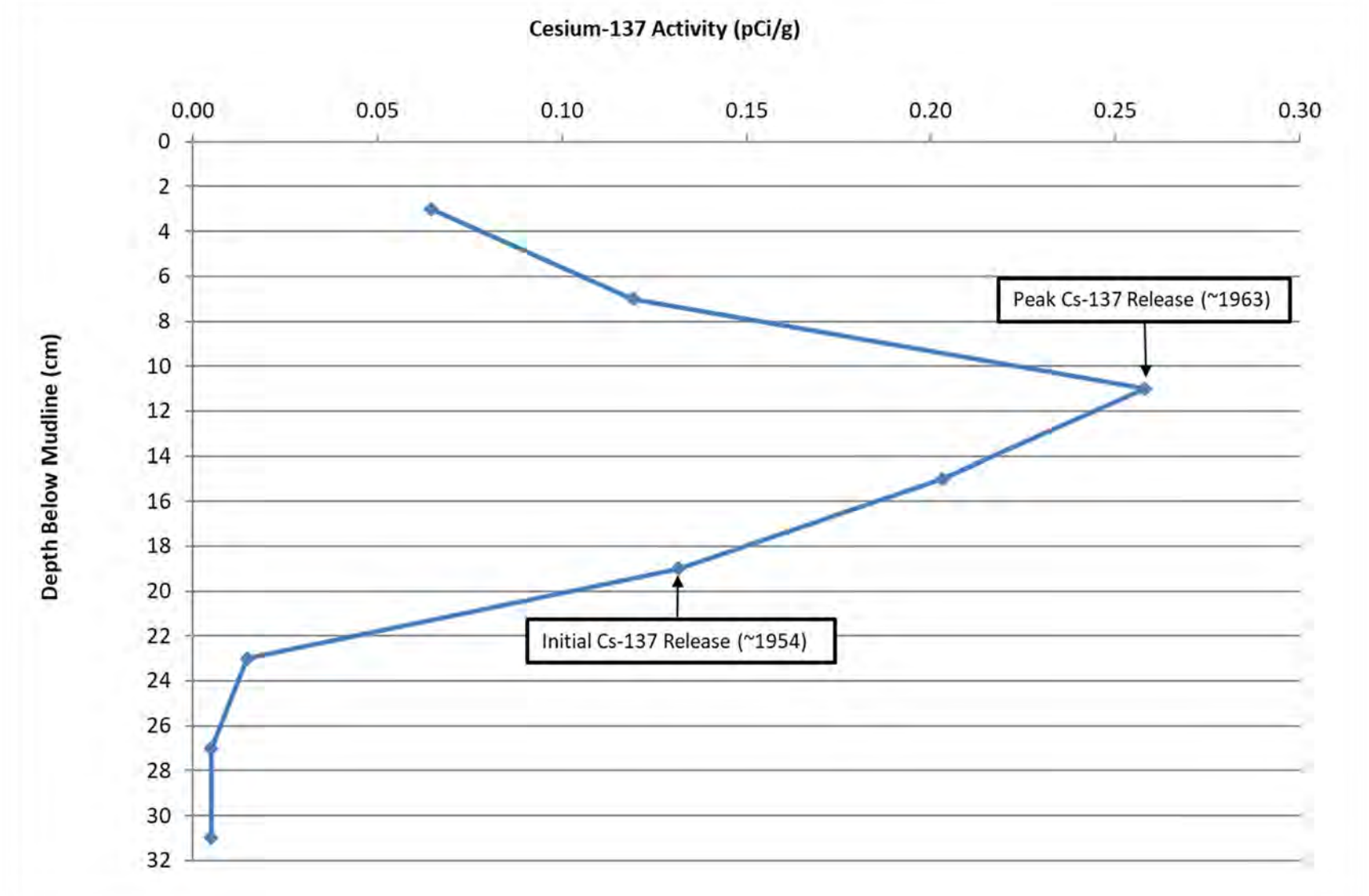

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Figure 4.3-9
JW-GC-2 Cesium-137 Profile
Draft Final RI/FS
Jeld-Wen/Former Nord Door Facility

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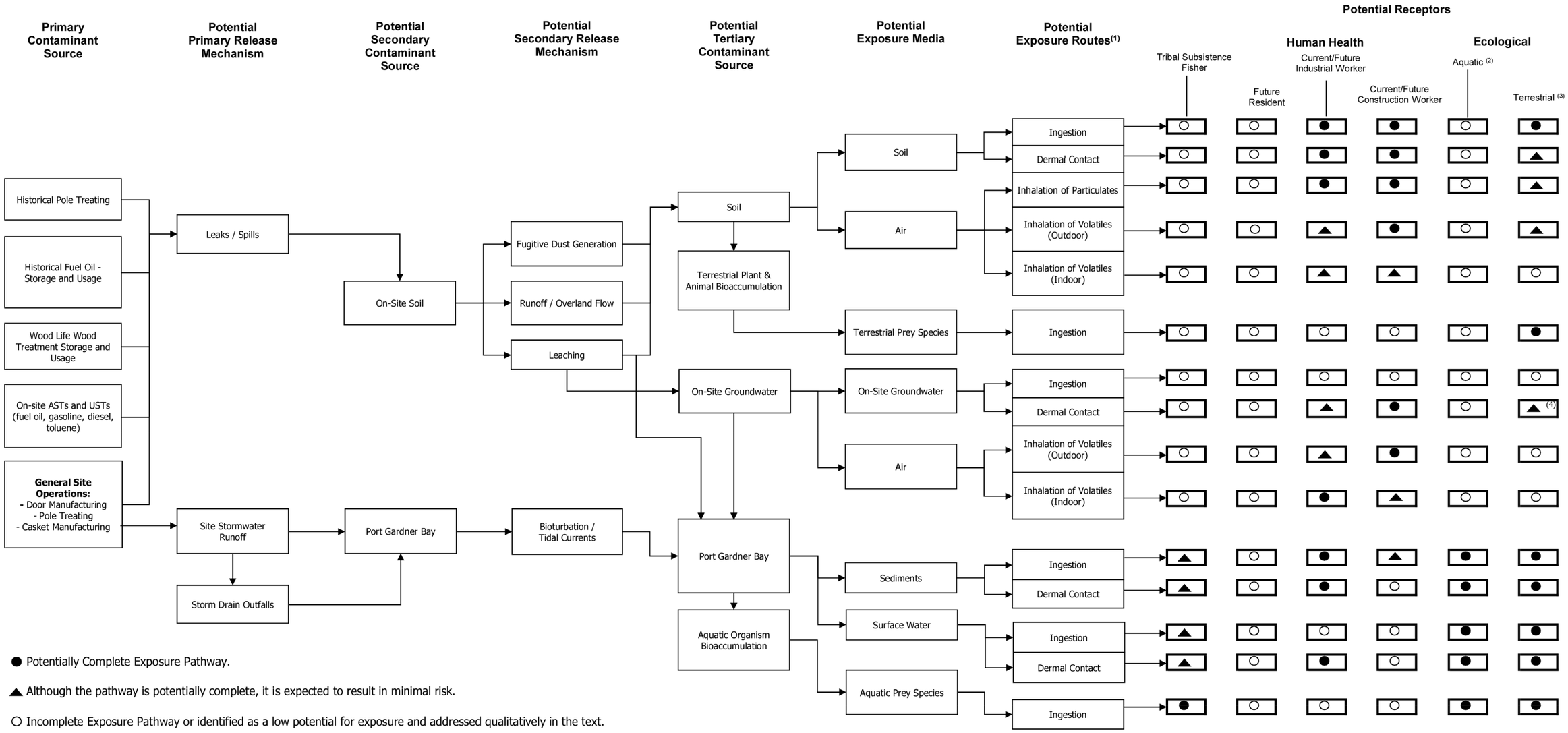
Figure 4.3-10
Total Dioxin/Furan PCB TEQ Results
Draft Final RI/FS
Jeld-Wen/Former Nord Door Facility



● Potentially Complete Exposure Pathway.

▲ Although the pathway is potentially complete, it is expected to result in minimal risk.

○ Incomplete Exposure Pathway or identified as a low potential for exposure and addressed qualitatively in the text.

(1) Preliminary cleanup levels are based on industrial land use.
(2) Aquatic ecological receptors may include mammals, birds, fish/shellfish, benthic invertebrates, reptiles, amphibians and aquatic vegetation.
(3) Terrestrial ecological receptors may include mammals, birds, reptiles, amphibians, invertebrates and terrestrial vegetation.
(4) This completed pathway is based on terrestrial vegetation (roots) coming into contact with groundwater.

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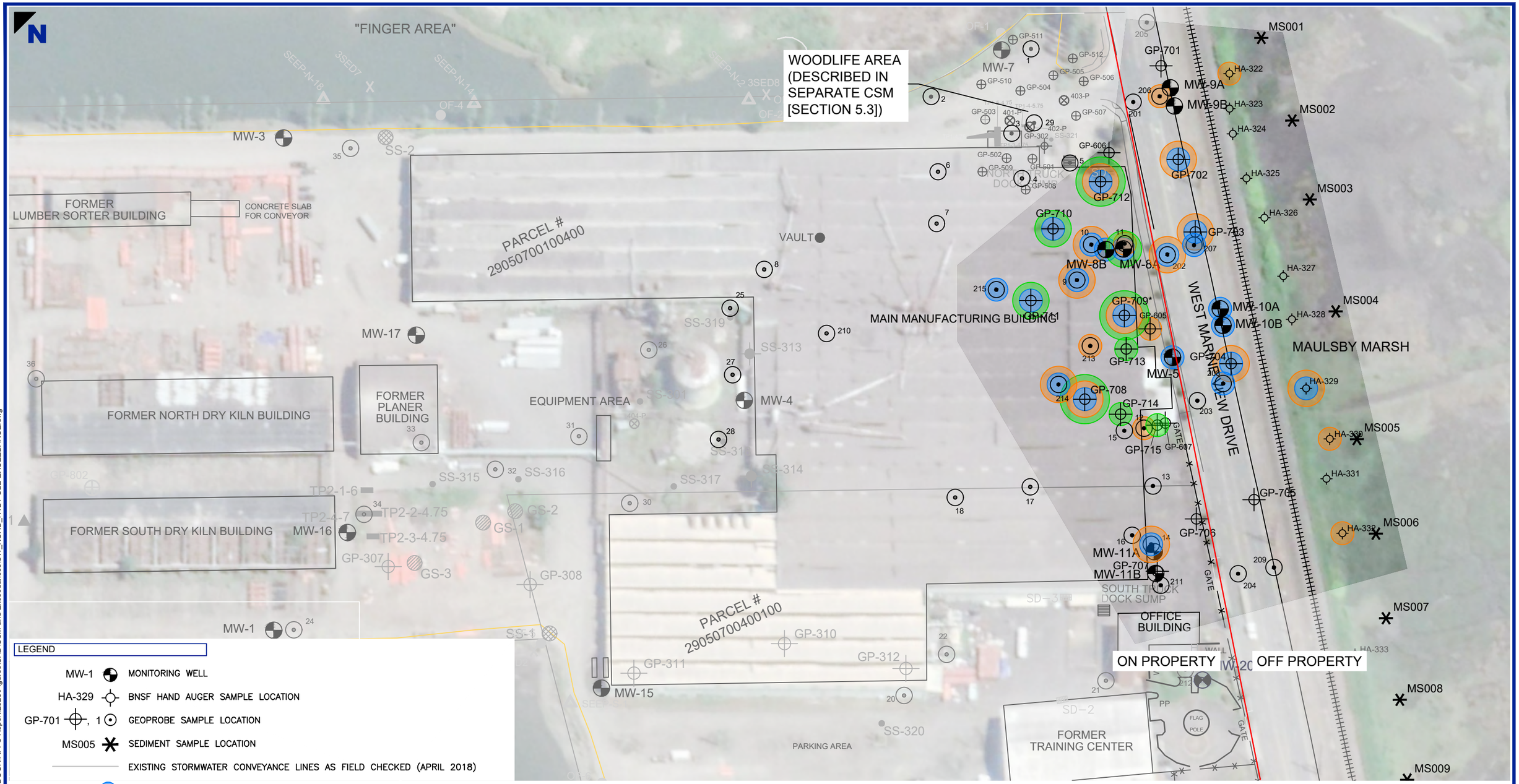
Figure 5
Conceptual Site Model
Draft Final RI/FS
Jeld-Wen/Former Nord Door Facility



LEGEND

- MW-1 — MONITORING WELL
- HA-329 — BNSF HAND AUGER SAMPLE LOCATION
- GP-701, 1 — GEOPROBE SAMPLE LOCATION
- MS005 — SEDIMENT SAMPLE LOCATION
- EXISTING STORMWATER CONVEYANCE LINES AS FIELD CHECKED (APRIL 2018)
- GROUNDWATER EXCEEDANCE OF NAPHTHALENE PCL (BASED ON VAPOR INTRUSION)
- SOIL EXCEEDANCE OF cPAH PCL (BASED ON DIRECT CONTACT)
- SOIL GAS EXCEEDANCE OF NAPHTHALENE PCL

NOTES

THE BUILDINGS, SURFACE UTILITIES, EDGE OF PAVEMENT, AND APPROXIMATE SHORELINE SHOWN ON THIS MAP ARE BASED ON A 2006 SURVEY PERFORMED BY WH PACIFIC.

0 115 230 345'

JELD-WEN/FORMER NORD DOOR FACILITY
300 WEST MARINE VIEW DRIVE
EVERETT, WASHINGTON

Report: DRAFT FINAL RI/FS REPORT

Drawing: CREOSOTE/FUEL OIL AREA SUMMARY

Date	MARCH 2021	Scale	AS SHOWN	Fig. No.
File Name	SW_NORD_NTL POLE EXCEEDANCE	Project No.	108.00228.00061	5.2-1

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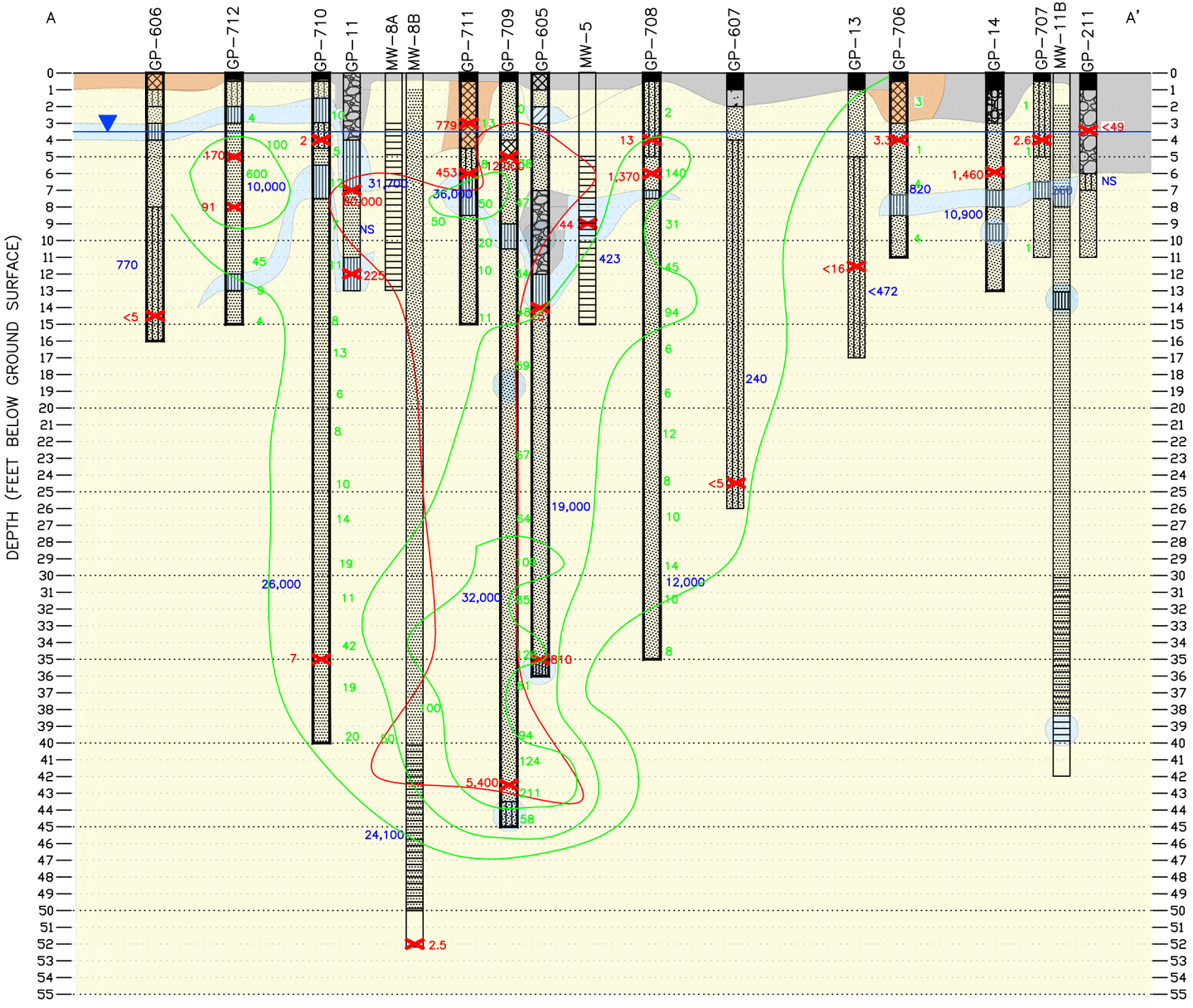

APPROXIMATE HORIZONTAL SCALE

0 75 150 225'

APPROXIMATE VERTICAL SCALE

0 7.5 15 22.5'

N

NOTES

NOT ALL SAMPLE LOCATIONS PRESENTED ON THIS CROSS SECTION

NOT ALL SAMPLE ANALYTICAL RESULTS PRESENTED (LIMITED TO SOIL AND GROUNDWATER SAMPLES FOR TPH–Dx (DIESEL RANGE))

PCLs
2,000 MG/KG FOR SATURATED SOIL
500 UG/L FOR GROUNDWATER

LEGEND

- APPROXIMATE GROUNDWATER LEVEL
- AS ASPHALT
- CL CLAY
- CONCRETE
- GM GRAVEL WITH SILT
- GP GRAVEL AND SAND
- PT PEAT
- ML SILT
- SM SILTY SAND
- SP SAND
- TOPSOIL
- SAND/SILTY SAND
- SILT
- TOPSOIL
- GRAVEL/CEMENT
- SOIL SAMPLE LOCATION
- 200 SOIL ANALYTICAL RESULTS (TPH–Dx DIESEL RANGE IN MG/KG)
- 700 GROUNDWATER ANALYTICAL RESULTS (TPH–Dx DIESEL RANGE IN ug/L)
- NS NOT SAMPLED FOR SELECTED PARAMETER
- 25.2 PID READING IN PPM (700 SERIES GEOPROBE LOCATIONS ONLY)
- PID CONTOURS IN PPM

JELD-WEN/FORMER NORD DOOR FACILITY
300 WEST MARINE VIEW DRIVE
EVERETT, WASHINGTON

Report
DRAFT FINAL RI/FS REPORT

Drawing
ON-PROPERTY CREOSOTE/FUEL OIL AREA
CROSS SECTION

Date	MARCH 2021	Scale	AS SHOWN	Fig. No.
File Name	X SECTION_04282020	Project No.	108.00228.00048	5.2.4-1

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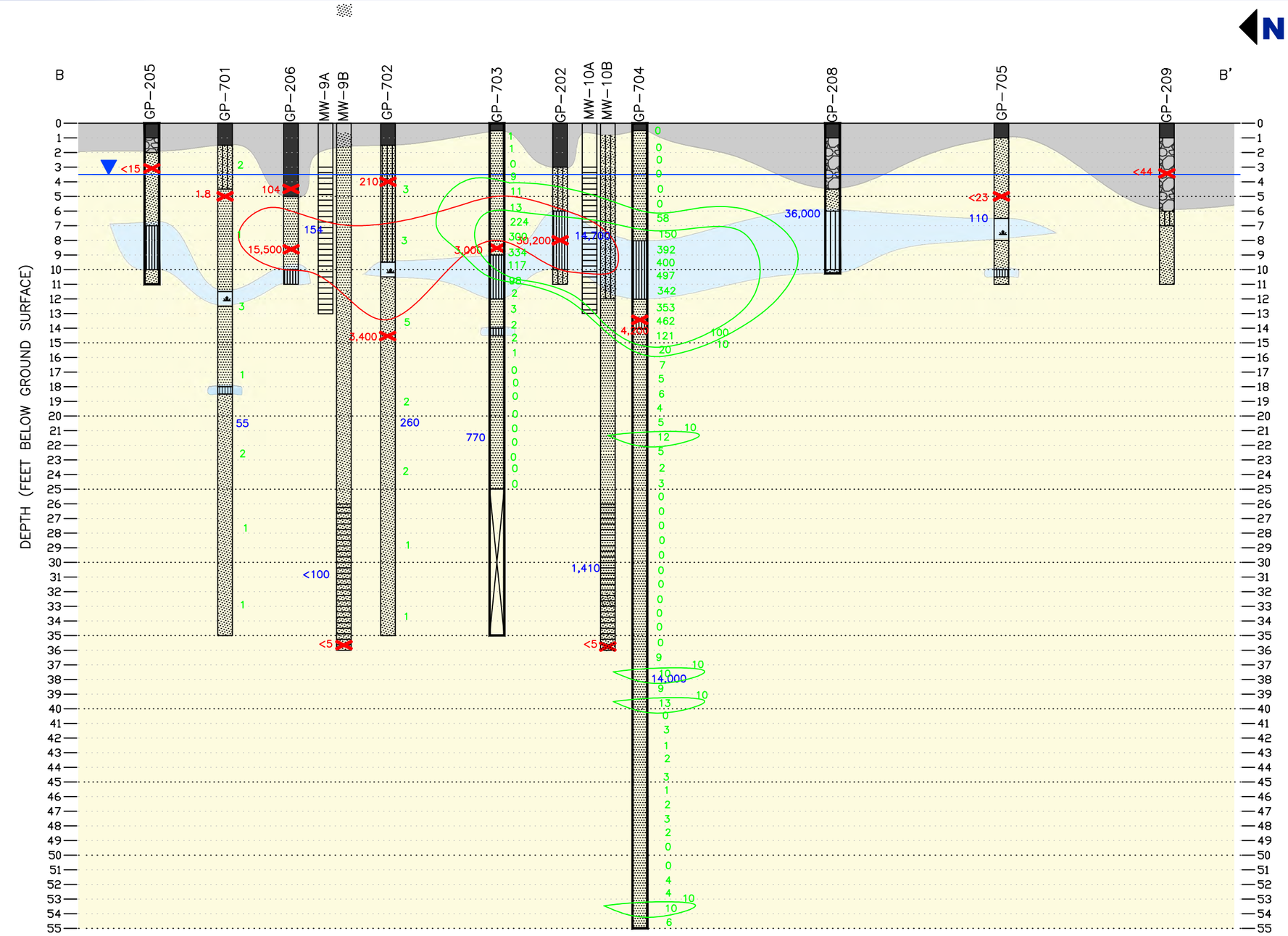

APPROXIMATE HORIZONTAL SCALE

0 75 150 225'

APPROXIMATE VERTICAL SCALE

0 7.5 15 22.5'

NOTES

NOT ALL SAMPLE LOCATIONS PRESENTED ON THIS CROSS SECTION

NOT ALL SAMPLE ANALYTICAL RESULTS PRESENTED (LIMITED TO SOIL AND GROUNDWATER SAMPLES FOR TPH-Dx (DIESEL RANGE))

PCLs
2,000 MG/KG FOR SATURATED SOIL
500 UG/L FOR GROUNDWATER

LEGEND

	APPROXIMATE GROUNDWATER LEVEL
AS	ASPHALT
CL	CLAY
	CONCRETE
GM	GRAVEL WITH SILT
GP	GRAVEL AND SAND
PT	PEAT
ML	SILT
SM	SILTY SAND
SP	SAND
	TOPSOIL
	SAND/SILTY SAND
	SILT/PEAT
	GRAVEL
	SOIL SAMPLE LOCATION
200	SOIL ANALYTICAL RESULTS (TPH-Dx DIESEL RANGE IN MG/KG)
700	GROUNDWATER ANALYTICAL RESULTS (TPH-Dx DIESEL RANGE IN ug/L)
NS	NOT SAMPLED FOR SELECTED PARAMETER
25.2	PID READINGS IN PPM (700 SERIES GEOPROBE LOCATIONS ONLY)
	PID CONTOURS IN PPM

JELD-WEN/FORMER NORD DOOR FACILITY
300 WEST MARINE VIEW DRIVE
EVERETT, WASHINGTON

Report
DRAFT FINAL RI/FS REPORT

Drawing
OFF-PROPERTY CREOSOTE/FUEL OIL AREA
CROSS SECTION

Date	MARCH 2021	Scale	AS SHOWN	Fig. No. 5.2.4-2
File Name	X SECTION_04282020	Project No.	108.00228.00048	

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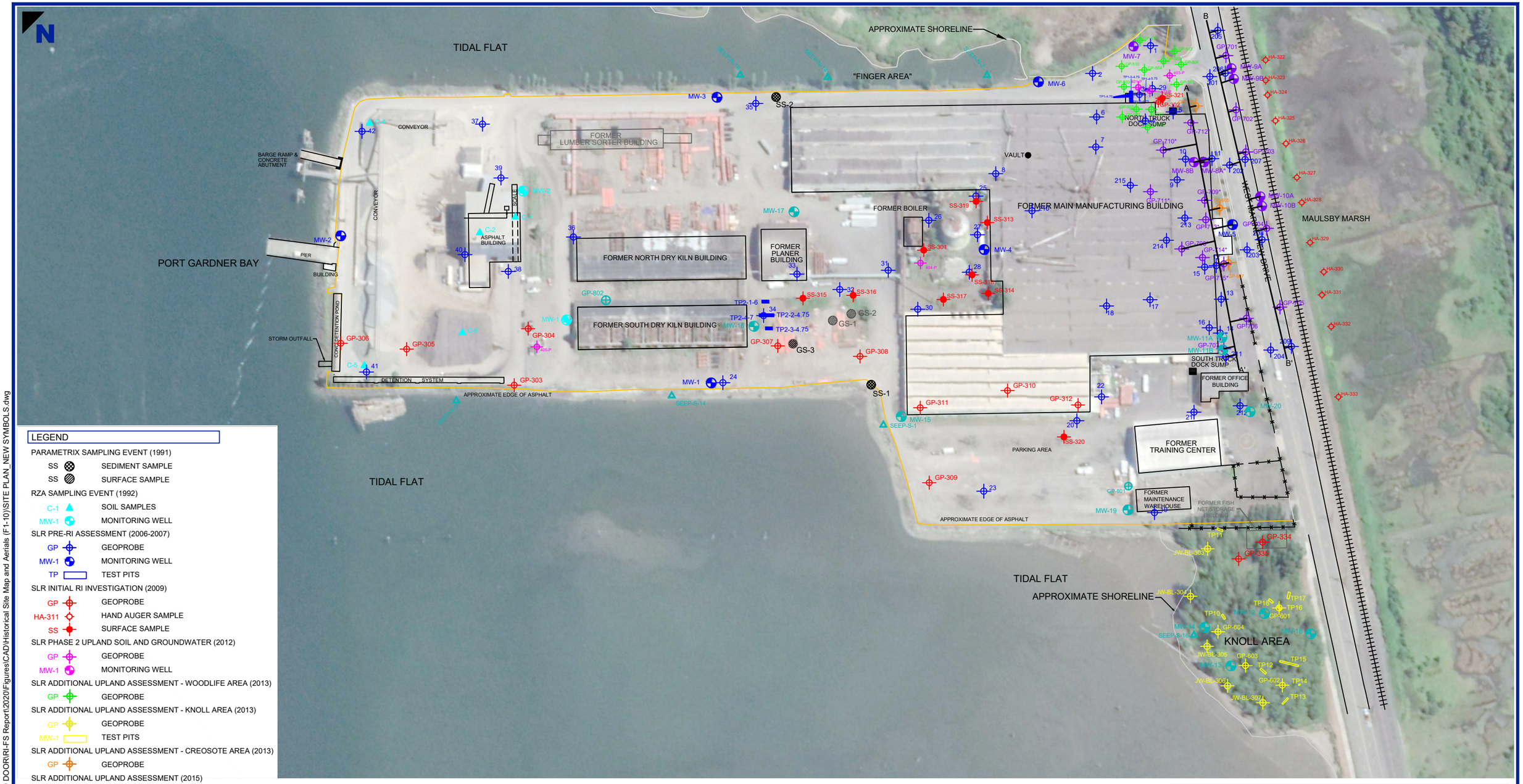

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LEGEND

PARAMETRIX SAMPLING EVENT (1991)
- SS — SEDIMENT SAMPLE
- SS — SURFACE SAMPLE

RZA SAMPLING EVENT (1992)
- C-1 — SOIL SAMPLES
- MW-1 — MONITORING WELL

SLR PRE-RI ASSESSMENT (2006-2007)
- GP — GEOPROBE
- MW-1 — MONITORING WELL
- TP — TEST PITS

SLR INITIAL RI INVESTIGATION (2009)
- GP — GEOPROBE
- HA-311 — HAND AUGER SAMPLE
- SS — SURFACE SAMPLE

SLR PHASE 2 UPLAND SOIL AND GROUNDWATER (2012)
- GP — GEOPROBE
- MW-1 — MONITORING WELL

SLR ADDITIONAL UPLAND ASSESSMENT - WOODLIFE AREA (2013)
- GP — GEOPROBE

SLR ADDITIONAL UPLAND ASSESSMENT - KNOLL AREA (2013)
- GP — GEOPROBE
- MW-1 — TEST PITS

SLR ADDITIONAL UPLAND ASSESSMENT - CREOSOTE AREA (2013)
- GP — GEOPROBE

SLR ADDITIONAL UPLAND ASSESSMENT (2015)
- GP — GEOPROBE
- MW-1 — MONITORING WELL
- * — SAMPLES WITH SOIL-GAS MEASUREMENTS

SLR SOURCE CONTROL EVALUATION (2018-2019)
- GP — GEOPROBE
- MW-1 — MONITORING WELL
- SEEP — SEEP

SLR ANCHOR QEA

NOTES

THE BUILDINGS, SURFACE UTILITIES, EDGE OF PAVEMENT, AND APPROXIMATE SHORELINE SHOWN ON THIS MAP ARE BASED ON A 2006 SURVEY PERFORMED BY WH PACIFIC.

AERIAL PHOTO FROM GOOGLE EARTH PRO, JULY 2019

0 200 400 600'

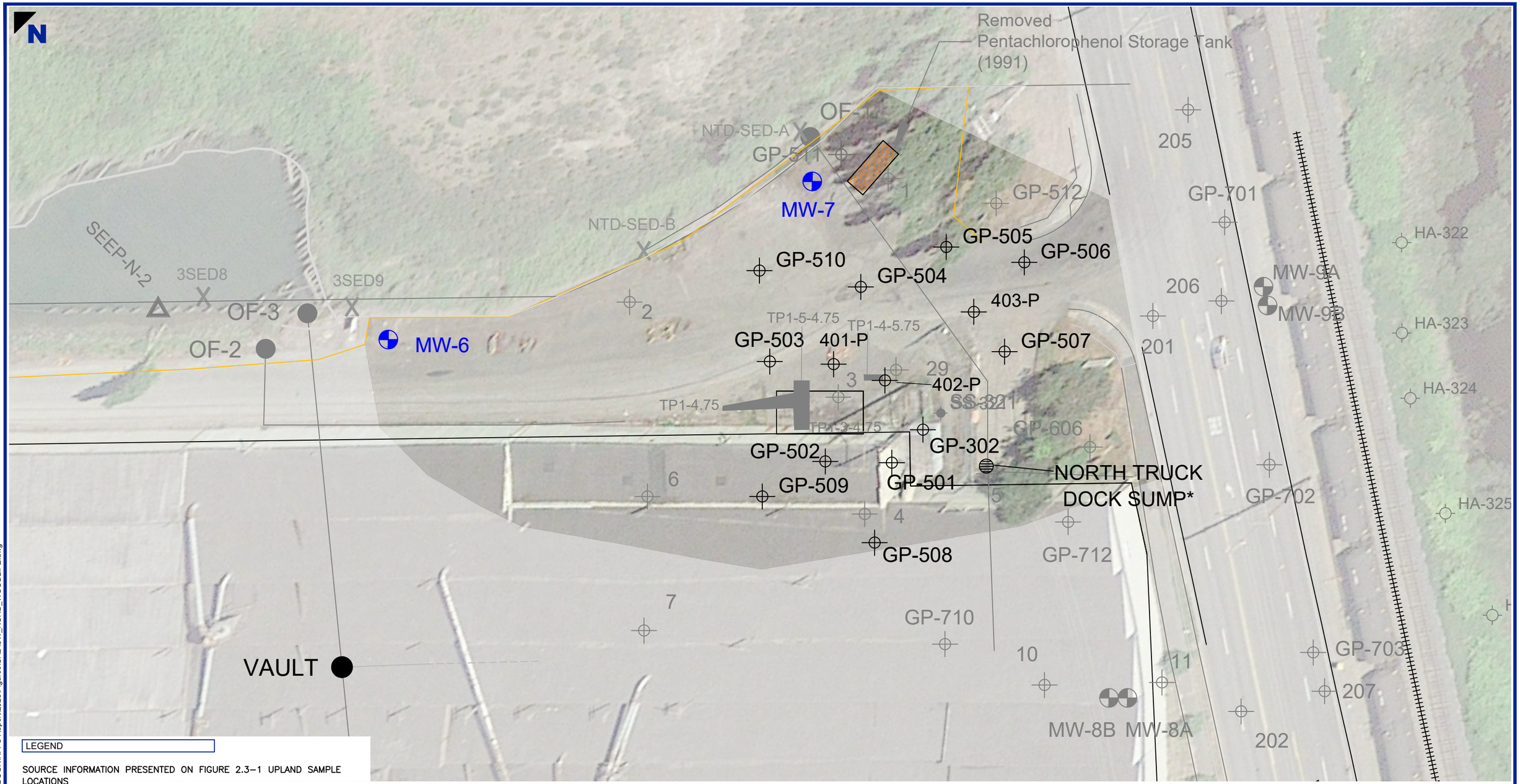
JELD-WEN/FORMER NORD DOOR FACILITY
300 WEST MARINE VIEW DRIVE
EVERETT, WASHINGTON

Report
DRAFT FINAL RI/FS REPORT

Drawing
CREOSOTE/FUEL OIL AREA CROSS SECTION PLAN

Date	December 2020	Scale	AS SHOWN
File Name	SITE PLAN_NEW SYMBOLS	Project No.	108.00228.00061

Fig. No. 5.2.4-3



LEGEND

SOURCE INFORMATION PRESENTED ON FIGURE 2.3–1 UPLAND SAMPLE LOCATIONS

SAMPLE LOCATIONS ANALYZED FOR DIOXINS/FURANS IN SOIL AND/OR GROUNDWATER SHOWN IN BLACK

*SAMPLE LOCATIONS NTD–SED–0418, NTD–SW–EAST–0418, NTD–SW–WEST–0418, NTD–SW–3"–0418, AND NTD–SW–8"–0418 COLLECTED AT THE NORTH TRUCK DOCK SUMP

NOTES

THE BUILDINGS, SURFACE UTILITIES, EDGE OF PAVEMENT, AND APPROXIMATE SHORELINE SHOWN ON THIS MAP ARE BASED ON A 2006 SURVEY PERFORMED BY WH PACIFIC.

0 45 90 135'

JELD-WEN/FORMER NORD DOOR FACILITY
300 WEST MARINE VIEW DRIVE
EVERETT, WASHINGTON

Report
DRAFT FINAL RI/FS REPORT

Drawing
WOODLIFE AREA SUMMARY

Date	MARCH 2021	Scale	AS SHOWN	Fig. No.	5.3-1
File Name	SW_NORD_WOODLIFE	Project No.	108.00228.00061		

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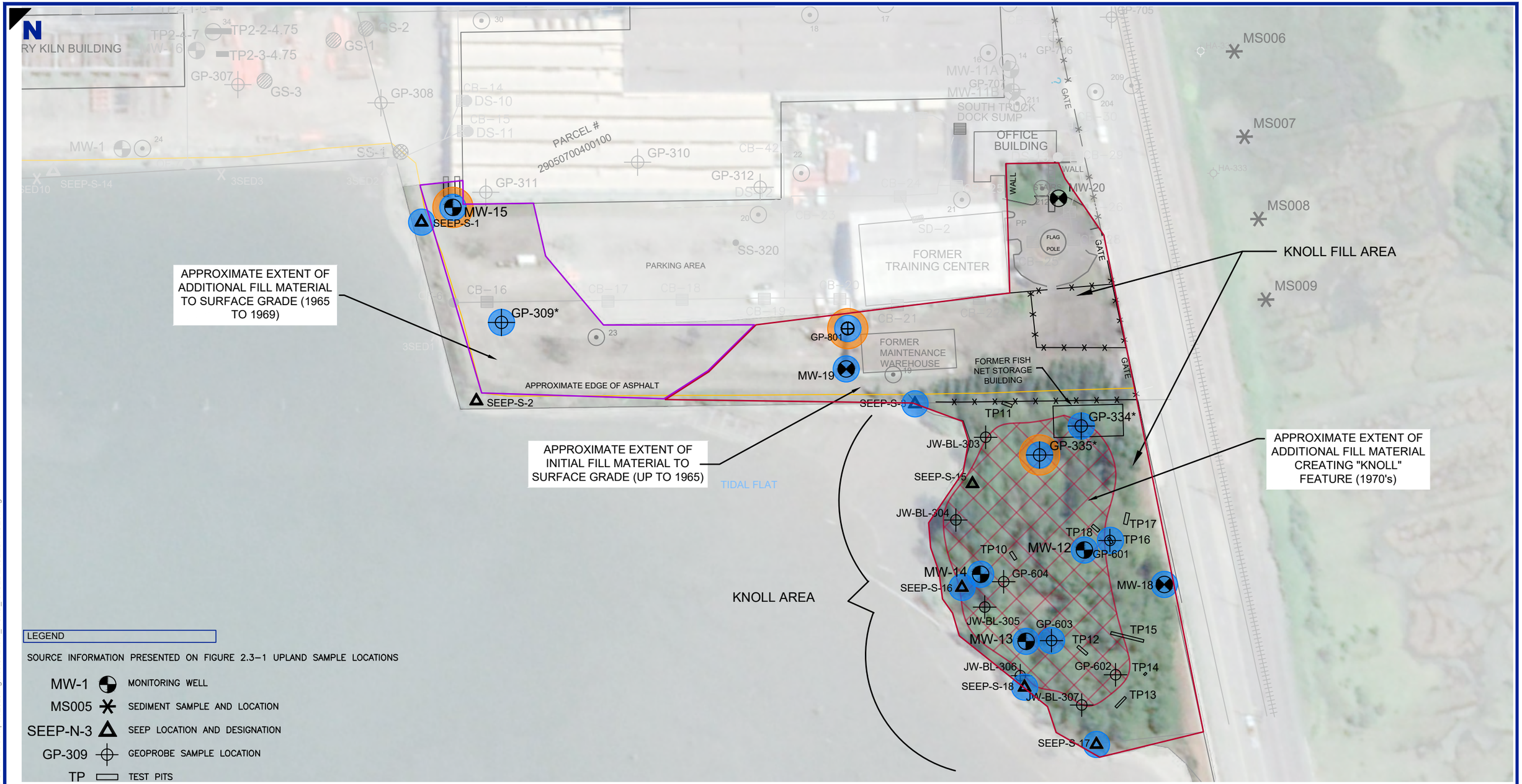

LEGEND

SOURCE INFORMATION PRESENTED ON FIGURE 2.3–1 UPLAND SAMPLE LOCATIONS

- MW-1 — MONITORING WELL
- MS005 — SEDIMENT SAMPLE AND LOCATION
- SEEP-N-3 — SEEP LOCATION AND DESIGNATION
- GP-309 — GEOPROBE SAMPLE LOCATION
- TP — TEST PITS

EXISTING STORMWATER CONVEYANCE LINES AS FIELD CHECKED (APRIL 2018)

GROUNDWATER EXCEEDANCE OF TOTAL PCB PCL
(* DENOTES EXCEEDANCE OF METALS PCL)

SOIL EXCEEDANCE OF APPLICABLE PCL

NOTES

THE BUILDINGS, SURFACE UTILITIES, EDGE OF PAVEMENT, AND APPROXIMATE SHORELINE SHOWN ON THIS MAP ARE BASED ON A 2006 SURVEY PERFORMED BY WH PACIFIC.

0 110 220 330'

JELD-WEN/FORMER NORD DOOR FACILITY
300 WEST MARINE VIEW DRIVE
EVERETT, WASHINGTON

Report
DRAFT FINAL RI/FS REPORT

Drawing
KNOLL FILL AREA SUMMARY

Date	MARCH 2021	Scale	AS SHOWN	Fig. No.
File Name	SW_NORD_KNOLL EXCEEDANCES	Project No.	108.00228.00061	5.4-1

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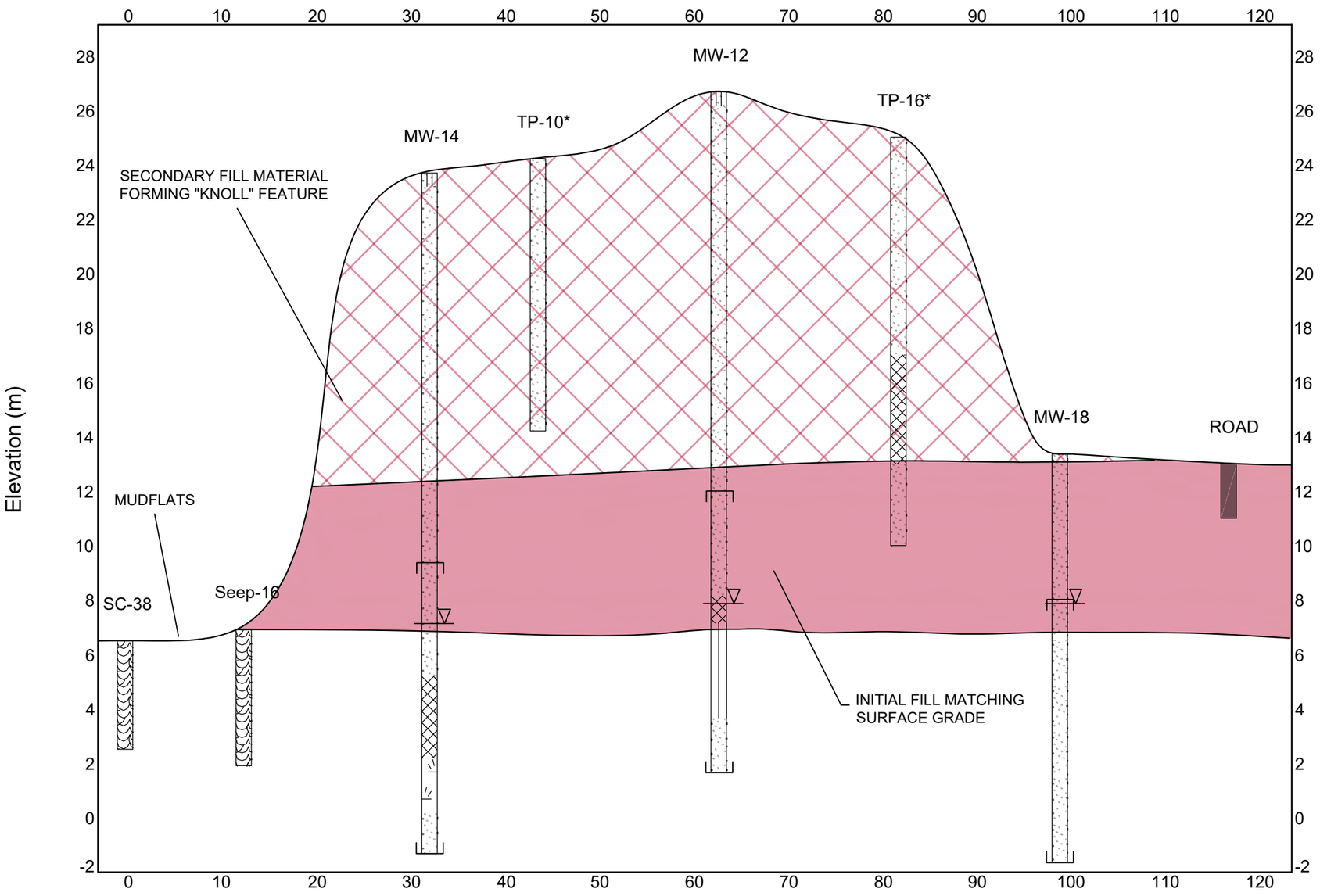

APPROXIMATE HORIZONTAL SCALE

0 12 24 36'

APPROXIMATE VERTICAL SCALE

0 4 8 12'

NOTES

NOT ALL SAMPLE LOCATIONS PRESENTED ON THIS CROSS SECTION

LEGEND

- SM
- SP
- FILL
- ML
- PT
- ASPHALT
- OHSH
- INITIAL FILL (UP TO 1965)
- "KNOLL" FILL (1970s)
- WATER LEVEL MEASURED ON 10/25/2019
- SCREEN SECTION OF MONITORING WELL
- * ESTIMATED SURFACE ELEVATION

JELD-WEN/FORMER NORD DOOR FACILITY
300 WEST MARINE VIEW DRIVE
EVERETT, WASHINGTON

Report: DRAFT FINAL RI/FS REPORT

Drawing: KNOLL CROSS SECTION

Date	MARCH 2021	Scale	AS SHOWN	Fig. No.
File Name	SW_NORD_XSECTIONS	Project No.	108.00228.00061	5.4.2-1

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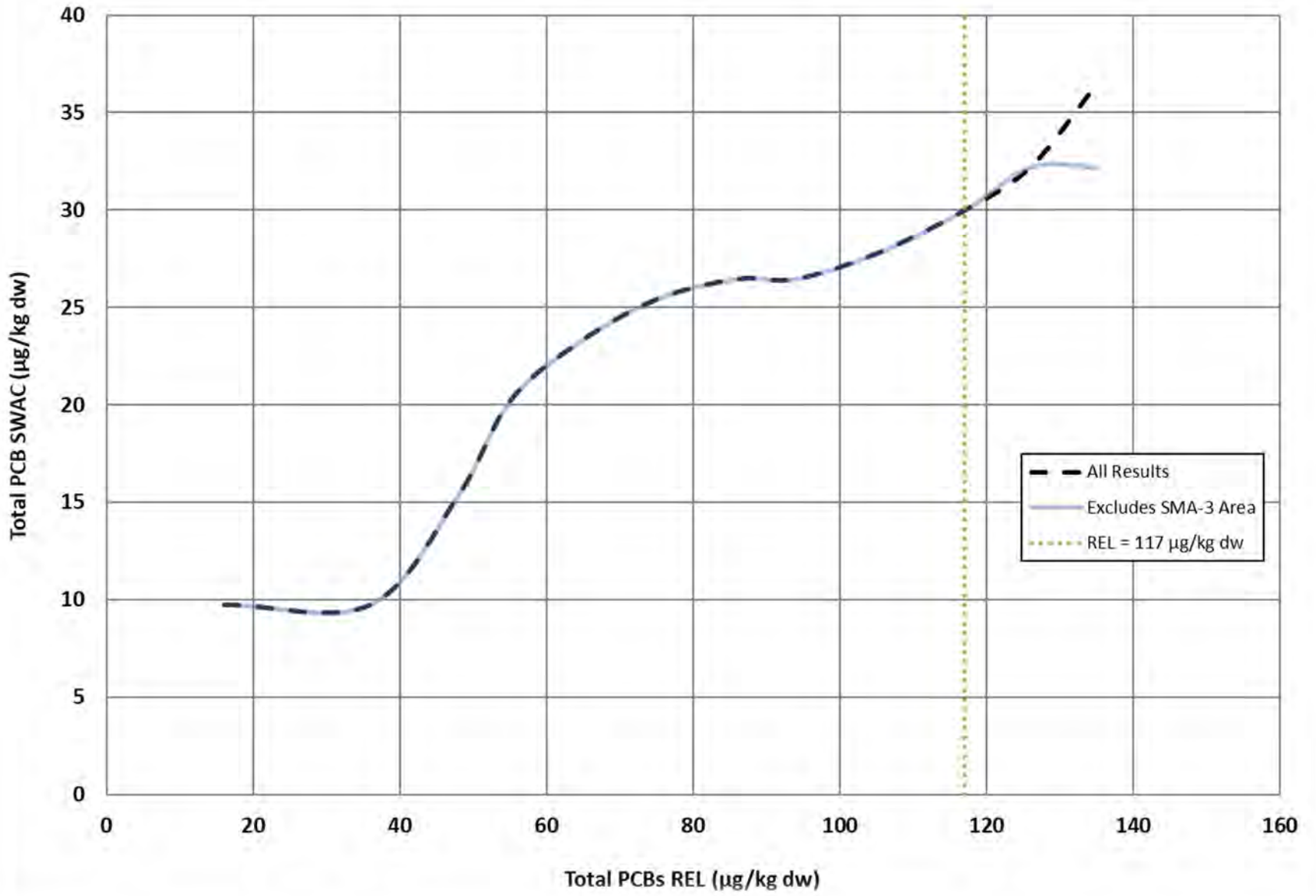
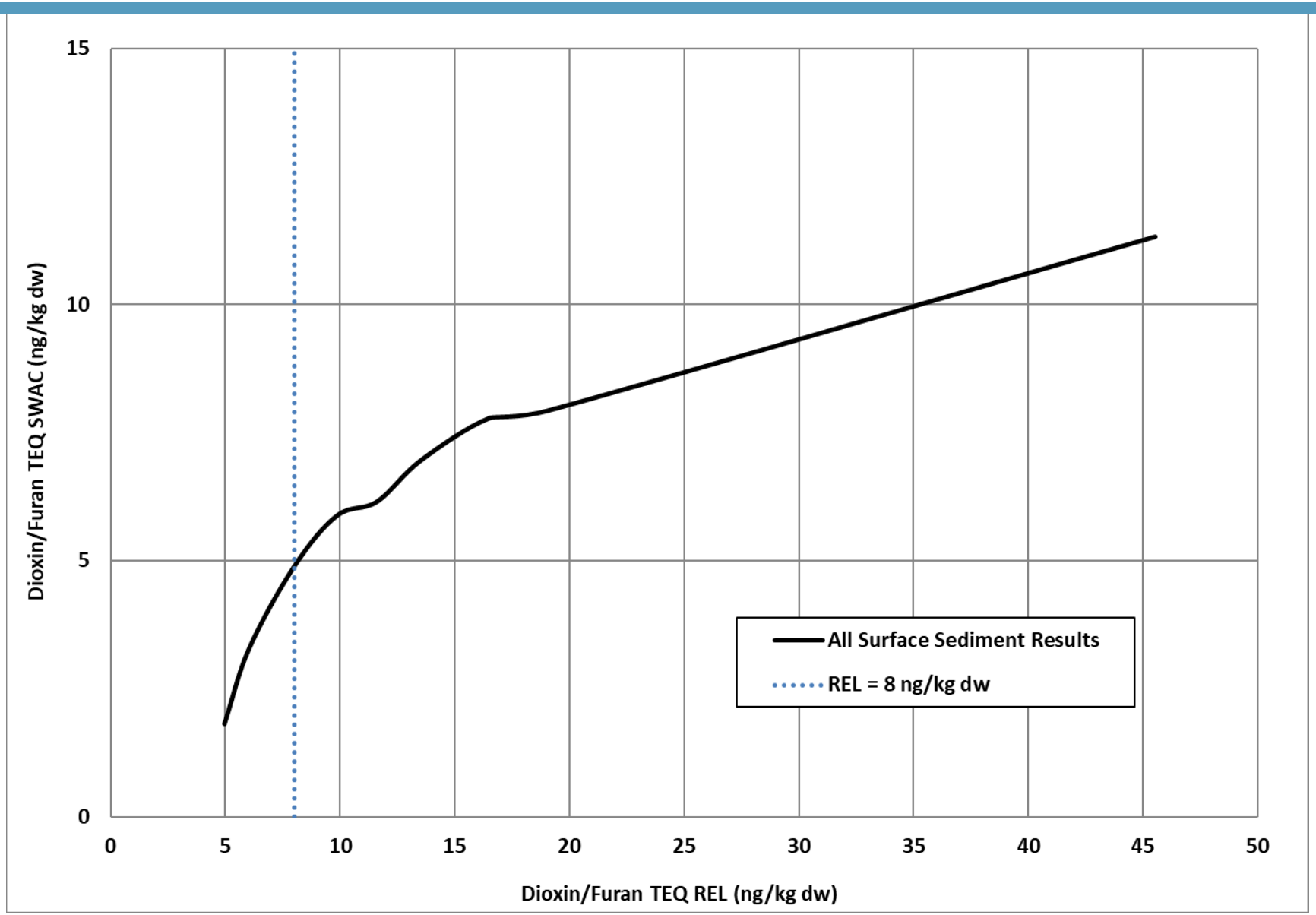


Note: REL = remediation level; SWAC = surface weighted average concentration

DRAFT

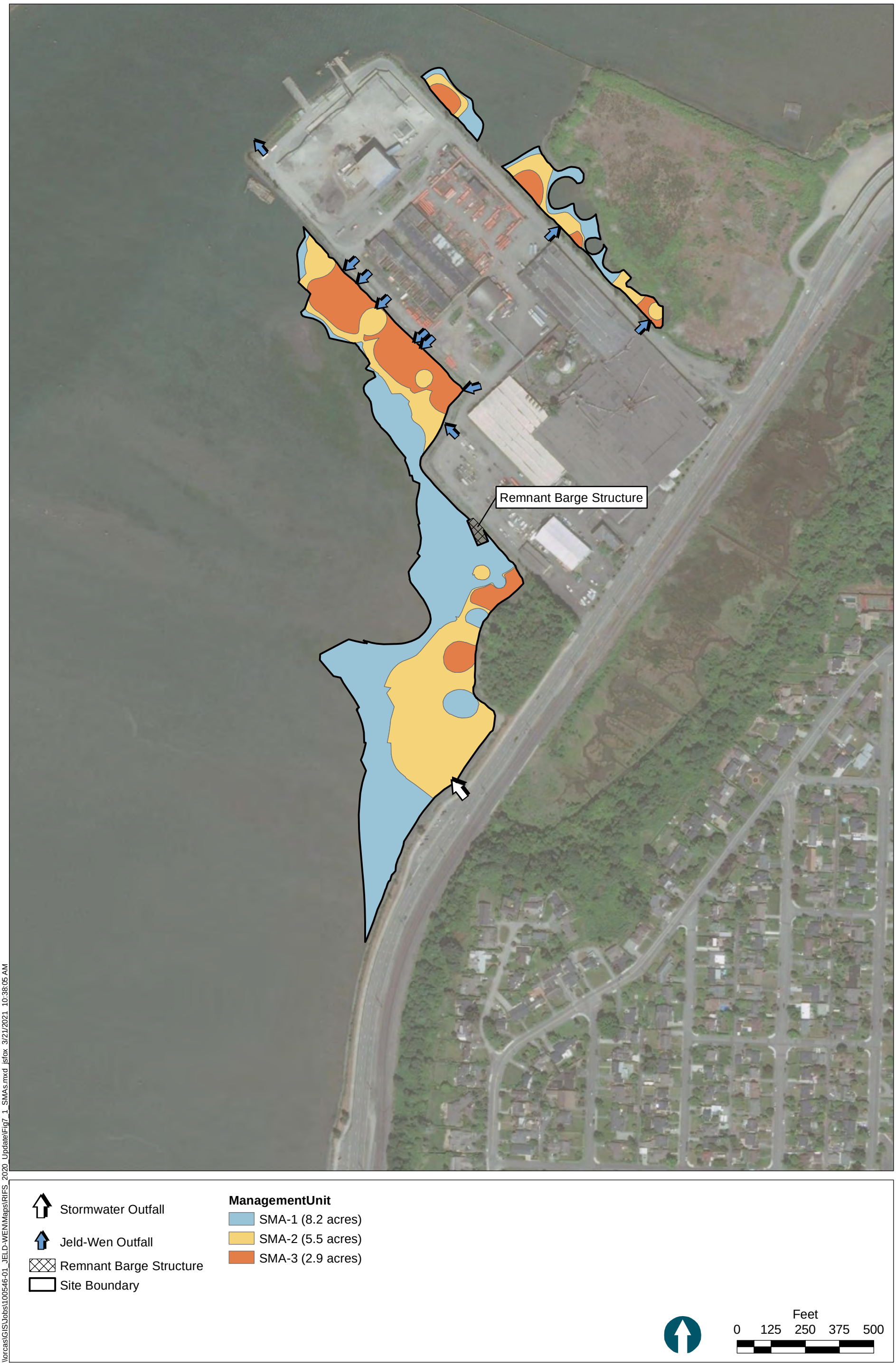
Figure 6.2-1
Total PCB REL Versus Acreage, JELD-WEN Marine Sediment Area Draft Final RI/FS
Jeld-Wen/Former Nord Door Facility



Note: REL = remediation level; SWAC = surface weighted average concentration

DRAFT

Figure 6.2-2
Total Dioxin/Furan REL Versus Acreage, JELD-WEN Marine Sediment Area Draft Final RI/FS
Jeld-Wen/Former Nord Door Facility



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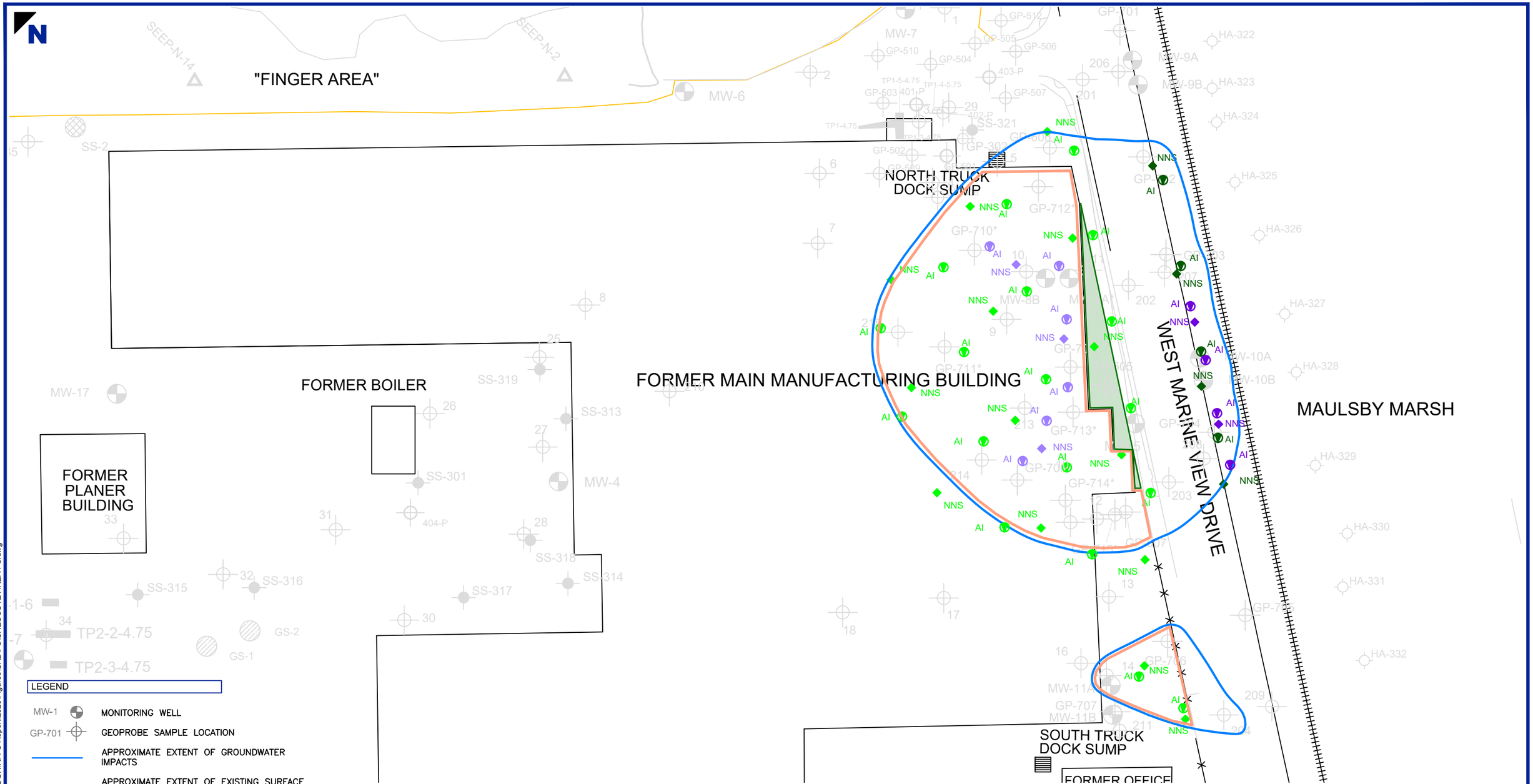
SLR

Figure 7.1
Sediment Management Areas
Draft Final RI/FS
Jeld-Wen/Former Nord Door Facility



LEGEND

MW-1	MONITORING WELL
GP-701	GEOPROBE SAMPLE LOCATION
	APPROXIMATE EXTENT OF GROUNDWATER IMPACTS
	APPROXIMATE EXTENT OF EXISTING SURFACE CAP WITHIN IMPACTED AREA ON PROPERTY
	APPROXIMATE EXTENT OF UNPAVED GROUND SURFACE ON PROPERTY (3,700 SQ FT)

PROPOSED BIOREMEDIATION TREATMENT

AI	AI WELLS (ON PROPERTY)	NNS	NNS WELLS (ON PROPERTY)
AI	AI WELLS (OFF PROPERTY)	NNS	NNS WELLS (OFF PROPERTY)
AI	AI DEEP WELLS (ON PROPERTY)	NNS	NNS VERTICAL RECIRCULATION WELLS (ON PROPERTY)
AI	AI DEEP WELLS (OFF PROPERTY)	NNS	NNS VERTICAL RECIRCULATION WELLS (OFF PROPERTY)

NOTES

THE BUILDINGS, SURFACE UTILITIES, EDGE OF PAVEMENT, AND APPROXIMATE SHORELINE SHOWN ON THIS MAP ARE BASED ON A 2006 SURVEY PERFORMED BY WH PACIFIC.

0 90 180 270'

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JELD-WEN/FORMER NORD DOOR FACILITY
300 WEST MARINE VIEW DRIVE
EVERETT, WASHINGTON

Report
DRAFT FINAL RI/FS REPORT

Drawing
CREOSOTE/FUEL OIL AREA ALTERNATIVE 2 - BIOREMEDIATION

Date	MARCH 2021	Scale	AS SHOWN	Fig. No.	8.4.1.1-A
File Name	CREOSOTE AREA FS	Project No.	108.00228.00061		

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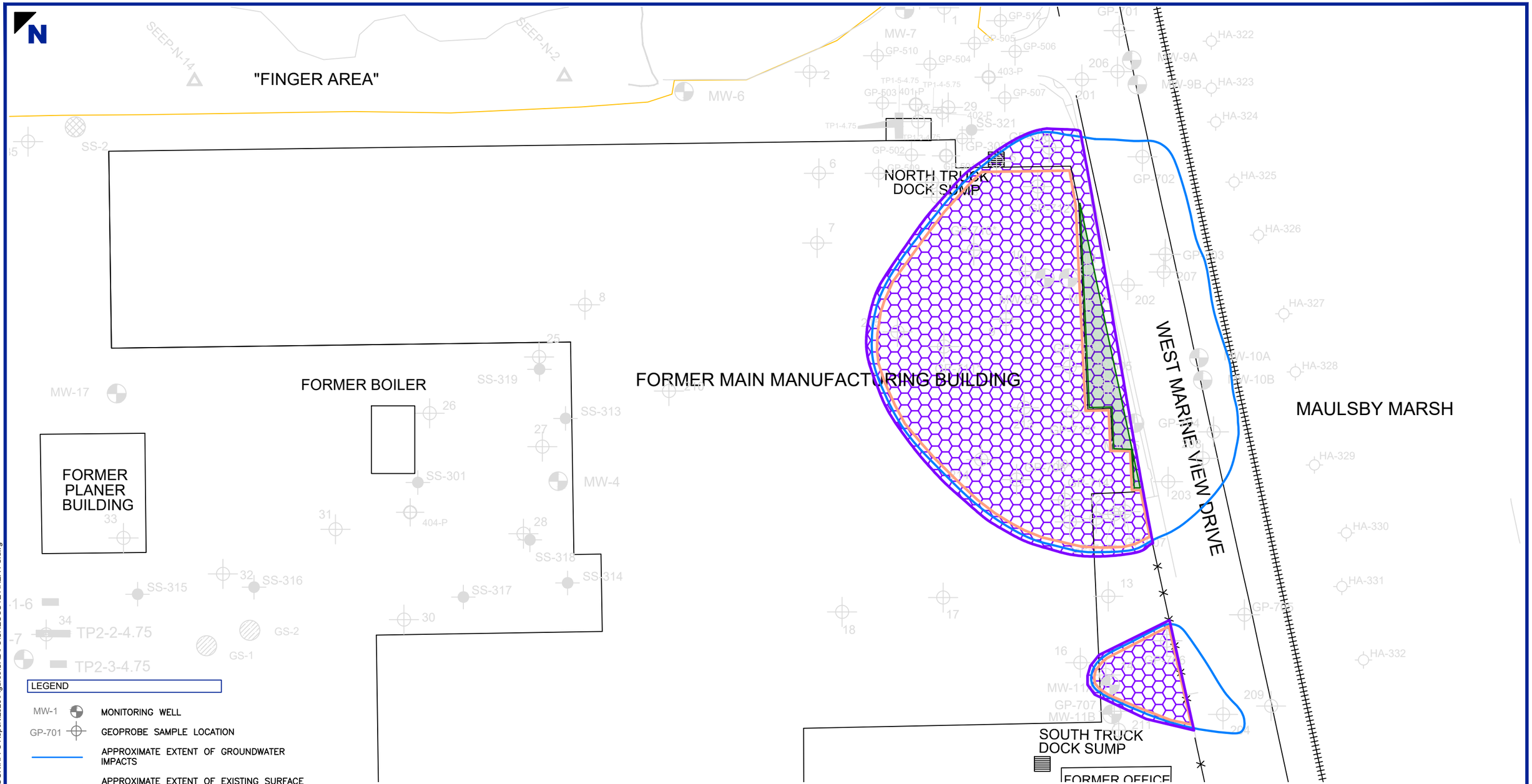

LEGEND

MW-1	MONITORING WELL
GP-701	GEOPROBE SAMPLE LOCATION
	APPROXIMATE EXTENT OF GROUNDWATER IMPACTS
	APPROXIMATE EXTENT OF EXISTING SURFACE CAP WITHIN IMPACTED AREA ON PROPERTY
	APPROXIMATE EXTENT OF UNPAVED GROUND SURFACE ON PROPERTY (3,700 SQ FT)
	APPROXIMATE ROI OF ISCO INJECTIONS (10 FT)

NOTES

THE BUILDINGS, SURFACE UTILITIES, EDGE OF PAVEMENT, AND APPROXIMATE SHORELINE SHOWN ON THIS MAP ARE BASED ON A 2006 SURVEY PERFORMED BY WH PACIFIC.

0 90 180 270'

JELD-WEN/FORMER NORD DOOR FACILITY
300 WEST MARINE VIEW DRIVE
EVERETT, WASHINGTON

Report
DRAFT FINAL RI/FS REPORT

Drawing
CREOSOTE/FUEL OIL AREA ALTERNATIVE 3 - ISCO

Date	MARCH 2021	Scale	AS SHOWN	Fig. No. 8.4.1.1-B
File Name	CREOSOTE AREA FS	Project No.	108.00228.00061	

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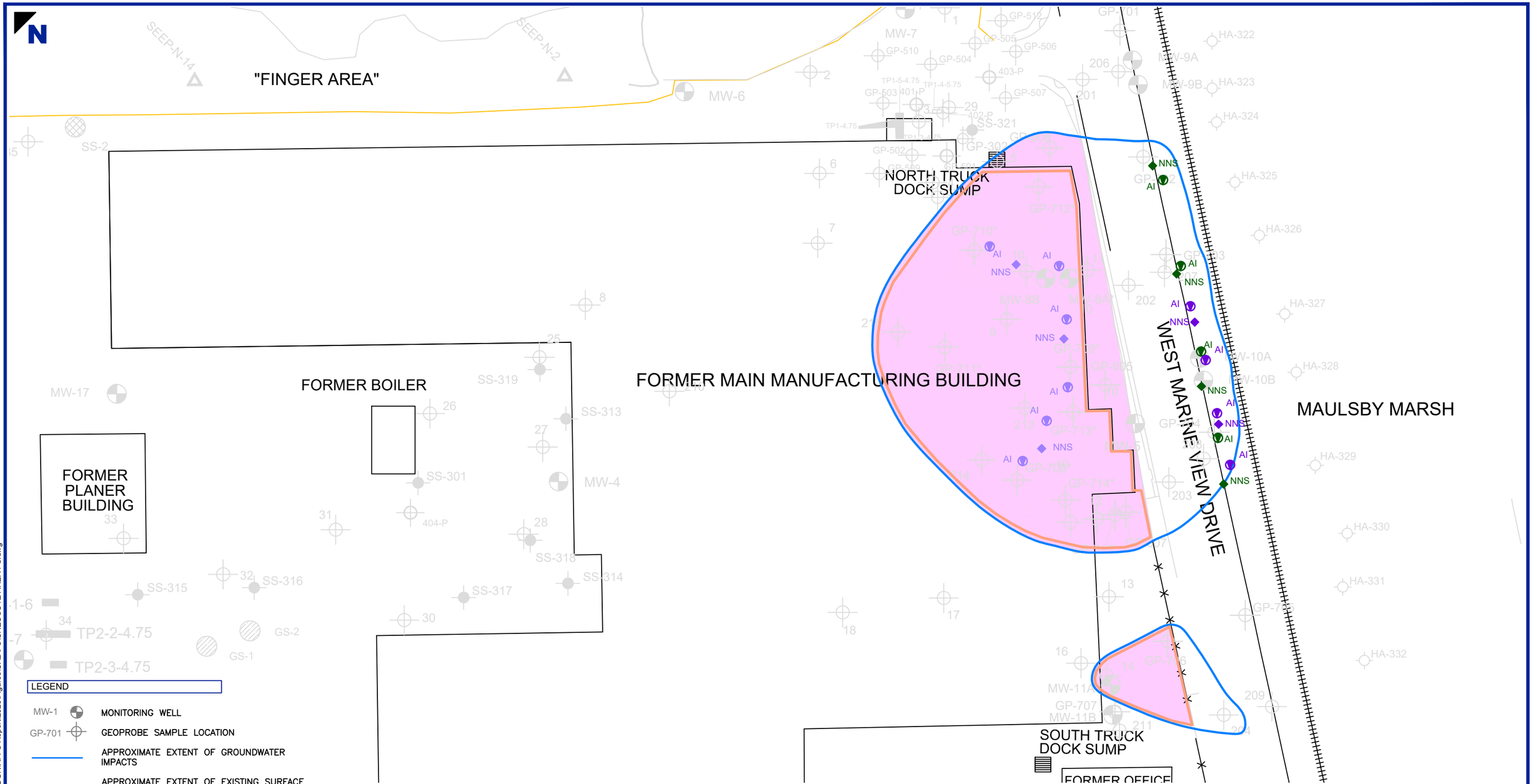

LEGEND

MW-1	MONITORING WELL
GP-701	GEOPROBE SAMPLE LOCATION
	APPROXIMATE EXTENT OF GROUNDWATER IMPACTS
	APPROXIMATE EXTENT OF EXISTING SURFACE CAP WITHIN IMPACTED AREA ON PROPERTY
	ESTIMATED EXTENT OF EXCAVATION

PROPOSED BIOREMEDIATION TREATMENT

AI	AI DEEP WELLS (ON PROPERTY)	NNS	NNS VERTICAL RECIRCULATION WELLS (ON PROPERTY)
AI	AI DEEP WELLS (OFF PROPERTY)	NNS	NNS VERTICAL RECIRCULATION WELLS (OFF PROPERTY)
AI	AI WELLS (OFF PROPERTY)	NNS	NNS WELLS (OFF PROPERTY)

NOTES

THE BUILDINGS, SURFACE UTILITIES, EDGE OF PAVEMENT, AND APPROXIMATE SHORELINE SHOWN ON THIS MAP ARE BASED ON A 2006 SURVEY PERFORMED BY WH PACIFIC.

0 90 180 270'

JELD-WEN/FORMER NORD DOOR FACILITY
300 WEST MARINE VIEW DRIVE
EVERETT, WASHINGTON

Report
DRAFT FINAL RI/FS REPORT

Drawing
CREOSOTE/FUEL OIL AREA ALTERNATIVE 4 - SOIL REMOVAL AND DISPOSAL

Date	MARCH 2021	Scale	AS SHOWN	Fig. No.	8.4.1.1-C
File Name	CREOSOTE AREA FS	Project No.	108.00228.00061		

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"FINGER AREA"

SEEP-N-14

SEEP-N-2

MW-6

MW-7

NORTH TRUCK DOCK SUMP

FORMER MAIN MANUFACTURING BUILDING

FORMER BOILER

FORMER PLANER BUILDING

WEST MARINE VIEW DRIVE

MAULSBY MARSH

SOUTH TRUCK DOCK SUMP

FORMER OFFICE

MW-17

MW-4

SS-2

SS-301

SS-313

SS-314

SS-315

SS-316

SS-317

SS-318

SS-319

SS-321

TP2-2-4.75

TP2-3-4.75

GS-1

GS-2

MW-9A

MW-9B

MW-10A

MW-10B

MW-11A

MW-11B

GP-707

HA-322

HA-323

HA-324

HA-325

HA-326

HA-327

HA-328

HA-329

HA-330

HA-331

HA-332

LEGEND

MW-1	MONITORING WELL
GP-701	GEOPROBE SAMPLE LOCATION
	APPROXIMATE EXTENT OF GROUNDWATER IMPACTS
	APPROXIMATE EXTENT OF EXISTING SURFACE CAP WITHIN IMPACTED AREA ON PROPERTY
	APPROXIMATE ROI FROM STEAM INJECTION WELLS (20 FT)
	ESTIMATED AREA FOR STEAM PLANT AND LIQUID & VAPOR TREATMENT EQUIPMENT

NOTES

THE BUILDINGS, SURFACE UTILITIES, EDGE OF PAVEMENT, AND APPROXIMATE SHORELINE SHOWN ON THIS MAP ARE BASED ON A 2006 SURVEY PERFORMED BY WH PACIFIC.

0 90 180 270'

SLR

ANCHOR QEA

JELD-WEN/FORMER NORD DOOR FACILITY
300 WEST MARINE VIEW DRIVE
EVERETT, WASHINGTON

Report
DRAFT FINAL RI/FS REPORT

Drawing CREOSOTE/FUEL OIL AREA ALTERNATIVE 5 - THERMAL TREATMENT

Date	MARCH 2021	Scale	AS SHOWN	Fig. No. 8.4.1.1-D
File Name	CREOSOTE AREA FS	Project No.	108.00228.00061	

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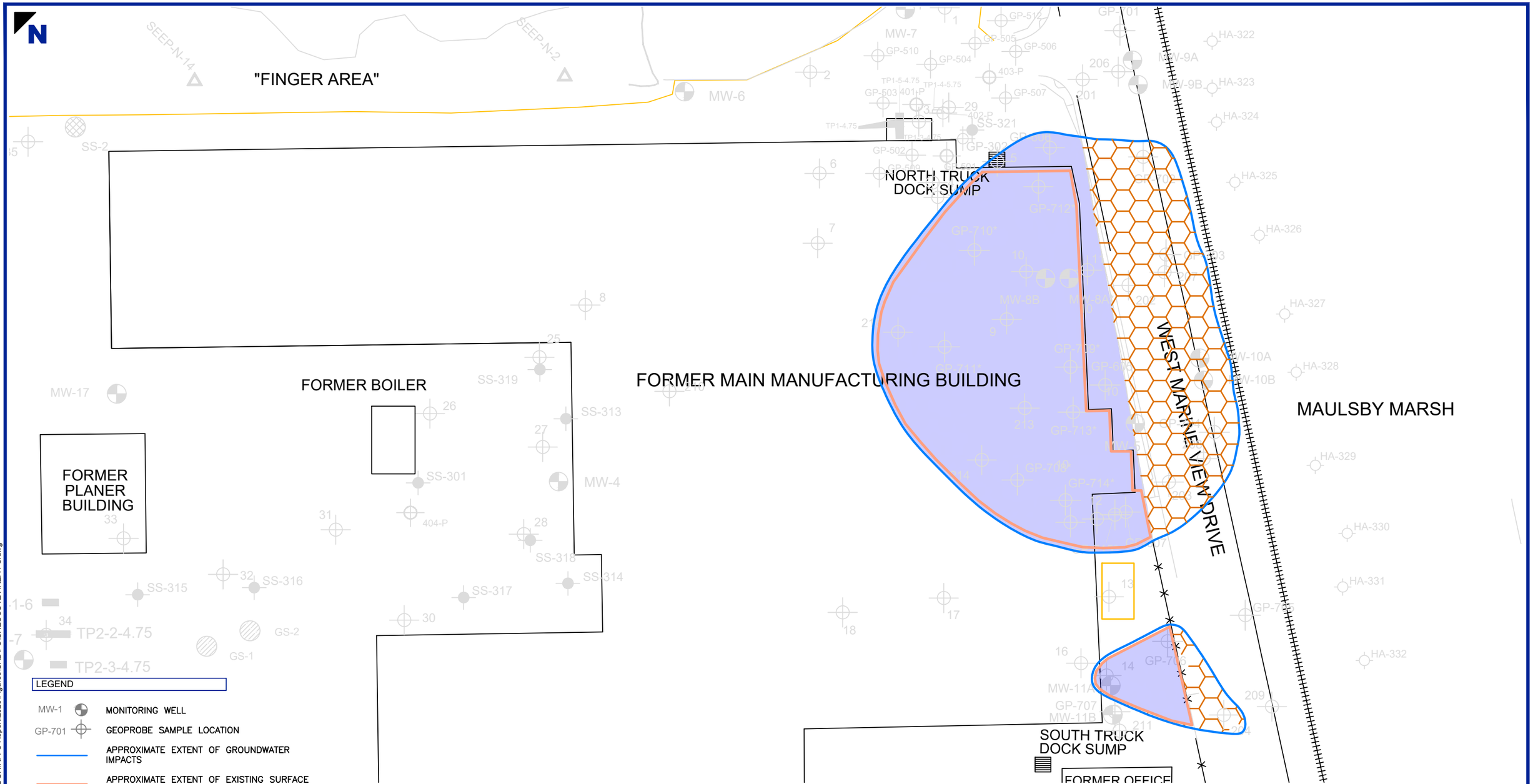

LEGEND

- MW-1 — MONITORING WELL
- GP-701 — GEOPROBE SAMPLE LOCATION
- APPROXIMATE EXTENT OF GROUNDWATER IMPACTS
- APPROXIMATE EXTENT OF EXISTING SURFACE CAP WITHIN IMPACTED AREA ON PROPERTY
- APPROXIMATE AREA OF ISS TREATMENT
- APPROXIMATE ROI FROM STEAM INJECTION WELLS (20 FT)
- ESTIMATED AREA FOR STEAM PLANT AND LIQUID & VAPOR TREATMENT EQUIPMENT

NOTES

THE BUILDINGS, SURFACE UTILITIES, EDGE OF PAVEMENT, AND APPROXIMATE SHORELINE SHOWN ON THIS MAP ARE BASED ON A 2006 SURVEY PERFORMED BY WH PACIFIC.

0 90 180 270'

SLR ANCHOR QEA

JELD-WEN/FORMER NORD DOOR FACILITY
300 WEST MARINE VIEW DRIVE
EVERETT, WASHINGTON

Report
DRAFT FINAL RI/FS REPORT

Drawing CREOSOTE/FUEL OIL AREA ALTERNATIVE 6 - IN SITU SOIL STABILIZATION

Date	MARCH 2021	Scale	AS SHOWN	Fig. No.
File Name	CREOSOTE AREA FS	Project No.	108.00228.00061	8.4.1.1-E

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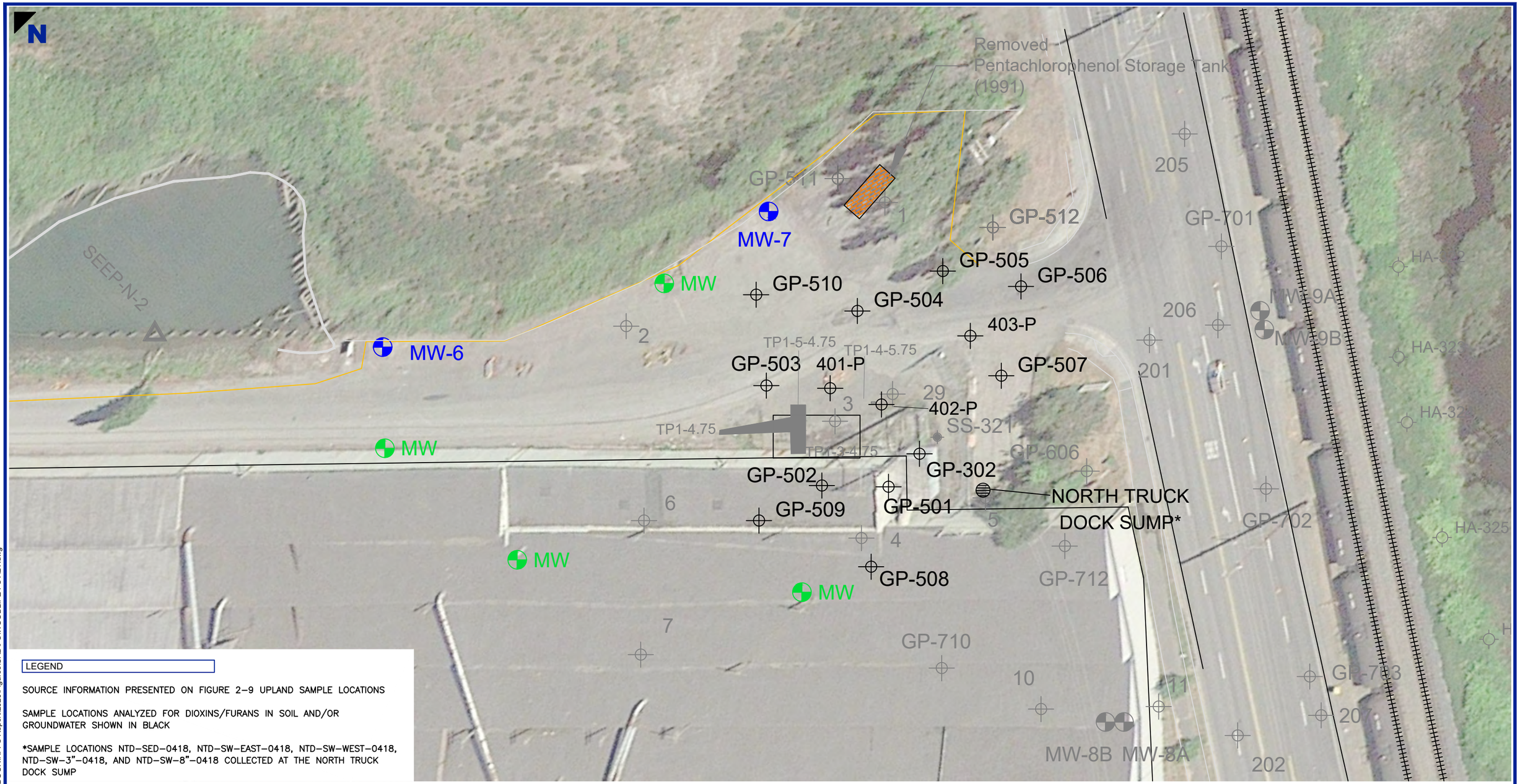

LEGEND

SOURCE INFORMATION PRESENTED ON FIGURE 2-9 UPLAND SAMPLE LOCATIONS

SAMPLE LOCATIONS ANALYZED FOR DIOXINS/FURANS IN SOIL AND/OR GROUNDWATER SHOWN IN BLACK

*SAMPLE LOCATIONS NTD-SED-0418, NTD-SW-EAST-0418, NTD-SW-WEST-0418, NTD-SW-3"-0418, AND NTD-SW-8"-0418 COLLECTED AT THE NORTH TRUCK DOCK SUMP

MW-6 — EXISTING GROUNDWATER MONITORING WELLS FOR LONG-TERM MONITORING

MW — APPROXIMATE LOCATION OF ADDITIONAL GROUNDWATER MONITORING WELLS FOR LONG-TERM MONITORING (ACTUAL LOCATIONS MAY BE MODIFIED IN CONJUNCTION WITH SELECTED CREOSOTE AREA CLEANUP ACTION)

SLR ANCHOR QEA

NOTES

THE BUILDINGS, SURFACE UTILITIES, EDGE OF PAVEMENT, AND APPROXIMATE SHORELINE SHOWN ON THIS MAP ARE BASED ON A 2006 SURVEY PERFORMED BY WH PACIFIC.

0 45 90 135'

JELD-WEN/FORMER NORD DOOR FACILITY
300 WEST MARINE VIEW DRIVE
EVERETT, WASHINGTON

Report
DRAFT FINAL RI/FS REPORT

Drawing
WOODLIFE AREA - ALTERNATIVE 1

Date	MARCH 2021	Scale	AS SHOWN	Fig. No.	8.4.2.1-A
File Name	WOODLIFE FS ALT	Project No.	108.00228.00061		

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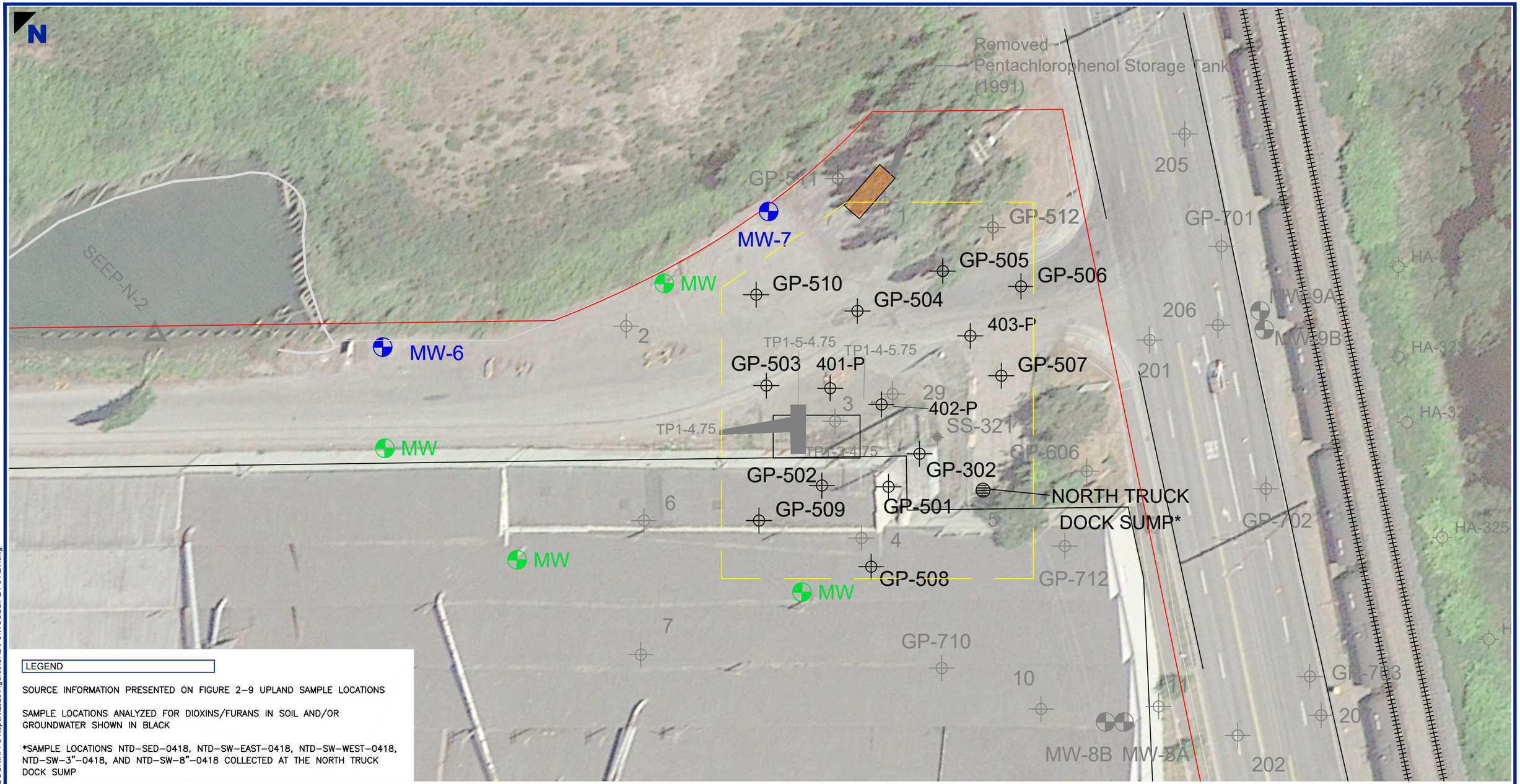

LEGEND

SOURCE INFORMATION PRESENTED ON FIGURE 2-9 UPLAND SAMPLE LOCATIONS

SAMPLE LOCATIONS ANALYZED FOR DIOXINS/FURANS IN SOIL AND/OR GROUNDWATER SHOWN IN BLACK

*SAMPLE LOCATIONS NTD-SED-0418, NTD-SW-EAST-0418, NTD-SW-WEST-0418, NTD-SW-3"-0418, AND NTD-SW-8"-0418 COLLECTED AT THE NORTH TRUCK DOCK SUMP

MW-6 EXISTING GROUNDWATER MONITORING WELLS

ESTIMATED LIMITS OF EXCAVATION (ACTUAL HORIZONTAL AND VERTICAL EXTENTS TO BE DETERMINED BY CONFIRMATION SOIL SAMPLING)

APPROXIMATE PROPERTY BOUNDARY

SLR ANCHOR QEA

NOTES

THE BUILDINGS, SURFACE UTILITIES, EDGE OF PAVEMENT, AND APPROXIMATE SHORELINE SHOWN ON THIS MAP ARE BASED ON A 2006 SURVEY PERFORMED BY WH PACIFIC.

0 45 90 135'

JELD-WEN/FORMER NORD DOOR FACILITY
300 WEST MARINE VIEW DRIVE
EVERETT, WASHINGTON

Report
DRAFT FINAL RI/FS REPORT

Drawing
WOODLIFE AREA - ALTERNATIVE 2

Date	MARCH 2021	Scale	AS SHOWN	Fig. No.	8.4.2.1-B
File Name	WOODLIFE FS ALT	Project No.	108.00228.00061		

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Figure 8.5-1
Alternative M1: Source Control and Natural Recovery
Draft Final RI/FS
Jeld-Wen/Former Nord Door Facility

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Figure 8.5-2
Alternative M2: Engineered Cap On-Grade
Draft Final RI/FS
Jeld-Wen/Former Nord Door Facility

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Figure 8.5-3
Alternative M3: Targeted Removal and Engineered Cap
Draft Final RI/FS
Jeld-Wen/Former Nord Door Facility

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Figure 8.5-4
Alternative M4: Partial Removal and Engineered Capping
Draft Final RI/FS
Jeld-Wen/Former Nord Door Facility

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Figure 8.5-5
Alternative M5: Expanded Partial Removal and Engineered Cap
Draft Final RI/FS
Jeld-Wen/Former Nord Door Facility

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Figure 8.5-6
Alternative M6: Removal Focus
Draft Final RI/FS
Jeld-Wen/Former Nord Door Facility

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Figure 8.5-7
Alternative M7: Full Removal
Draft Final RI/FS
Jeld-Wen/Former Nord Door Facility

Figure 10.1-1
Creosote/Fuel Area Area DCA
(Excludes Alternative 1)

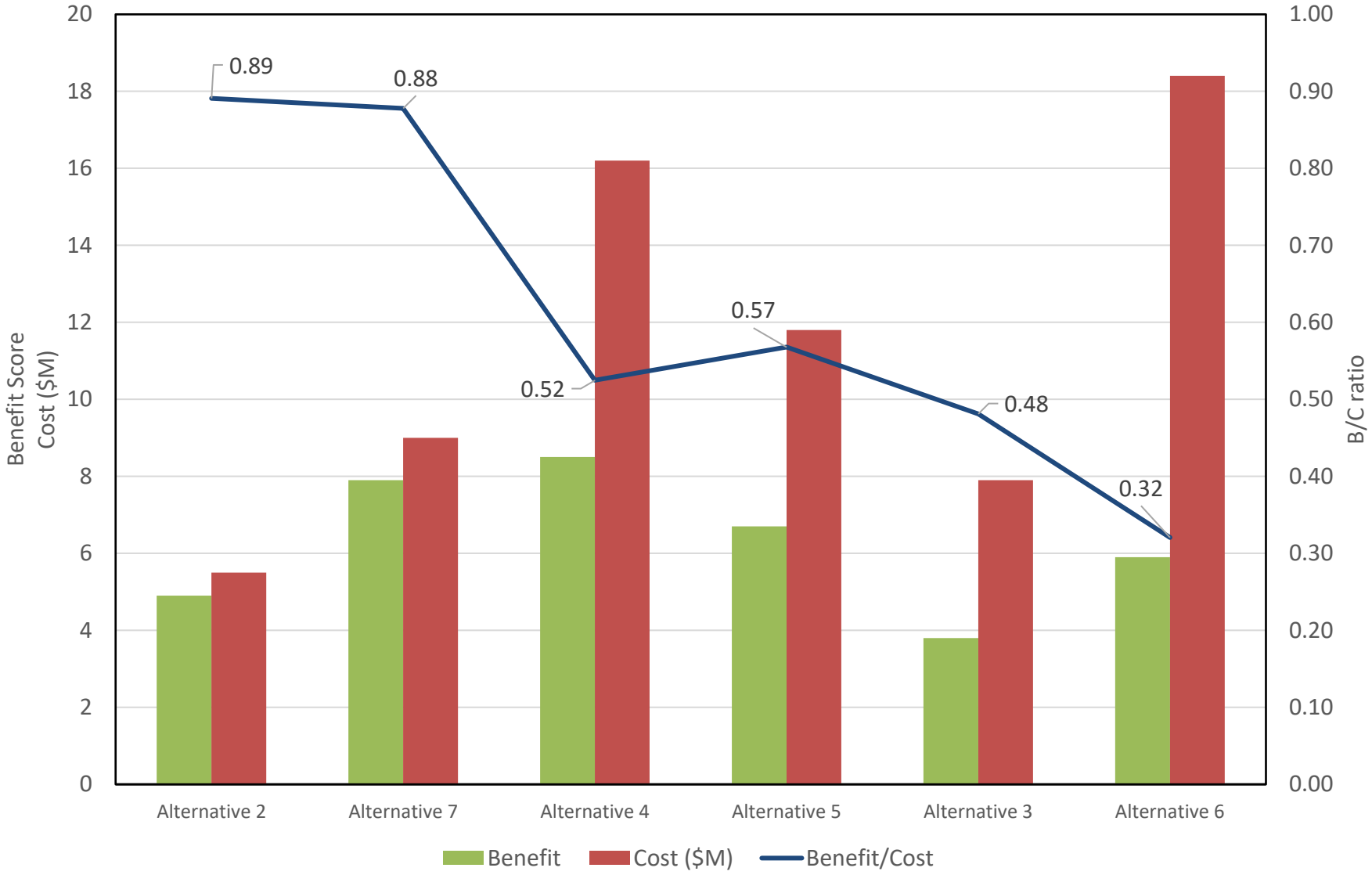
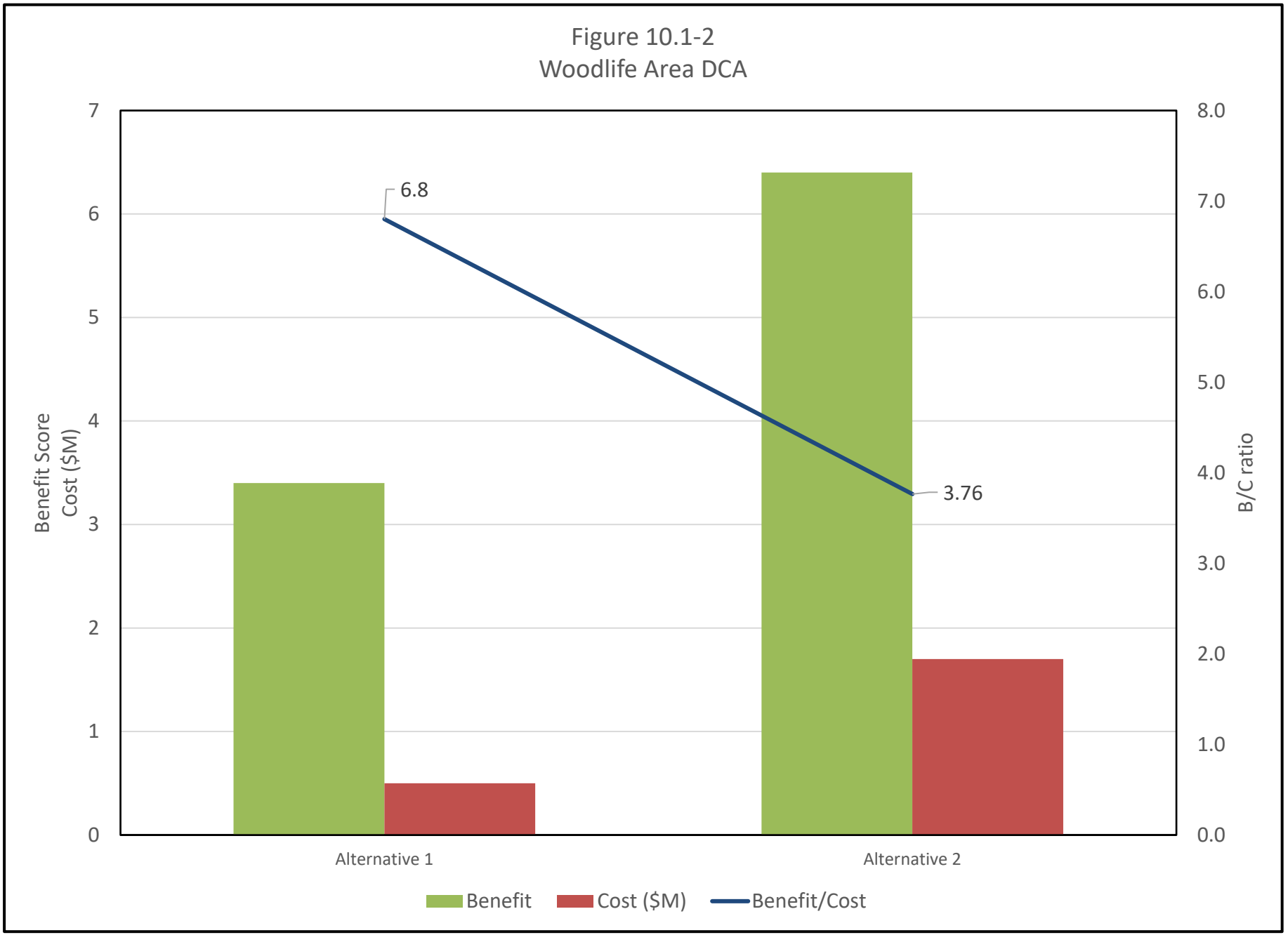


Figure 10.1-2
Woodlife Area DCA



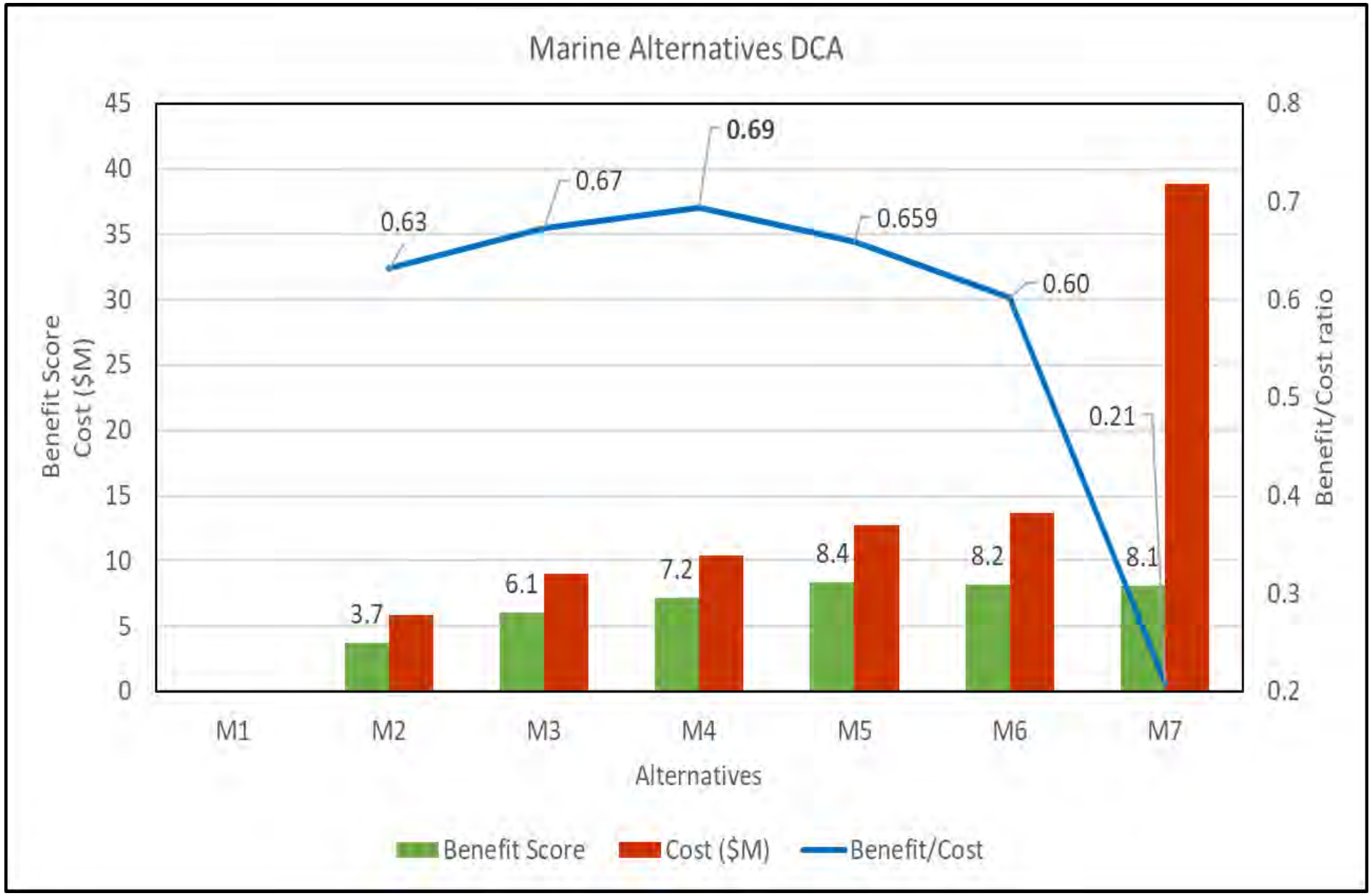


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Figure 10.2-1
MTCA DCA Marine Area
Draft Final RI/FS
Jeld-Wen/Former Nord Door Facility

TABLES

Table ES-1 – Assessment Area Summary

Assessment Area	Remedial Investigation Activities	Affected Media (primary COCs)	RI Section	FS Section
Creosote Area Former creosote pole-treating and former fuel oil storage area. Eastern portion of the property and off-property area including a portion West Marine View Drive, railroad ROW, and western portion of Maulsby Marsh.	Geoprobe borings, monitoring well installation (shallow and deep) with on-going monitoring, soil gas sampling, hand auger sampling, freshwater sediment sampling (Maulsby Marsh).	Soil, groundwater, soil gas (Creosote and fuel oil related COCs)	Section 5.2	Section 8.4.1
Woodlife Area Near the corner of the former main manufacturing building. Former Woodlife (wood preservative) storage and use area and North Truck Dock area.	Geoprobe borings, monitoring well installations and on-going sampling, groundwater seep sampling, North Truck Dock assessment	Soil, groundwater, catch basin sediments (Dioxin/furans)	Section 5.3	Section 8.4.2
Knoll Fill Area – Upland Southern portion of the property, including wooded "knoll Area" and adjacent on-property areas. These areas were filled from unknown source(s) at various stages.	Test pits, Geoprobe borings, monitoring well installations and on-going sampling, groundwater seep sampling, SPME sampling, bank soil sampling	Groundwater (PCBs)	Section 5.4	GW part of sediment remedy alternatives Section 10.2
Maulsby Marsh Freshwater Sediments Marsh/swamp created when railroad was built on mudflat area. Off-property, east of the railroad tracks and ROW. Upgradient (groundwater flow) of the on-property portion of the site.	Hand auger assessment (adjacent to Maulsby Marsh on BNSF property), freshwater sediment sampling.	N/A	Section 4.2 Appendix E	N/A
Marine Sediments Sediment management areas were defined based on protection on indicator hazardous substance concentrations	Sediment sampling, tissue sampling, groundwater, porewater/seep sampling, and geochronology analysis	Sediment	Section 4.3 Section 6.2	Section 8.5
Test Pit 2 /GP-34 area Former equipment fueling area near form kiln buildings	Geoprobe borings, test pit and soil excavation, and monitoring well MW-16 installation and sampling	Soil (TPH and cPAHs)	Section 4.1.2	N/A
GP-24 area / MW-1 Near shore sampling area during pre-RI assessment	Geoprobe borings followed by installation and sampling of MW-1	Soil (TPH)	Section 4.1.2	N/A
GP-14 area Pre-RI assessment area near historical fuel oil storage	Geoprobe borings (GP-14, GP-211, and GP-707) followed by installation and sampling of MW-11A/11B	Soil (cPAHs and naphthalene)	Section 4.1.2	N/A
GP-311 Area / MW-15 Former manufacturing building Pre-RI assessment area	Geoprobe borings (GP-311) followed by installation and sampling MW-15	Soil (naphthalene)	Section 4.1.2	N/A
GP-601 and GP-603 (Knoll Area) Groundwater sampling during RI assessment of the Knoll Area	Test-pit sampling and Geoprobe borings followed by installation and sampling Knoll Fill Area monitoring wells	Groundwater (TPH, cPAHs, naphthalene)	Section 4.1.2	N/A

Table 2.3-1
Upland RI Investigation Sample Summary

Sample ID	Matrix	Sample Date	Sample Depth (Ft)	TPH-HCID	TPH-Gx	TPH-Dx	PAHs	SVOCs	VOCs	PCB Aroclors	PCB Congeners	Metals	Dioxins and Furans
Parametrix Sampling Event (1991)													
GS-1	Soil	5/24/1991	-			X	X	X	X [1]				
GS-2	Soil	5/24/1991	-			X	X	X	X [1]				
GS-4	Soil	5/24/1991	-			X	X	X	X [1]				
SS-1	Soil	5/24/1991	-		X	X	X	X	X [1]				
SS-2	Soil	5/24/1991	-		X	X	X	X	X [1]				
RZA Sampling Event (1992)													
C1-S1	Soil	8/27/1992	2.5-4.0	X		X			X [1]	X			
C2-S2	Soil	8/27/1992	7.5-9.0	X		X			X [1]	X			
C4-S1	Soil	8/27/1992	2.5-4.0		X								
C5-S1	Soil	8/27/1992	2.5-4.0		X								
C6-S1	Soil	8/27/1992	2.5-4.0	X		X			X [1]				
MW-1,S-2	Soil	8/31/1992	7.5-9.0	X									
MW-1	Groundwater	9/4/1992	-		X								
MW-2, S-1	Soil	8/31/1992	2.5-4.0	X									
MW-2	Groundwater	9/4/1992	-		X								
SLR Pre RI Assessment (2006-2007)													
GP1-6	Soil	5/4/2006	6.0	X									
GP1-10	Soil	5/4/2006	10.0	X	X			X					
GP1-GW	Groundwater	5/4/2006	-	X				X [2]					
GP2-5	Soil	5/4/2006	5.0	X									
GP2-GW	Groundwater	5/4/2006	-	X					X				
GP3-9	Soil	5/4/2006	9.0	X					X [1]				
GP3-GW	Groundwater	5/4/2006	-	X				X [2]	X				
GP4-4.5	Soil	5/11/1006	4.5	X	X		X						
GP4-GW	Groundwater	5/11/2006	-	X	X	X		X					
GP5-6.5	Soil	5/4/2006	6.5	X			X						
GP5-12	Soil	5/4/2006	12.0	X									
GP5-GW	Groundwater	5/4/2006	-	X					X				
GP6-5	Soil	5/2/2006	5.0	X									
GP6-GW	Groundwater	5/2/2006	-	X			X						
GP7-5	Soil	5/2/2006	5.0	X									
GP7-GW	Groundwater	5/2/2006	-	X				X					
GP8-5	Soil	5/2/2006	5.0	X									
GP8-GW	Groundwater	5/2/2006	-	X									
GP-9-6	Soil	5/1/2006	6.0					X					
GP9-12	Soil	5/1/2006	12.0	X	X	X	X						
GP9-GW	Groundwater	5/1/2006	-	X	X	X		X	X				
GP10-3	Soil	5/1/2006	3.0			X		X					
GP10-11	Soil	5/1/2006	11.0	X	X	X	X						

Table 2.3-1
Upland RI Investigation Sample Summary

Sample ID	Matrix	Sample Date	Sample Depth (Ft)	TPH-HCID	TPH-Gx	TPH-Dx	PAHs	SVOCs	VOCs	PCB Aroclors	PCB Congeners	Metals	Dioxins and Furans
GP10-GW	Groundwater	5/1/2006	-	X	X	X		X	X				
GP11-6	Soil	5/4/2006	6.0	X	X	X							
GP11-12	Soil	5/4/2006	12.0	X	X	X	X						
GP11-GW	Groundwater	5/4/2006	-	X			X						
GP12-8	Soil	5/2/2006	8.0	X	X	X		X					
GP12-GW	Groundwater	5/2/2006	-	X		X		X	X				
GP13-11.5	Soil	5/1/2006	11.5	X		X		X					
GP13-GW	Groundwater	5/1/2006	-	X	X	X		X	X				
GP14-6	Soil	5/1/2006	6.0	X	X	X		X	X [1]				
GP14-GW	Groundwater	5/1/2006	-	X	X	X		X	X				
GP15-10	Soil	5/1/2006	10.0	X				X					
GP15-GW	Groundwater	5/1/2006	-	X		X		X					
GP16-8	Soil	5/1/2006	8.0	X				X					
GP16-GW	Groundwater	5/1/2006	-	X		X		X					
GP17-5	Soil	5/1/2006	5.0	X		X		X					
GP17-GW	Groundwater	5/1/2006	-	X		X		X					
GP18-8	Soil	5/1/2006	8.0	X			X						
GP18-GW	Groundwater	5/1/2006	-	X			X						
GP19-10	Soil	5/1/2006	10.0	X									
GP19-GW	Groundwater	5/1/2006	-	X				X	X				
GP20-GW	Groundwater	5/4/2006	-	X									
GP21-5	Soil	5/4/2006	5.0	X									
GP21-GW	Groundwater	5/4/2006	-	X					X				
GP22-6.5	Soil	5/4/2006	6.5	X		X	X						
GP22-GW	Groundwater	5/4/2006	-	X				X	X				
GP23-6	Soil	5/1/2006	6.0	X									
GP23-GW	Groundwater	5/1/2006	-	X		X		X	X				
GP24-6	Soil	5/3/2006	6.0	X		X	X						
GP24-GW	Groundwater	5/3/2006	-	X				X	X				
GP26-7	Soil	5/3/2006	7.0	X									
GP26-GW	Groundwater	5/3/2006	-	X									
GP27-2	Soil	5/3/2006	2.0	X									
GP27-GW	Groundwater	5/3/2006	-	X				X	X				
GP29-8	Soil	5/4/2006	8.0	X		X	X						
GP29-GW	Groundwater	5/4/2006	-	X				X	X				
GP31-6	Soil	5/3/2006	6.0	X									
GP31-GW	Groundwater	5/3/2006	-	X			X		X				
GP33-7	Soil	5/3/2006	7.0	X									
GP33-GW	Groundwater	5/3/2006	-	X									
GP34-8	Soil	5/3/2006	8.0	X	X	X	X		X [1]	X			
GP34-GW	Groundwater	5/3/2006	-	X				X	X	X			

Table 2.3-1
Upland RI Investigation Sample Summary

Sample ID	Matrix	Sample Date	Sample Depth (Ft)	TPH-HCID	TPH-Gx	TPH-Dx	PAHs	SVOCs	VOCs	PCB Aroclors	PCB Congeners	Metals	Dioxins and Furans
GP35-7	Soil	5/4/2006	7.0	X									
GP35-GW	Groundwater	5/4/2006	-	X			X		X				
GP36-6	Soil	5/3/2006	6.0	X									
GP36-GW	Groundwater	5/3/2006	-	X				X	X				
GP37-8	Soil	5/2/2006	8.0	X		X	X						
GP37-GW	Groundwater	5/2/2006	-	X									
GP38-8	Soil	5/2/2006	8.0	X									
GP38-GW	Groundwater	5/2/2006	-	X									
GP39-9	Soil	5/2/2006	9.0	X		X	X						
GP39-GW	Groundwater	5/2/2006	-	X									
GP40-8	Soil	5/2/2006	8.0	X									
GP40-GW	Groundwater	5/2/2006	-	X									
GP41-8	Soil	5/2/2006	8.0	X		X	X						
GP41-GW	Groundwater	5/2/2006	-	X				X	X				
GP42-8	Soil	5/2/2006	8.0	X		X	X						
GP42-GW	Groundwater	5/2/2006	-	X				X	X				
GP201-4.5	Soil	9/11/2006	4.5	X					X [1]				
GP201-GW	Groundwater	9/11/2006	-	X					X				
GP202-7.5	Soil	9/11/2006	7.5			X	X						
GP-202-P	Groundwater	9/11/2006	-						X				
GP203-5.5	Soil	9/11/2006	5.5			X							
GP204-7.5	Soil	9/11/2006	7.5			X							
GP204-GW	Groundwater	9/11/2006	-	X		X	X		X				
GP205-3	Soil	9/12/2006	3.0			X							
GP205-GW	Groundwater	9/11/2006	-	X					X				
GP206-4.5	Soil	9/12/2006	4.5			X		X					
GP206-8.5	Soil	9/12/2006	8.5			X		X					
GP-206-P	Product	9/11/2006	-				X		X				
GP207-3	Soil	9/12/2006	3.0			X							
GP207-9	Soil	9/12/2006	9.0			X							
GP-207-GW	Groundwater	9/12/2006	-						X				
GP208-GW	Groundwater	9/11/2006	-	X		X	X		X				
GP209-3	Soil	9/12/2006	3.0	X									
GP209-GW	Groundwater	9/11/2006	-	X					X				
GP210-4	Soil	9/12/2006	4.0	X									
GP210-GW	Groundwater	9/11/2006	-	X					X				
GP211-3.5	Soil	9/11/2006	3.5	X									
GP211-GW	Groundwater	9/11/2006	-	X			X		X				
GP212-3.5	Soil	9/11/2006	3.5	X									
GP212-GW	Groundwater	9/11/2006	-	X					X				
GP213-3	Soil	9/12/2006	3.0	X	X	X		X	X [1]				

Table 2.3-1
Upland RI Investigation Sample Summary

Sample ID	Matrix	Sample Date	Sample Depth (Ft)	TPH-HCID	TPH-Gx	TPH-Dx	PAHs	SVOCs	VOCs	PCB Aroclors	PCB Congeners	Metals	Dioxins and Furans
GP214-6	Soil	9/12/2006	6.0			X		X	X [1]				
GP214-GW	Groundwater	9/11/2006	-	X	X	X		X	X				
GP215-4.5	Soil	9/11/2006	4.5	X					X [1]				
GP215-GW	Groundwater	9/11/2006	-	X	X	X		X	X				
MW1-6.5	Soil	10/2/2006	6.5			X	X						
MW1-1106	Groundwater	11/14/2006	-	X					X				
MW2-1106	Groundwater	11/14/2006	-	X					X				
MW3-6.5	Soil	10/2/2006	6.5			X	X						
MW3-1106	Groundwater	11/14/2006	-	X					X				
MW4-6.5	Soil	10/2/2006	6.5			X							
MW4-1106	Groundwater	11/14/2006	-	X					X				
MW5-8.5	Soil	10/2/2006	8.5			X	X						
MW5-1106	Groundwater	11/14/2006	-	X					X				
TP1-1-4.75	Soil	10/18/2006	4.75	X					X [1]				
TP1-2-4.75	Soil	10/18/2006	4.75	X					X [1]				
TP1-3-4.75	Soil	10/18/2006	4.75	X		X	X		X [1]				
TP1-4-5.75	Soil	10/18/2006	5.75	X					X [1]				
TP1-5-4.75	Soil	10/19/2006	4.75	X					X [1]				
TP1-Stockpile	Soil	10/19/2006	Comp.	X	X	X	X	X	X [1]				
TP2-1-6	Soil	10/19/2006	6.0	X		X	X						
TP2-2-4.75	Soil	10/19/2006	4.75	X			X						
TP2-3-4.75	Soil	10/19/2006	4.75	X		X	X						
TP2-4-7	Soil	10/19/2006	7.0	X		X	X	X					
MW6-407-10	Soil	4/20/2007	10	X		X		X					
MW6-407-14	Soil	4/20/2007	14					X					
MW6-507	Groundwater	5/11/2007	-	X				X	X				
SLR Initial RI Investigation (2009)													
SS-301 (Ash)	Boiler Ash	6/24/2009	-										X
GP-302-1FT	Soil	5/21/2009	1.0			X		X [2]					X
GP-302-3.5FT	Soil	5/21/2009	3.5			X		X [2]					
GP-302-GW	Groundwater	5/20/2009	-										X
GP-303-6	Soil	6/1/2009	6.0	X			X	X	X	X		X	
GP-303-GW	Groundwater	6/1/2009	-	X				X	X			X	
GP-304-6	Soil	6/1/2009	6.0	X			X	X	X	X		X	
GP-304-GW	Groundwater	6/1/2009	-	X		X		X	X			X	
GP-305-7	Soil	6/1/2009	7.0				X	X	X	X		X	
GP-305-GW	Groundwater	6/1/2009	-	X				X	X			X	
GP-306-7	Soil	6/1/2009	7.0	X			X	X	X	X		X	
GP-306-GW	Groundwater	6/1/2009	-	X				X	X			X	
GP-307-4	Soil	6/1/2009	4.0				X	X	X	X		X	

Table 2.3-1
Upland RI Investigation Sample Summary

Sample ID	Matrix	Sample Date	Sample Depth (Ft)	TPH-HCID	TPH-Gx	TPH-Dx	PAHs	SVOCs	VOCs	PCB Aroclors	PCB Congeners	Metals	Dioxins and Furans
GP-307-GW	Groundwater	5/21/2009	-	X				X	X			X	
GP-308-2	Soil	5/21/2009	2.0	X			X	X	X	X		X	
GP-308-GW	Groundwater	5/21/2009	-	X		X		X	X			X	
GP-309-5	Soil	5/22/2009	5.0	X			X	X	X	X		X	X
GP-309A-GW	Groundwater	5/22/2009	-	X				X	X			X	X
GP-310-4.5	Soil	5/22/2009	4.5				X	X	X	X		X	
GP-310-GW	Groundwater	5/22/2009	-	X		X		X	X			X	
GP-311-3.5	Soil	5/22/2009	3.5	X		X	X	X	X	X		X	
GP-311-GW	Groundwater	5/22/2009	-	X				X	X			X	
GP-312-3.5	Soil	5/22/2009	3.5	X			X	X	X	X		X	
GP312-GW	Groundwater	5/22/2009	-	X		X		X	X			X	
SS-313	Soil	6/4/2009	1.0	X		X				X		X	
SS-314	Soil	6/4/2009	1.0	X		X				X		X	
SS-315	Soil	6/4/2009	Surface							X			
SS-316	Soil	6/4/2009	Surface							X			
SS-317	Soil	6/4/2009	Surface							X			
SS-318	Soil	6/4/2009	Surface							X			
SS-319	Soil	6/4/2009	Surface							X		X	
SS-320	Soil	6/4/2009	Surface							X			
SS-321	Soil	6/4/2009	Surface							X			
GP-334-3	Soil	5/22/2009	3.0	X	X	X	X	X	X	X		X	
GP-334-GW	Groundwater	5/22/2009	-					X	X	X		X	
GP-335-7.5	Soil	5/22/2009	7.5	X		X	X	X	X	X		X	
GP-335-9.5	Soil	5/22/2009	9.5				X	X	X	X		X	
GP-335-GW	Groundwater	5/22/2009	-					X	X	X		X	
HA-322-1	Soil	9/23/2009	1.0	X		X	X	X					
HA-322-1.5	Soil	9/23/2009	1.5	X		X	X	X	X				
HA-322-GW	Groundwater	9/23/2009	-	X		X	X	X					
HA-323-1	Soil	9/23/2009	1.0	X		X	X	X					
HA-323-GW	Groundwater	9/23/2009	-	X		X	X	X					
HA-324-GW	Groundwater	10/12/2009	-	X		X		X					
HA-325-GW	Groundwater	9/24/2009	-	X		X	X	X					
HA-326-2	Soil	9/24/2009	2.0	X		X	X	X					
HA-326-2.5	Soil	9/24/2009	2.5	X		X	X	X					
HA-326-GW	Groundwater	10/12/2009	-	X		X							
HA-327-1.5	Soil	10/12/2009	1.5	X	X	X	X	X					
HA-327-2.5	Soil	10/12/2009	2.5	X	X	X	X	X	X				
HA-327-GW	Groundwater	10/12/2009	-	X									
HA-328-1	Soil	10/12/2009	1.0	X	X	X	X	X	X				
HA-328-2.5	Soil	10/12/2009	2.5	X	X	X	X	X	X				
HA-328-GW	Groundwater	10/12/2009	-	X	X	X		X	X				
HA-329-1	Soil	10/12/2009	1.0	X	X	X	X	X	X				

Table 2.3-1
Upland RI Investigation Sample Summary

Sample ID	Matrix	Sample Date	Sample Depth (Ft)	TPH-HCID	TPH-Gx	TPH-Dx	PAHs	SVOCs	VOCs	PCB Aroclors	PCB Congeners	Metals	Dioxins and Furans
HA-329-GW	Groundwater	10/13/2009	-	X	X	X		X	X				
HA-330-1	Soil	10/13/2009	1.0	X	X	X	X	X	X				
HA-330-GW	Groundwater	10/13/2009	-	X									
HA-331-2	Soil	10/13/2009	2.0	X	X	X	X	X	X				
HA-332-1	Soil	10/13/2009	1.0	X	X	X	X	X	X				
HA-332-GW	Groundwater	10/13/2009	-	X									
HA-333-2	Soil	10/13/2009	2.0	X	X	X	X	X	X				
MW-1-GW	Groundwater	10/29/2009	-			X				X		X	
MW-2-GW	Groundwater	10/29/2009	-									X	
MW-4-GW	Groundwater	10/29/2009	-									X	
MW-5-GW	Groundwater	10/29/2009	-									X	
MW-6-GW	Groundwater	10/29/2009	-									X	
SLR Phase 2 Upland Soil and Groundwater (2012)													
MW-1-GW (Low Tide)	Groundwater	5/24/2012	-	X	X	X						X	
MW-1-GW (High Tide)	Groundwater	5/24/2012	-	X	X	X						X	
MW-5-GW (Low Tide)	Groundwater	5/24/2012	-	X	X	X							
MW-5-GW (High Tide)	Groundwater	5/24/2012	-	X	X	X							
MW-6-GW	Groundwater	5/24/2012	-									X	
401-P	Soil	5/17/2002	2.0										X
401P-GW	Groundwater	5/17/2002	-						X				
402-P	Soil	5/17/2012	3.0										X
403-P	Soil	5/17/2012	3.0										X
403P-GW	Groundwater	5/17/2012	-						X				X
404-P	Soil	5/17/2012	-										X
405P-GW	Groundwater	5/17/2012	-									X	
SLR Additional Upland Assessment - Woodlife Area (2013)													
GP-501-1	Soil	3/14/2013	1.0										X
GP-501-3	Soil	3/14/2013	3.0				X	X	X				
GP-501-5	Soil	3/14/2013	5.0										X
GP-501-GW	Groundwater	3/14/2013	-										X
GP-502-GW	Groundwater	3/14/2013	-										X
GP-503-1	Soil	3/13/2013	1.0										X
GP-503-3	Soil	3/13/2013	3.0										X
GP-503-5	Soil	3/13/2013	5.0										X
GP-503-GW	Groundwater	3/13/2013	-										X
GP-504-1	Soil	3/13/2013	1.0										X
GP-504-GW	Groundwater	3/13/2013	-										X
GP-505-1	Soil	3/13/2013	1.0										X
GP-505-3	Soil	3/13/2013	3.0										X
GP-505-GW	Groundwater	3/13/2013	-										X
GP-506-1	Soil	3/13/2013	1.0										X
GP-507-1	Soil	3/13/2013	1.0										X

Table 2.3-1
Upland RI Investigation Sample Summary

Sample ID	Matrix	Sample Date	Sample Depth (Ft)	TPH-HCID	TPH-Gx	TPH-Dx	PAHs	SVOCs	VOCs	PCB Aroclors	PCB Congeners	Metals	Dioxins and Furans
GP-507-3	Soil	3/13/2013	3.0										X
GP-508-1	Soil	3/13/2013	1.0										X
GP-508-3	Soil	3/14/2013	3.0										X
GP-508-GW	Groundwater	3/13/2013	-										X
GP-510-1	Soil	3/13/2013	1.0										X
GP-510-3	Soil	3/13/2013	3.0										X
GP-510-GW	Groundwater	3/13/2013	-										X
GP-511-1	Soil	3/13/2013	1.0										X
GP-512-1	Soil	3/14/2013	1.0										X
SLR Additional Upland Assessment - Knoll Area (2013)													
TP-10-10	Soil	11/13/2013	10.0	X					X	X			
TP-11-2	Soil	11/13/2013	2.0	X					X	X			
TP-12-12.5	Soil	11/13/2013	12.5	X					X	X			
TP-13-12	Soil	11/13/2013	12.0	X					X	X			
TP-14-12	Soil	11/14/2013	12.0	X					X	X			
TP-15-9	Soil	11/14/2013	9.0	X					X	X			
TP-16-11.5	Soil	11/14/2013	11.5	X		X	X	X	X	X			
TP-17-13	Soil	11/14/2013	13.0	X			X	X	X	X			
GP-601-W	Groundwater	11/18/2013	-	X		X	X	X	X				
GP-602-W	Groundwater	11/18/2013	-	X					X				
GP-603-W	Groundwater	11/18/2013	-	X		X	X		X				
GP-604-W	Groundwater	11/18/2013	-	X	X	X	X		X				
SLR Additional Upland Assessment - National Pole Area (2013)													
GP-605-13.5	Soil	12/18/2013	13.5	X			X						
GP-605-34.5	Soil	12/18/2013	34.5	X			X						
GP-605-GW	Groundwater	12/18/2013	-	X			X						
GP-606-14.5	Soil	12/18/2013	14.5	X			X						
GP-606-GW	Groundwater	12/18/2013	-	X			X						
GP-607-24.5	Soil	12/18/2013	24.5	X			X						
GP-607-GW	Groundwater	12/18/2013	-	X			X						
SLR Additional Upland Assessment (2015)													
GP-701-5	Soil	7/9/2015	5.0		X	X	X [3]		X [4]				
GP-701-GW	Groundwater	7/9/2015	-		X	X	X [3]		X [4]				
GP-702-4	Soil	7/9/2015	4.0		X	X	X [3]		X [4]				
GP-702-14.5	Soil	7/9/2015	14.5		X	X	X [3]		X [4]				
GP-702-GW	Groundwater	7/9/2015	-		X	X	X [3]		X [4]				
GP-703-8.5	Soil	7/21/2015	8.5		X	X	X [3]		X [4]				
GP-703-GW	Groundwater	7/21/2015	-		X	X	X [3]		X [4]				
GP-704-13.5	Soil	7/21/2015	13.5		X	X	X [3]		X [4]				
GP-704-GW	Groundwater	7/21/2015	-		X	X	X [3]		X [4]				

Table 2.3-1
Upland RI Investigation Sample Summary

Sample ID	Matrix	Sample Date	Sample Depth (Ft)	TPH-HCID	TPH-Gx	TPH-Dx	PAHs	SVOCs	VOCs	PCB Aroclors	PCB Congeners	Metals	Dioxins and Furans
GP-705-5	Soil	7/9/2015	5.0		X	X	X [3]		X [4]				
GP-705-GW	Groundwater	7/9/2015	-		X	X	X [3]		X [4]				
GP-706-4	Soil	7/8/2015	4.0		X	X	X [3]		X [4]				
GP-706-GW	Groundwater	7/8/2015	-		X	X	X [3]		X [4]				
GP-707-4	Soil	7/6/2015	4.0		X	X	X [3]		X [4]				
GP-707-GW	Groundwater	7/6/2015	-		X	X	X [3]		X [4]				
GP-708-4	Soil	7/8/2015	4.0		X	X	X [3]		X [4]				
GP-708-6	Soil	7/8/2015	6.0		X	X	X [3]		X [4]				
GP-708-GW	Groundwater	7/8/2015	-		X	X	X [3]		X [4]				
GP-708-SG	Soil Gas	7/7/2015	-						X [5]				
GP-709-5	Soil	7/7/2015	5.0		X	X	X [3]		X [4]				
GP-709-42	Soil	7/7/2015	42.0		X	X	X [3]		X [4]				
GP-709-GW	Groundwater	7/7/2015	-		X	X	X [3]		X [4]				
GP-709-SG	Soil Gas	7/6/2015	-						X [5]				
GP-710-4	Soil	7/8/2015	4.0		X	X	X [3]		X [4]				
GP-710-35	Soil	7/8/2015	35.0		X	X	X [3]		X [4]				
GP-710-GW	Groundwater	7/8/2015	-		X	X	X [3]		X [4]				
GP-710-SG	Soil Gas	7/7/2015	-						X [5]				
GP-711-3	Soil	7/8/2015	3.0		X	X	X [3]		X [4]				
GP-711-6	Soil	7/8/2015	6.0		X	X	X [3]		X [4]				
GP-711-GW	Groundwater	7/8/2015	-		X	X	X [3]		X [4]				
GP-711-SG	Soil Gas	7/7/2015	-						X [5]				
GP-712-5	Soil	7/7/2015	5.0		X	X	X [3]		X [4]				
GP-712-8	Soil	7/7/2015	8.0		X	X	X [3]		X [4]				
GP-712-GW	Groundwater	7/7/2015	-		X	X	X [3]		X [4]				
GP-712-SG	Soil Gas	7/7/2015	-						X [5]				
GP-713-SG	Soil Gas	7/6/2015	-						X [5]				
GP-714-SG	Soil Gas	7/6/2015	-						X [5]				
GP-715-SG	Soil Gas	7/6/2015	-						X [5]				
MW7-12.5	Soil	8/14/2015	12.5		X	X	X [3]		X [4]				
MW8A-SG	Soil Gas	7/7/2015	-						X [5]				
MW8B-54	Soil	8/12/2015	54.0		X	X	X [3]		X [4]				
MW9B-35.5	Soil	8/14/2015	35.5						X [5]				
MW10B-35	Soil	8/13/2015	35.0						X [5]				

Table 2.3-1
Upland RI Investigation Sample Summary

Sample ID	Matrix	Sample Date	Sample Depth (Ft)	TPH-HCID	TPH-Gx	TPH-Dx	PAHs	SVOCs	VOCs	PCB Aroclors	PCB Congeners	Metals	Dioxins and Furans
SLR Quarterly Groundwater Monitoring Well Sampling (September 2015)													
MW-1-GW	Groundwater	9/9/2015	-		X	X	X [3]		X [4]				
MW-2-GW	Groundwater	9/10/2015	-		X	X	X [3]		X [4]				
MW-4-GW	Groundwater	9/9/2015	-		X	X	X [3]		X [4]				
MW-5-GW	Groundwater	9/9/2015	-		X	X	X [3]		X [4]				
MW-6-GW	Groundwater	9/9/2015	-		X	X	X [3]		X [4]				
MW-7-GW	Groundwater	9/9/2015	-		X	X	X [3]		X [4]				
MW-8A-GW	Groundwater	9/9/2015	-		X	X	X [3]		X [4]				
MW-8B-GW	Groundwater	9/9/2015	-		X	X	X [3]		X [4]				
MW-9A-GW	Groundwater	9/10/2015	-		X	X	X [3]		X [4]				
MW-9B-GW	Groundwater	9/10/2015	-		X	X	X [3]		X [4]				
MW-10A-GW	Groundwater	9/10/2015	-		X	X	X [3]		X [4]				
MW-10B-GW	Groundwater	9/10/2015	-		X	X	X [3]		X [4]				
SLR Quarterly Groundwater Monitoring Well Sampling (December 2015)													
MW-1-GW	Groundwater	12/10/2015	-		X	X	X [3]		X [4]				
MW-2-GW	Groundwater	12/11/2015	-		X	X	X [3]		X [4]				
MW-3-GW	Groundwater	12/11/2015	-		X	X	X [3]		X [4]				
MW-4-GW	Groundwater	12/10/2015	-		X	X	X [3]		X [4]				
MW-5-GW	Groundwater	12/11/2015	-		X	X	X [3]		X [4]				
MW-6-GW	Groundwater	12/10/2015	-		X	X	X [3]		X [4]				X
MW-7-GW	Groundwater	12/10/2015	-		X	X	X [3]		X [4]				X
MW-8A-GW	Groundwater	12/11/2015	-		X	X	X [3]		X [4]				
MW-8B-GW	Groundwater	12/11/2015	-		X	X	X [3]		X [4]				
MW-9A-GW	Groundwater	12/10/2015	-		X	X	X [3]		X [4]				X
MW-9B-GW	Groundwater	12/10/2015	-		X	X	X [3]		X [4]				
MW-10A-GW	Groundwater	12/11/2015	-		X	X	X [3]		X [4]				
MW-10B-GW	Groundwater	12/11/2015	-		X	X	X [3]		X [4]				
SLR Quarterly Groundwater Monitoring Well Sampling (March 2016)													
MW-2-032916	Groundwater	3/29/2016	-			X	X [3]						
MW-3-032916	Groundwater	3/29/2016	-			X	X [3]						
MW4-032816	Groundwater	3/28/2016	-			X	X [3]						
MW5-032816	Groundwater	3/28/2016	-			X	X [3]						
MW-6-032916	Groundwater	3/29/2016	-			X	X [3]						
MW7-032816	Groundwater	3/28/2016	-			X	X [3]						
MW8A-032816	Groundwater	3/28/2016	-			X	X [3]						
MW8B-032816	Groundwater	3/28/2016	-			X	X [3]						

Table 2.3-1
Upland RI Investigation Sample Summary

Sample ID	Matrix	Sample Date	Sample Depth (Ft)	TPH-HCID	TPH-Gx	TPH-Dx	PAHs	SVOCs	VOCs	PCB Aroclors	PCB Congeners	Metals	Dioxins and Furans
MW9A-032916	Groundwater	3/29/2016	-			X	X [3]						
MW9B-032916	Groundwater	3/29/2016	-			X	X [3]						
MW10A-032916	Groundwater	3/29/2016	-			X	X [3]						
MW10B-032916	Groundwater	3/29/2016	-			X	X [3]						
SLR Quarterly Groundwater Monitoring Well Sampling (June 2016)													
MW1-062316	Groundwater	6/23/2016	-			X							
MW4-062316	Groundwater	6/23/2016	-				X						
MW5-062316	Groundwater	6/23/2016	-				X		X [6]				
MW6-062316	Groundwater	6/23/2016	-				X		X [6]				X
MW7-062416	Groundwater	6/24/2016	-				X		X [6]				X
MW8A-062416	Groundwater	6/24/2016	-				X		X [6]				X
MW8B-062416	Groundwater	6/24/2016	-				X		X [6]				
MW9A-062416	Groundwater	6/24/2016	-				X		X [6]				X
MW9B-062416	Groundwater	6/24/2016	-				X		X [6]				
MW10A-062416	Groundwater	6/24/2016	-				X		X [6]				
MW10B-062416	Groundwater	6/24/2016	-				X		X [6]				
SLR Quarterly Groundwater Monitoring Well Sampling (January 2017)													
MW-1-0117	Groundwater	1/30/2017	-			X							
MW-3-0117	Groundwater	1/30/2017	-			X							
MW-5-0117	Groundwater	1/30/2017	-			X	X [3]		X [7]				
MW-6-0117	Groundwater	1/31/2017	-			X	X [3]						X
MW-7-0117	Groundwater	1/31/2017	-			X	X [3]						X
MW-8A-0117	Groundwater	1/31/2017	-			X	X [3]		X [7]				
MW-8B-0117	Groundwater	1/31/2017	-			X	X [3]		X [7]				
MW-9A-0117	Groundwater	1/30/2017	-			X	X [3]						
MW-9B-0117	Groundwater	1/30/2017	-			X	X [3]						
MW-10A-0117	Groundwater	1/30/2017	-			X	X [3]		X [7]				
MW-10B-0117	Groundwater	1/30/2017	-			X	X [3]		X [7]				
SLR Quarterly Groundwater Monitoring Well Sampling (April 2017)													
MW-5-0417	Groundwater	4/25/2017	-			X							
MW-8A-0417	Groundwater	4/25/2017	-			X	X [3]		X [7]				
MW-8B-0417	Groundwater	4/25/2017	-			X	X [3]		X [7]				
MW-10A-0417	Groundwater	4/25/2017	-			X							
MW-10B-0417	Groundwater	4/25/2017	-			X							
SLR Quarterly Groundwater Monitoring Well Sampling (June 2017)													
MW-1-0617	Groundwater	6/28/2017	-			X							
MW-3-0617	Groundwater	6/28/2017	-			X							
MW-4-0617	Groundwater	6/28/2017	-			X							

Table 2.3-1
Upland RI Investigation Sample Summary

Sample ID	Matrix	Sample Date	Sample Depth (Ft)	TPH-HCID	TPH-Gx	TPH-Dx	PAHs	SVOCs	VOCs	PCB Aroclors	PCB Congeners	Metals	Dioxins and Furans
MW-5-0617	Groundwater	6/29/2017	-			X	X [3]		X [7]				
MW-6-0617	Groundwater	6/29/2017	-			X	X [3]						X
MW-7-0617	Groundwater	6/29/2017	-			X	X [3]						X
MW-8A-0617	Groundwater	6/28/2017	-			X	X [3]		X [7]				X
MW-8B-0617	Groundwater	6/28/2017	-			X	X [3]		X [7]				
MW-9A-0617	Groundwater	6/29/2017	-			X	X [3]						X
MW-9B-0617	Groundwater	6/29/2017	-			X	X [3]						
MW-10A-0617	Groundwater	6/28/2017	-			X	X [3]		X [7]				
MW-10B-0617	Groundwater	6/28/2017	-			X	X [3]		X [7]				
SLR Quarterly Groundwater Monitoring Well Sampling (October 2017)													
MW-5-1017	Groundwater	10/23/2017	-			X							
MW-8A-1017	Groundwater	10/23/2017	-			X	X [3]		X [7]				
MW-8B-1017	Groundwater	10/23/2017	-			X	X [3]		X [7]				
MW-10A-1017	Groundwater	10/23/2017	-			X							
MW-10B-1017	Groundwater	10/23/2017	-			X							
SLR Quarterly Groundwater Monitoring Well Sampling (January 2018)													
MW-1-0118	Groundwater	1/15/2018	-			X							
MW-3-0118	Groundwater	1/15/2018	-			X							
MW-4-0118	Groundwater	1/15/2018	-			X							
MW-5-0118	Groundwater	1/15/2018	-			X	X [3]		X [7]				
MW-6-0118	Groundwater	1/15/2018	-			X	X [3]						X
MW-7-0118	Groundwater	1/15/2018	-			X	X [3]						X
MW-8A-0118	Groundwater	1/16/2018	-			X	X [3]		X [7]				
MW-8B-0118	Groundwater	1/16/2018	-			X	X [3]		X [7]				
MW-9A-0118	Groundwater	1/15/2018	-			X	X [3]						
MW-9B-0118	Groundwater	1/15/2018	-			X	X [3]						
MW-10A-0118	Groundwater	1/15/2018	-			X	X [3]		X [7]				
MW-10B-0118	Groundwater	1/15/2018	-			X	X [3]		X [7]				
SLR Quarterly Groundwater Monitoring Well Sampling (April 2018)													
MW-5-0418	Groundwater	4/10/2018	-			X							
MW-8A-0418	Groundwater	4/10/2018	-			X	X [3]		X [7]				
MW-8B-0418	Groundwater	4/10/2018	-			X	X [3]		X [7]				
MW-10A-0418	Groundwater	4/10/2018	-			X							
MW-10B-0418	Groundwater	4/10/2018	-			X							
SLR Source Control Evaluation (2018-2019)													
NTD-SED-0418	Soil	4/4/2018	-			X	X [3]		X [7]		X		X
NTD-SED-A	Soil	7/9/2018	0-1			X	X [3]		X [7]		X		X

Table 2.3-1
Upland RI Investigation Sample Summary

Sample ID	Matrix	Sample Date	Sample Depth (Ft)	TPH-HCID	TPH-Gx	TPH-Dx	PAHs	SVOCs	VOCs	PCB Aroclors	PCB Congeners	Metals	Dioxins and Furans
NTD-SED-B	Soil	7/9/2018	0-1			X	X [3]		X [7]		X		X
NTD-SW-EAST-0418	Groundwater	4/5/2018	-			X	X [3]		X [7]		X		X
NTD-SW-WEST-0418	Groundwater	4/5/2018	-			X	X [3]		X [7]		X		X
NTD-SW-3"-0418	Stormwater	4/4/2018	-			X	X [3]	`	X [7]		X		X
NTD-SW-8"-0418	Stormwater	4/4/2018	-			X	X [3]		X [7]		X		X
SLR Quarterly Groundwater Monitoring Well Sampling (July 2018)													
MW-1-0718	Groundwater	7/9/2018	-			X							
MW-3-0718	Groundwater	7/9/2018	-			X							
MW-4-0718	Groundwater	7/9/2018	-			X							
MW-5-0718	Groundwater	7/9/2018	-			X	X [3]		X [7]				
MW-6-0718	Groundwater	7/10/2018	-			X	X [3]						X
MW-7-0718	Groundwater	7/10/2018	-			X	X [3]						X
MW-8A-0718	Groundwater	7/9/2018	-			X	X [3]		X [7]				X
MW-8B-0718	Groundwater	7/9/2018	-			X	X [3]		X [7]				
MW-9A-0718	Groundwater	7/10/2018	-			X	X [3]						X
MW-9B-0718	Groundwater	7/10/2018	-			X	X [3]						
MW-10A-0718	Groundwater	7/10/2018	-			X	X [3]		X [7]				
MW-10B-0718	Groundwater	7/10/2018	-			X	X [3]		X [7]				
SLR Quarterly Groundwater Monitoring Well Sampling (October 2018)													
MW-5-1018	Groundwater	10/24/2018	-			X							
MW-8A-1018	Groundwater	10/24/2018	-			X	X [3]		X [7]				
MW-8B-1018	Groundwater	10/24/2018	-			X	X [3]		X [7]				
MW-10A-1018	Groundwater	10/24/2018	-			X							
MW-10B-1018	Groundwater	10/24/2018	-			X							
SLR Quarterly Groundwater Monitoring Well Sampling (January 2019)													
MW-1-0119	Groundwater	1/17/2019	-			X							
MW-3-0119	Groundwater	1/17/2019	-			X							
MW-4-0119	Groundwater	1/17/2019	-			X							
MW-5-0119	Groundwater	1/17/2019	-			X	X [3]		X [7]				
MW-6-0119	Groundwater	1/17/2019	-			X	X [3]						X
MW-7-0119	Groundwater	1/17/2019	-			X	X [3]						X
MW-8A-0119	Groundwater	1/17/2019	-			X	X [3]		X [7]				
MW-8B-0119	Groundwater	1/17/2019	-			X	X [3]		X [7]				
MW-9A-0119	Groundwater	1/17/2019	-			X	X [3]						
MW-9B-0119	Groundwater	1/17/2019	-			X	X [3]						
MW-10A-0119	Groundwater	1/17/2019	-			X	X [3]		X [7]				
MW-10B-0119	Groundwater	1/17/2019	-			X	X [3]		X [7]				

Table 2.3-1
Upland RI Investigation Sample Summary

Sample ID	Matrix	Sample Date	Sample Depth (Ft)	TPH-HCID	TPH-Gx	TPH-Dx	PAHs	SVOCs	VOCs	PCB Aroclors	PCB Congeners	Metals	Dioxins and Furans
SLR Quarterly Groundwater Monitoring Well Sampling (April 2019)													
MW-5-0418	Groundwater	4/15/2019	-			X							
MW-8A-0418	Groundwater	4/15/2019	-			X	X [3]		X [7]				
MW-8B-0418	Groundwater	4/15/2019	-			X	X [3]		X [7]				
MW-10A-0418	Groundwater	4/15/2019	-			X							
MW-10B-0418	Groundwater	4/15/2019	-			X							
SLR Source Control Evaluation (2018-2019)													
GP-MW-11-SS	Soil	4/25/2019	0-12					X	X		X		X
MW-11A-0519	Groundwater	5/3/2019	-				X [3]	X	X			X	
MW-11B -0519	Groundwater	5/3/2019	-			X	X [3]	X	X				
GP-MW-12-SS	Soil	4/25/2019	0-12				X [3]		X		X		X
GP-MW-12-SS-18-19	Soil	4/25/2019	18-19										X
MW-12-0519	Groundwater	5/3/2019	-				X [3]		X		X	X	
GP-MW-13-SS	Soil	4/25/2019	0-12				X [3]	X			X		X
MW-13-0519	Groundwater	5/3/2019	-				X [3]	X			X	X	
GP-MW-14-SS	Soil	4/25/2019	0-12				X [3]	X			X		X
MW-14-0519	Groundwater	5/3/2019	-				X [3]	X			X	X	
GP-MW-15-SS	Soil	4/26/2019	0-12						X		X		
MW-15-0519	Groundwater	5/3/2019	-								X	X	
GP-MW-16-SS	Soil	4/26/2019	0-12			X	X [3]	X			X		X
MW-16-0519	Groundwater	5/3/2019	-				X [3]	X			X	X	X
GP-MW-17-SS	Soil	4/26/2019	0-12			X	X [3]	X	X		X		X
MW-17-0519	Groundwater	5/3/2019	-			X	X [3]	X	X		X	X	
GP-801-SS	Soil	4/26/2019	0-12			X	X [3]	X	X		X		X
GP-801-GW	Groundwater	4/26/2019	-			X	X [3]	X	X		X		
GP-802-SS	Soil	4/26/2019	0-12			X	X [3]	X	X		X		X
GP-802-GW	Groundwater	4/26/2019	-			X	X [3]	X	X		X		
SLR Quarterly Groundwater Monitoring Well Sampling (July 2019)													
MW-1-0719	Groundwater	7/31/2019	-				X [3]				X	X	
MW-2-0719	Groundwater	7/31/2019	-			X	X [3]				X	X	
MW-3-0718	Groundwater	7/31/2019	-				X [3]				X	X	
MW-4-0718	Groundwater	7/31/2019	-				X [3]				X	X	
MW-5-0718	Groundwater	7/30/2019	-								X	X	
MW-6-0718	Groundwater	7/31/2019	-				X [3]				X	X	
MW-7-0718	Groundwater	7/10/2018	-				X [3]				X	X	
MW-8A-0718	Groundwater	7/30/2019	-								X	X	
MW-9A-0718	Groundwater	7/31/2019	-				X [3]				X	X	

Table 2.3-1
Upland RI Investigation Sample Summary

Sample ID	Matrix	Sample Date	Sample Depth (Ft)	TPH-HCID	TPH-Gx	TPH-Dx	PAHs	SVOCs	VOCs	PCB Aroclors	PCB Congeners	Metals	Dioxins and Furans
MW-9B-0718	Groundwater	7/31/2019	-				X [3]						
MW-10A-0718	Groundwater	7/31/2019	-								X	X	
MW-11A-0719	Groundwater	7/30/2019	-			X	X [3]				X	X	
MW-12-0719	Groundwater	8/1/2019	-								X	X	
MW-13-0719	Groundwater	8/1/2019	-			X	X [3]				X	X	
MW-14-0719	Groundwater	8/1/2019	-								X	X	
MW-15-0719	Groundwater	7/31/2019	-			X	X [3]				X	X	X
MW-16-0719	Groundwater	7/31/2019	-								X	X	X
MW-17-0719	Groundwater	7/30/2019	-			X					X	X	
SLR Semiannual Groundwater Sampling Event (February 2020)													
MW-1-0719	Groundwater	2/18/2020	-				X [3]						
MW-3-0220	Groundwater	2/18/2020	-								X		
MW-6-0220	Groundwater	2/19/2020	-									X	
MW-7-0220	Groundwater	2/19/2020	-									X	
MW-8A-0220	Groundwater	2/19/2020	-									X	
MW-9B-0718	Groundwater	7/31/2019	-				X [3]						
MW-10A-0220	Groundwater	2/18/2020	-								X		
MW-11A-0220	Groundwater	2/19/2020	-			X							
MW-12-0220	Groundwater	2/19/2020	-								X		
MW-13-0220	Groundwater	2/19/2020	-								X		
MW-14-0220	Groundwater	2/19/2020	-								X		
MW-17-0220	Groundwater	2/19/2020	-									X	
MW-18-0220	Groundwater	2/18/2020	-								X		
MW-19-0220	Groundwater	2/18/2020	-								X		

Notes:

TPH-HCID = Total Petroleum Hydrocarbons - Identification

TPH-Gx - Total Petroleum Hydrocarbons - Gasoline Range

TPH-Dx - Total Petroleum Hydrocarbons - Diesel Range and Heavy Oil/Lube Oil Range

PAHs = Polynuclear Aromatic Hydrocarbons

SVOCs = Semivolatile Organic Compounds

VOCs = Volatile Organic Compounds

PCBs = Polychlorinated Biphenyls

Table 4.1-1
Summary of Soil Analytical Results

Analytes Detected above Laboratory Reporting Limit	Soil Analytical Samples					Notes
	Number of Samples	Detects	FOD (%)	Initial PCL Exceedances	Initial PCL (mg/kg)	
Total Petroleum Hydrocarbons (TPH)						
NWTPH-Gx	53	37	70%	8	30/100	Co-located with cPAH Exceedances
NWTPH-Dx Diesel	102	74	73%	11	2,000	Co-located with cPAH Exceedances
NWTPH-Dx- Heavy Oil	93	79	85%	9	2,000	Co-located with cPAH Exceedances
Polynuclear Aromatic Hydrocarbons (PAHs)						
Benzo(a)anthracene	143	99	69%	-	-	Included as cPAH TEQ calculation
Benzo(a)pyrene	144	91	63%	-	-	Included as cPAH TEQ calculation
Benzo(b)fluoranthene	144	98	68%	-	-	Included as cPAH TEQ calculation
Benzo(k)fluoranthene	144	86	60%	-	-	Included as cPAH TEQ calculation
Chrysene	144	99	69%	-	-	Included as cPAH TEQ calculation
Dibenzo(a,h)anthracene	144	55	38%	-	-	Included as cPAH TEQ calculation
Indeno(1,2,3-cd)pyrene	143	78	55%	-	-	Included as cPAH TEQ calculation
Total PAHs TEQ U = 0	110	84	76%	31	0.19	Indicator Hazardous Substance - Creosote/Fuel Oil Area
Methylnaphthalene; 1-	36	27	75%	19	0.004	Co-located with cPAH Exceedances
Methylnaphthalene; 2-	86	41	48%	11	0.088	Co-located with cPAH Exceedances
Acenaphthylene	71	32	45%	0	33	No Exceedances of Initial PCL
Acenaphthene	115	49	43%	12	5	Co-located with cPAH Exceedances
Anthracene	115	57	50%	6	110	Co-located with cPAH Exceedances
Benzo(ghi)perylene	117	53	45%	4	33	Co-located with cPAH Exceedances
Fluoranthene	117	79	68%	9	32	Co-located with cPAH Exceedances
Fluorene	117	51	44%	12	5.1	Co-located with cPAH Exceedances
Naphthalene [x]	145	82	57%	32	0.24	Co-located with cPAH Exceedances
Phenanthrene	117	17	15%	12	33	Co-located with cPAH Exceedances
Pyrene	78	55	71%	8	33	Co-located with cPAH Exceedances
Semivolatile Organic Compounds (SVOCs)						
Acetophenone	30	2	7%	0	8,000	No Exceedances of Initial PCL
Benzaldehyde	30	1	3%	-	-	Low FOD (not greater than 5%)
Biphenyl;1,1'-	30	2	7%	1	0.333	Co-located with cPAH Exceedances
Bis(2-chloroisopropyl) ether	37	1	3%	-	-	Low FOD (not greater than 5%)
Bis(2-ethylhexyl) phalate	37	1	3%	-	-	Low FOD (not greater than 5%)
Carbazole	43	12	28%	5	0.333	Co-located with cPAH Exceedances
Dibenzofuran	52	16	31%	5	0.333	Co-located with cPAH Exceedances
Dichlorophenol;2,4-	37	1	3%	-	-	Low FOD (not greater than 5%)
Di(2-ethylhexyl) phthalate	37	1	3%	-	-	Low FOD (not greater than 5%)
Dimethylphenol; 2-4	59	1	2%	-	-	Low FOD (not greater than 5%)
Dibutyl phthalate	37	1	3%	-	-	Low FOD (not greater than 5%)

Table 4.1-1
Summary of Soil Analytical Results

Analytes Detected above Laboratory Reporting Limit	Soil Analytical Samples					Notes
	Number of Samples	Detects	FOD (%)	Initial PCL Exceedances	Initial PCL (mg/kg)	
m,p-Cresol (3,4-Methylphenol)	46	5	11%	0	4,000	No Exceedances of Initial PCL
o-Cresol (2-Methylphenol)	59	1	2%	-	-	Low FOD (not greater than 5%)
Pentachlorophenol	82	3	4%	-	-	Low FOD (not greater than 5%)
Phenol	58	5	9%	0	0.76	No Exceedances of Initial PCL
Volatile Organic Compounds (VOCs)						
Acetic Acid, Methyl Ester	31	1	3%	-	-	Low FOD (not greater than 5%)
Acetone	37	23	62%	1	2.1	Co-located with cPAH Exceedances
Benzene	83	33	40%	7	0.0017	Co-located with cPAH Exceedances
Bromomethane	37	1	3%	-	-	Low FOD (not greater than 5%)
2-Butanone (MEK)	37	12	32%	0	48,000	No Exceedances of Initial PCL
Carbon Tetrachloride	37	1	3%	-	-	Less than 5% FOD
Carbon Disulfide	31	16	52%	0	0.27	No Exceedances of Initial PCL
Chloroform	37	2	5%	-	-	Low FOD (not greater than 5%)
Chloromethane	37	1	3%	-	-	Low FOD (not greater than 5%)
Cyclohexane	31	1	3%	-	-	Low FOD (not greater than 5%)
1,2-cis Dichloroethylene	37	1	3%	-	-	Low FOD (not greater than 5%)
1,2-trans Dichloroethylene	37	2	5%	-	-	Low FOD (not greater than 5%)
1,1-Dichloroethane	37	1	3%	-	-	Low FOD (not greater than 5%)
Ethylbenzene	83	26	31%	2	0.34	Co-located with cPAH Exceedances
Isopropylbenzene (Cumene)	37	1	3%	-	-	Low FOD (not greater than 5%)
Methylene Chloride	37	8	22%	7	0.002	Co-located with cPAH Exceedances
Methylcyclohexane	31	1	3%	-	-	Low FOD (not greater than 5%)
Tetrachloroethylene	37	7	19%	3	0.0028	Co-located with cPAH Exceedances
Toluene	83	38	46%	6	0.27	Co-located with cPAH Exceedances
Trichloroethylene	37	3	8%	3	0.0015	Co-located with cPAH Exceedances
1,2,3-Trimethylbenzene	6	1	17%	-	-	Low FOD (isolated detection)
1,2,4-Trimethylbenzene	43	26	60%	8	0.025	Co-located with cPAH Exceedances
Xylenes (total)	83	30	36%	3	0.83	Co-located with cPAH Exceedances
Polychlorinated Biphenyls (PCBs)						
Total PCB Aroclors	33	3	9%	0	0.5	No Exceedances of Initial PCL
PCB Congeners	12	12	100%	0	0.5	No Exceedances of Initial PCL
Metals						
Antimony	16	9	56%	9	0.272	Not COPC
Arsenic	16	9	56%	0	20	No Exceedances of Initial PCL
Beryllium	16	6	38%	0	3.16	No Exceedances of Initial PCL
Cadmium	16	15	94%	1	1.0	Not COPC

Table 4.1-1
Summary of Soil Analytical Results

	Soil Analytical Samples					Notes
Analytes Detected above Laboratory Reporting Limit	Number of Samples	Detects	FOD (%)	Initial PCL Exceedances	Initial PCL (mg/kg)	
Chromium	16	16	100%	0	135	No Exceedances of Initial PCL
Copper	16	16	100%	3	36	Not COPC
Lead	16	16	100%	2	24	Not COPC
Nickel	16	16	100%	1	48	Not COPC
Selenium	16	5	31%	2	0.5	Not COPC
Silver	16	10	63%	9	0.69	Not COPC
Thallium	16	9	56%	9	0.1	Not COPC
Zinc	16	15	94%	1	300	Not COPC
Mercury	16	16	100%	2	0.105	Not COPC
Dioxins and Furans						
TEQ U = 0	36	36	100%	21	5.7	Indicator Hazardous Substance - Woodlife Area

Notes:
FOD indicates Frequency of Detection
Only analytes detected above laboratory reporting limit are presented on this table
Initial PCLs presented on Table 4.1.2.1-1
Indicator Hazardous Substance (IHS) status determined for each Area of Concern
Sample and detection values from Ecology EIM Database download on February 25, 2020 (some results pending at time of this report)
x - Naphthalene calculations include per 8270, 8270-SIM, and 8260 methods

Table 4.1-2
Summary of Groundwater Analytical Results

Analytes Detected above Laboratory Reporting Limit	Groundwater Analytical Samples					Notes
	Number of Samples	Detects	FOD (%)	Initial PCL Exceedances	Initial PCL (ug/L))	
Total Petroleum Hydrocarbons (TPH)						
NWTPH-Gx	53	37	70%	15	800/1,000	Co-located with Naphthalene
NWTPH-Dx Diesel	174	134	77%	28	500	Co-located with Naphthalene
NWTPH-Dx Heavy Oil	174	103	59%	15	500	Co-located with Naphthalene
Polynuclear Aromatic Hydrocarbons (PAHs)						
Benzo(a)anthracene	205	115	56%	-	-	Included as cPAH TEQ calculation
Benzo(a)pyrene	205	87	42%	-	-	Included as cPAH TEQ calculation
Benzo(b)fluoranthene	205	116	57%	-	-	Included as cPAH TEQ calculation
Benzo(k)fluoranthene	205	78	38%	-	-	Included as cPAH TEQ calculation
Chrysene	205	106	52%	-	-	Included as cPAH TEQ calculation
Dibenzo(a,h)anthracene	167	55	33%	-	-	Included as cPAH TEQ calculation
Indeno(1,2,3-cd)pyrene	205	70	34%	-	-	Included as cPAH TEQ calculation
Total PAHs TEQ U = 0	205	116	57%	34	0.015	Co-located with Naphthalene
1-Methylnaphthalene	29	17	59%	10	1.5	Co-located with Naphthalene
2-Methylnaphthalene	70	25	36%	12	32	Co-located with Naphthalene
Acenaphthylene	51	12	24%	2	8.0	No Exceedances of Initial PCL
Acenaphthene	89	46	52%	20	30	Co-located with Naphthalene
Anthracene	89	27	30%	3	100	No Exceedances of Initial PCL
Benzo(ghi)perylene	89	18	20%	2	8.0	No Exceedances of Initial PCL
Fluoranthene	89	31	35%	16	6.0	Co-located with Naphthalene
Fluorene	89	36	40%	18	10	Co-located with Naphthalene
Naphthalene x	166	91	55%	44	8.9	Indicator Hazardous Substance - Creosote/Fuel Oil Area
Phenanthrene	89	34	38%	20	8.0	Co-located with Naphthalene
Pyrene	88	31	35%	15	8.0	Co-located with Naphthalene
Semivolatile Organic Compounds (SVOCs)						
1,1-Biphenyl	16	1	6%	1	5.5	Low FOD (isolated detection), not COPC
Carbazole	44	9	20%	-	-	No available PCL, Not COPC
Dibenzofuran	44	10	23%	7	16	Co-located with Naphthalene
2,4-Dimethylphenol	53	3	6%	2	97	Co-located with Naphthalene
2-Methyl-phenol	52	2	4%	-	-	Low FOD (not greater than 5%)
3,4-Methylphenol	44	4	9%	1	400	Co-located with Naphthalene
4-Nitrophenol	25	1	4%	-	-	Low FOD (not greater than 5%)
Phenol	53	11	21%	0	70,000	No Exceedances of Initial PCL
Bis(2-ethylhexyl)phthalate	25	1	4%	-	-	Low FOD (not greater than 5%)
Diethyl phthalate	25	1	4%	-	-	Low FOD (not greater than 5%)
Volatile Organic Compounds (VOCs)						
Acetone	26	8	31%	0	7,200	No Exceedances of Initial PCL
Benzene	142	47	33%	15	1.6	Co-located with Naphthalene
1,1-Dichloroethane	26	1	4%	-	-	Low FOD (not greater than 5%)

Table 4.1-2
Summary of Groundwater Analytical Results

Analytes Detected above Laboratory Reporting Limit	Groundwater Analytical Samples					Notes
	Number of Samples	Detects	FOD (%)	Initial PCL Exceedances	Initial PCL (ug/L))	
1, 2-, cis Dichloroethylene	26	1	4%	-	-	Low FOD (not greater than 5%)
1, 2-, trans Dichroloroethylene	26	1	4%	-	-	Low FOD (not greater than 5%)
Ethylbenzene	101	18	18%	9	31	Co-located with Naphthalene
Isopropylbenzene	66	4	6%	0	720	No Exceedances of Initial PCL
p-Isopropyltoluene	10	3	30%	-	-	No available PCL, Not COPC
Naphthalene x	166	91	55%	44	8.9	Indicator Hazardous Substance - Creosote Area
n-Propylbenzene	52	1	2%	-	-	Low FOD (not greater than 5%)
Tetrachloroethylene	26	1	4%	-	-	Low FOD (not greater than 5%)
Toluene	100	28	28%	4	130	Co-located with Naphthalene
Trichloroethylene	26	1	4%	-	-	Low FOD (not greater than 5%)
1,2,4-Trimethylbenzene	85	20	24%	0	240	No Exceedances of Initial PCL
1,3,5-Trimethylbenzene	50	1	2%	-	-	Low FOD (not greater than 5%)
Xylenes	101	20	20%	1	330	Co-located with Naphthalene
Polychlorinated Biphenyls (PCBs)						
Total Congeners	44	44	100%	8	1,210	Indicator Hazardous Substance - Knoll Fill Area
Metals						
Antimony	50	24	48%	0	90	No Exceedances of Initial PCL
Arsenic	50	49	98%	19	5	Not COPC
Beryllium	50	3	6%	0	270	No Exceedances of Initial PCL
Cadmium	50	6	12%	1	7.9	Not COPC
Chromium	50	31	62%	0	240,000	No Exceedances of Initial PCL
Copper	50	31	62%	16	3.1	Not COPC
Lead	50	23	46%	9	8.1	Not COPC
Nickel	50	27	54%	7	8.2	Not COPC
Selenium	50	15	30%	2	71	Not COPC
Silver	50	6	12%	0	26,000	No Exceedances of Initial PCL
Thallium	50	3	6%	2	0.22	Not COPC
Zinc	50	28	56%	5	81	Not COPC
Mercury	50	7	14%	2	0.025	Not COPC
Dioxins and Furans						
TEQ U = 0	47	34	72%	2	57	Indicator Hazardous Substance - Woodlife Area

Notes:
FOD indicates Frequency of Detection
Only analytes detected above laboratory reporting limit are presented on this table
Initial PCLs presented on Table 4.1.2.1-2
Indicator Hazardous Substance (IHS) status determined for each Area of Concern
Sample and detection values from Ecology EIM Database download on February 25, 2020 (some results pending at time of this report)
x - Naphthalene calculations include per 8270, 8270-SIM, and 8260 methods

Table 4.1-3
Soil Analytical Results -TPH

Sample Location	Sample ID	Sample Depth (feet)	Sample Date	Hydrocarbon Identification [A] (mg/Kg)						Total Petroleum Hydrocarbons [B] (mg/Kg)					
				Gasoline		Diesel		Heavy Oil		TPH-Gx Gasoline Range		TPH-Dx Diesel Range		TPH-Dx Heavy Oil Range	
				Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual
Parametrix Sampling Event (1991)															
GS-1	-	-	5/24/1991	-		-		-		-		**19**		-	
GS-2	-	-	5/24/1991	-		-		-		-		**23**		-	
GS-4	-	-	5/24/2991	-		-		-		-		**22**		-	
SS-1	-	-	5/30/1991	-		-		-		<10.0		<10.0		-	
SS-2	-	-	5/30/1991	-		-		-		<10.0		<10.0		-	
RZA Sampling Event (1992)															
C1	C1-S1	2.5-4.0	8/27/1992	<20		<50		<100		-		<1		-	
C2	C2-S2	7.5-9.0	8/27/1992	<20		<50		<100		-		<1		-	
C4	C4-S1	2.5-4.0	8/27/1992	-		-		-		<10		-		-	
C5	C5-S1	2.5-4.0	8/27/1992	-		-		-		<10		-		-	
C6	C6-S1	2.5-4.0	8/27/1992	<20		<50		<100		-		<1		-	
MW-1	MW-1,S-2	7.5-9.0	8/31/1992	<20		**DET**		**DET**		-		-		-	
MW-2	MW-2, S-1	2.5-4.0	8/31/1992	<20		<50		**DET**		-		-		-	
SLR Pre RI Assessment (2006-2007)															
GP-1	GP1-6	6.0	5/4/2006	<33.2		<82.9		**DET**		-		-		-	
GP-1	GP1-10	10.0	5/4/2006	<18.6		**DET**		**DET**		<4.47		-		-	
GP-2	GP2-5	5.0	5/4/2006	<16.8		<41.9		<83.8		-		-		-	
GP-3	GP3-9	9.0	5/4/2006	<21.6		<54.0		<108		-		-		-	
GP-4	GP4-4.5	4.5	5/11/1006	**DET**		<67.9		<136		**47**		-		-	
GP-5	GP5-6.5	6.5	5/4/2006	<17.8		<44.6		<89.2		-		-		-	
GP-5	GP5-12	12.0	5/4/2006	<18.0		<44.9		<89.9		-		-		-	
GP-6	GP6-5	5.0	5/2/2006	<13.6		<34.1		<68.2		-		-		-	
GP-7	GP7-5	5.0	5/2/2006	<21.6		<54.1		<108		-		-		-	
GP-8	GP8-5	5.0	5/2/2006	<22.2		<55.4		<111		-		-		-	
GP-9	GP9-6	6.0	5/1/2006	-		-		-		-		**12,100**		**2,700**	
GP-9	GP9-12	12.0	5/1/2006	**DET**		**DET**		**DET**		**25**		**1,580**		**371**	
GP-10	GP10-3	3.0	5/1/2006	-		-		-		-		**440**		**1,660**	
GP-10	GP10-11	11.0	5/1/2006	**DET**		**DET**		**DET**		**45**		**14,600**		**3,020**	
GP-11	GP11-6	6.0	5/4/2006	**DET**		**DET**		**DET**		**58**		**60,400**		**15,700**	
GP-11	GP11-12	12.0	5/4/2006	**DET**		**DET**		**DET**		**11**		**225**		**47**	
GP-12	GP12-8	8.0	5/2/2006	**DET**		**DET**		**DET**		<4.88		**2,380**		**801**	
GP-13	GP13-11.5	11.5	5/1/2006	<21.0		<52.4		**DET**		-		<16		<31	
GP-14	GP14-6	6.0	5/1/2006	**DET**		**DET**		**DET**		**14**		**1,460**		**284**	
GP-15	GP15-10	10.0	5/1/2006	<23.5		<58.8		<118		-		-		-	
GP-16	GP16-8	8.0	5/1/2006	<20.9		<52.3		<105		-		-		-	
GP-17	GP17-5	5.0	5/1/2006	<20.3		<50.8		**DET**		-		**41**		**639**	
GP-18	GP18-8	8.0	5/1/2006	<24.3		<60.7		<121		-		-		-	
GP-19	GP19-10	10.0	5/1/2006	<17.8		<44.6		<89.2		-		-		-	
GP-21	GP21-5	5.0	5/4/2006	<17.7		<44.3		<88.5		-		-		-	
GP-22	GP22-6.5	6.5	5/4/2006	<20.2		<50.6		**DET**		-		<15		**38**	
GP-23	GP23-6	6.0	5/1/2006	<17.9		<44.7		<89.3		-		-		-	
GP-24	GP24-6	6.0	5/3/2006	<17.2		<42.9		**DET**		-		**53**		**471**	
GP-26	GP26-7	7.0	5/3/2006	<21.4		<53.6		<107		-		-		-	
GP-27	GP27-2	2.0	5/3/2006	<17.6		<44.1		<88.2		-		-		-	
GP-29	GP29-8	8.0	5/4/2006	<20.7		<51.9		**DET**		-		<16.2		**76**	
GP-31	GP31-6	6.0	5/3/2006	<16.8		<41.9		<83.8		-		-		-	
GP-33	GP33-7	7.0	5/3/2006	<19.5		<48.8		<97.5		-		-		-	
GP-34	GP34-8	8.0	5/3/2006	**DET**		**DET**		**DET**		<4.35		**770**		**3,400**	
GP-35	GP35-7	7.0	5/4/2006	<22.3		<55.6		<111		-		-		-	
GP-36	GP36-6	6.0	5/3/2006	<19.7		<49.2		<98.4		-		-		-	
GP-37	GP37-8	8.0	5/2/2006	<18.5		<46.3		**DET**		-		<15		**64**	
GP-38	GP38-8	8.0	5/2/2006	<21.8		<54.6		<109		-		-		-	
GP-39	GP39-9	9.0	5/2/2006	<19.0		<47.6		**DET**		-		<69.0		**290**	
GP-40	GP40-8	8.0	5/2/2006	<17.6		<44.1		<88.2		-		-		-	
GP-41	GP41-8	8.0	5/2/2006	<19.3		<48.3		**DET**		-		<28.0		**86**	
GP-42	GP42-8	8.0	5/2/2006	<19.6		<49.0		**DET**		-		<13		**70**	
GP201	GP201-4.5	4.5	9/11/2006	<22.4		<55.9		<112		-		-		-	
GP202	GP202-7.5	7.5	9/11/2006	-		-		-		-		**30,200**		**8,220**	
GP203	GP203-5.5	5.5	9/11/2006	-		-		-		-		**10,400**		**2,820**	
GP204	GP204-7.5	7.5	9/11/2006	-		-		-		-		<23		<45.9	
GP205	GP205-3	3.0	9/12/2006	-		-		-		-		<14.6		<29.2	
GP206	GP206-4.5	4.5	9/12/2006	-		-		-		-		**104**		**389**	
GP206	GP206-8.5	8.5	9/12/2006	-		-		-		-		**15,500**		**3,620**	
GP207	GP207-3	3.0	9/12/2006	-		-		-		-		**54**		**411**	

Table 4.1-3
Soil Analytical Results -TPH

Sample Location	Sample ID	Sample Depth (feet)	Sample Date	Hydrocarbon Identification [A] (mg/Kg)						Total Petroleum Hydrocarbons [B] (mg/Kg)					
				Gasoline		Diesel		Heavy Oil		TPH-Gx Gasoline Range		TPH-Dx Diesel Range		TPH-Dx Heavy Oil Range	
				Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual
GP207	GP207-9	9.0	9/12/2006	-		-		-		-		**775**		<49.1	
GP209	GP209-3	3.0	9/12/2006	<17.4		<43.5		<87.1		-		-		-	
GP210	GP210-4	4.0	9/12/2006	<17.4		<43.6		<87.2		-		-		-	
GP211	GP211-3.5	3.5	9/11/2006	<19.4		<48.6		<97.1		-		-		-	
GP212	GP212-3.5	3.5	9/11/2006	<19.4		<48.5		<97		-		-		-	
GP213	GP213-3	3.0	9/12/2006	**DET**		**DET**		**DET**		<4.35		**276**		-	
GP214	GP214-6	6.0	9/12/2006	-		-		-		-		**152**		<37.9	
GP215	GP215-4.5	4.5	9/11/2006	<17.6		<43.9		<87.8		-		-		-	
MW-1	MW1-6.5	6.5	10/2/2006	-		-		-		-		**24**		**111**	
MW-3	MW3-6.5	6.5	10/2/2006	-		-		-		-		<14.6		<29.1	
MW-4	MW4-6.5	6.5	10/2/2006	-		-		-		-		<14.3		<28.7	
MW-5	MW5-8.5	8.5	10/2/2006	-		-		-		-		**44**		<36.3	
TP1	TP1-1-4.75	4.75	10/18/2006	<9.75		<48.7		<97.5		-		-		-	
TP1	TP1-2-4.75	4.75	10/18/2006	<20.0		<50.1		<100		-		-		-	
TP1	TP1-3-4.75	4.75	10/18/2006	<23.5		<58.7		**DET**		-		**35**		**99**	
TP1	TP1-4-5.75	5.75	10/18/2006	<22.0		<54.9		<110		-		-		-	
TP1	TP1-5-4.75	4.75	10/19/2006	<22.9		<57.2		<114		-		-		-	
TP1	TP1-Stockpile	Comp.	10/19/2006	**DET**		**DET**		**DET**		**190**		**43**		**162**	
TP2	TP2-1-6	6.0	10/19/2006	<16.5		<41.2		**DET**		-		**26**		**173**	
TP2	TP2-2-4.75	4.75	10/19/2006	<21.5		<53.6		<107		-		-		-	
TP2	TP2-3-4.75	4.75	10/19/2006	<22.5		<56.1		**DET**		-		**64**		**182**	
TP2	TP2-4-7	7.0	10/19/2006	<17.4		**DET**		**DET**		-		**97**		**225**	
MW-6	MW6-407-10	10	4/20/2007	<18.5		<46.8		**DET**		-		<14.3		**116**	
MW-6	MW6-407-14	14	4/20/2007	<20.6		<51.4		<103		-		-		-	
SLR Initial RI Investigation (2009)															
GP-302	GP-302-1FT	1.0	5/21/2009	-		-		-		-		**73**	J	**200**	J
GP-302	GP-302-3.5FT	3.5	5/21/2009	-		-		-		-		<5.2		**16**	
GP-303	GP-303-6	6.0	6/1/2009	<4.8		**2.4**	J	**8.4**	J	-		-		-	
GP-304	GP-304-6	6.0	6/1/2009	<4.9		**3.6**	J	**6.5**	J	-		-		-	
GP-305	GP-305-7	7.0	6/1/2009	<4.4		<4.4		<11		-		-		-	
GP-306	GP-306-7	7.0	6/1/2009	<4.4		<4.4		**5.0**	J	-		-		-	
GP-307	GP-307-4	4.0	5/20/2009	<4.9		<4.9		<12		-		-		-	
GP-308	GP-308-2	2.0	5/21/2009	<4.4		<4.4		<11		-		-		-	
GP-309	GP-309-5	5.0	5/22/2009	<4.2		<4.2		<11		-		-		-	
GP-311	GP-311-3.5	3.5	5/22/2009	<6.0		**11**		**110**		-		**14**		**91**	
GP-310	GP-310-4.5	4.5	5/22/2009	<4.3		<4.3		<11		-		-		-	
GP-312	GP-312-3.5	3.5	5/22/2009	<4.8		<4.8		**9.9**	J	-		-		-	
SS-313	SS-313	1.0	6/4/2009	<4.7		**2.1**	J	**19**		-		**3.6**	J	**29**	
SS-314	SS-314	1.0	6/4/2009	<4.2		**1.9**	J	**52**		-		**5.8**		**82**	
SS-321	SS-321	Surface	6/4/2009	-		-		-		-		**1,300**		**1,000**	
GP-334	GP-334-3	3.0	5/22/2009	**12**		**9.2**		**260**		<0.19		**21**		**280**	
GP-334	GP-334-9.5	9.5	5/22/2009	<4.6		<4.6		<11		-		-		-	
GP-335	GP-335-7.5	7.5	5/22/2009	<5.0		**11**		**79**		-		**26**	Q	**120**	Q, J5, J3
GP-335	GP-335-9.5	9.5	5/22/2009	<4.8		<4.8		<12		-		-		-	
HA-322	HA-322-1	1.0	9/23/2009	<28	B2	**2.4**	J	**12**	J	-		**4.1**	J	**17**	
HA-322	HA-322(2)-1.5	1.5	9/23/2009	<57	B2	**46**		**71**		-		**37**		**91**	
HA-323	HA-323-1	1.0	9/23/2009	<45	B2	**8.7**	J	**34**		-		**7.2**	J	**31**	
HA-324	HA-324-1.5	1.5	9/24/2009	<24	B2	<4.7		<12		-		-		-	
HA-324	HA-324(2)-2	2.0	9/24/2009	<28	B2	<5.6		<14		-		-		-	
HA-325	HA-325-2	2.0	9/24/2009	<26	B2	<5.3		<13		-		-		-	
HA-326	HA-326-2	2.0	9/24/2009	<25	B2	<5.0		**8.7**	J	-		**5.3**		**35**	
HA-326	HA-326(2)-2.5	2.5	9/24/2009	<37	B2	**9.8**		**100**		-		**54**		**160**	
HA-327	HA-327-1.5	1.5	10/12/2009	<4.8		**1.7**	J	**58**	J6	-		<4.8		**8.1**	J
HA-327	HA-327-2.5	2.5	10/12/2009	**2.0**	J	**7.6**		**14**		**0.076**	J	<5.7		**17**	
HA-328	HA-328-1	1.0	10/12/2009	**3.6**	J	**18**		**200**		**0.13**	J	**31**		**150**	
HA-328	HA-328-2.5	2.5	10/12/2009	**5.4**	J	**19**		**160**		**0.084**	J	**47**		**150**	
HA-329	HA-329-1	1.0	10/12/2009	**14**		**550**		**2,400**		**22**		**790**		**1,600**	
HA-330	HA-330-1	1.0	10/13/2009	**49**		**120**		**420**		**0.19**	J	**190**		**420**	
HA-331	HA-331-2	2.0	10/13/2009	**3.0**	J	**2.0**	J	**5.0**	J	<0.13		<5.1		**7.7**	J
HA-332	HA-332-1	1.0	10/13/2009	**7.8**	J	**23**		**260**		**0.27**	J	**26**		**51**	
HA-333	HA-333-3	3.0	10/13/2009	**3.6**	J	**12**		**62**		<0.27		**5.4**	J	**41**	
SLR Additional Upland Assessment - Woodlife Area (2013)															
GP-501	GP-501-3	3.0	3/14/2013	-		-		-		**3.0**		**1,300**		**1,700**	
SLR Additional Upland Assessment - Knoll Area (2013)															
TP-10	TP-10-10	10.0	11/13/2013	<4.2		<4.2		<10		-		-		-	

Table 4.1-3
Soil Analytical Results -TPH

Sample Location	Sample ID	Sample Depth (feet)	Sample Date	Hydrocarbon Identification [A] (mg/Kg)						Total Petroleum Hydrocarbons [B] (mg/Kg)					
				Gasoline		Diesel		Heavy Oil		TPH-Gx Gasoline Range		TPH-Dx Diesel Range		TPH-Dx Heavy Oil Range	
				Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual
TP-11	TP-11-2	2.0	11/13/2013	<4.7		<4.7		<12		-		-		-	
TP-12	TP-12-12.5	12.5	11/13/2013	<4.4		<4.4		<11		-		-		-	
TP-13	TP-13-12	12.0	11/13/2013	<4.5		**5.8**	J3	<10	J	-		-		-	
TP-14	TP-14-12	12.0	11/14/2013	<4.4		<4.4		<11		-		-		-	
TP-15	TP-15-9	9.0	11/14/2013	<4.5		<4.5		<11		-		-		-	
TP-16	TP-16-11.5	11.5	11/14/2013	<95		**50**	J,J3	**230**	J	-		<95	T8,J5,J3	**240**	T8,J6.J5.J3
TP-17	TP-17-13	13.0	11/14/2013	**2.4**	J	**34**	J3	**53**	J	-		-		-	
SLR Additional Upland Assessment - National Pole Area (2013)															
GP-605	GP-605-13.5	13.5	12/18/2013	-		-		-		-		<4.9		<12	
GP-605	GP-605-34.5	34.5	12/18/2013	-		-		-		-		**810**		**130**	
GP-606	GP-606-14.5	14.5	12/18/2013	-		-		-		-		<5.1		<13	
GP-607	GP-607-24.5	24.5	12/18/2013	-		-		-		-		<4.6		<12	
SLR Additional Upland Assessment (2015)															
GP-701	GP-701-5	5.0	7/9/2015	-		-		-		<0.11		**1.8**	J	**14**	
GP-702	GP-702-4	4.0	7/9/2015	-		-		-		**1.4**		**210**	J	**1,000**	
GP-702	GP-702-14.5	14.5	7/9/2015	-		-		-		**40**		**3,400**		**1,200**	
GP-703	703-P-8.5-9	8.5	7/21/2015	-		-		-		**460**		**3,000**		**1,000**	
GP-704	704-P-13.5-14	13.5	7/21/2015	-		-		-		**390**		**4,200**		**1,400**	
GP-705	GP-705-5	5.0	7/9/2015	-		-		-		**9.2**		<23		**26**	J
GP-706	GP-706-4	4.0	7/8/2015	-		-		-		<0.13		**3.3**	J	**8.6**	J
GP-707	GP-707-4	4.0	7/6/2015	-		-		-		**0.037**	J	**2.6**	J	**3.8**	J
GP-708	GP-708-4	4.0	7/8/2015	-		-		-		<0.15		**13**		**21**	
GP-708	GP-708-6	6.0	7/8/2015	-		-		-		**40**		**1,400**		**530**	
GP-709	GP-709-5	5.0	7/7/2015	-		-		-		**6.9**		**12,000**		**7,000**	
GP-709	GP-709-42	42.0	7/7/2015	-		-		-		**32**		**5,400**		**2,000**	
GP-710	GP-710-4	4.0	7/8/2015	-		-		-		<0.12		**1.7**	J	<12	
GP-710	GP-710-35	35.0	7/8/2015	-		-		-		**2.0**	J	**6.6**		<12	
GP-711	GP-711-3	3.0	7/8/2015	-		-		-		**0.12**		**780**		**790**	
GP-711	GP-711-6	6.0	7/8/2015	-		-		-		**0.051**	J	**450**		**480**	
GP-712	GP-712-5	5.0	7/7/2015	-		-		-		**6.0**		**170**		**91**	
GP-712	GP-712-8	8.0	7/7/2015	-		-		-		**11**		**310**		**160**	
MW-7	MW7-12.5	12.5	8/14/2015	-		-		-		<0.12		<5		<12	
MW-8B	MW8B-54	54.0	8/12/2015	-		-		-		<0.12		**2.5**		<12	
MW-9B	MW9B-35.5	35.5	8/14/2015	-		-		-		**0.049**	J	<5		<12	
MW-10B	MW10B-35	35.0	8/13/2015	-		-		-		<0.12		<5		<12	
SLR Source Control Evaluation (2018-2019)															
NTD	NTD-SED-0418	--	4/4/2018	-		-		-		-		<363		**931**	
	NTD-SED-A	0-1	7/9/2018	-		-		-		-		**234**		**1,530**	
	NTD-SED-B	0-1	7/9/2018	-		-		-		**-**		**452**		**2,350**	
MW-16	GP-MW-16-SS	0-12	4/26/2019	-		-		-		-		**63**		**604**	
MW-17	GP-MW-17-SS	0-12	4/26/2019	-		-		-		-		**3.8**	J	**11**	J
GP-801	GP-801-SS	0-12	4/26/2019	-		-		-		**-**		<47.1		**75**	J
GP-802	GP-802-SS	0-12	4/26/2019	-		-		-		-		**2.4**	J	**13**	
Intial PCL (per Table 4.1.2.1-1)				-		-		-		30/100	mA	2,000	mA	2,000	mA

Notes

- indicates Not Sampled or Not Analyzed for specific constituent

BOLD = Analytes detected at or above the laboratory practical quantitation limit (PQL)

<0.40 indicates not detected above the laboratory PQL of 0.40 mg/Kg (milligrams per Kilogram)

Only those analytes with greater than 5% frequency of detection are listed

Laboratory qualifiers defined on Table 4.1-21

A - Hydrocarbon Identification per NW-TPH Methodology. TPH-HCID method is a qualitative and semi-quantitative screen to determine the presence and type of petroleum products that may exist. DET indicates the presence of the hydrocarbon range is confirmed.

B - Total Petroleum Hydrocarbons (TPH) per NWTPH-Gx Method, Washington State Method 418.1 modified, 8015 Method, or NWTPH-Dx Method

Table 4.1-4
Soil Analytical Results - cPAHs

Sample Location	Sample ID	Sample Depth (feet)	Sample Date	Carcinogenic Polynuclear Aromatic Hydrocarbons [A] (PAHs) (mg/Kg)															
				Benzo(a) anthracene		Benzo(a) pyrene		Benzo(b) fluoranthene		Benzo(k) fluoranthene		Chrysene		Dibenzo(a,h) anthracene		Indeno (1,2,3-cd) pyrene		TEQ U = 0	TEQ U = 1/2
				Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual		
Parametrix Sampling Event (1991)																			
GS-1	-	-	5/24/1991	<0.370		<0.370		<0.370		<0.370		<0.370		<0.370		<0.370		ND	0.28
GS-2	-	-	5/24/1991	<0.40		<0.40		<0.40		<0.40		<0.40		<0.40		<0.40		ND	0.30
GS-4	-	-	5/24/1991	<0.370		<0.370		<0.370		<0.370		<0.370		<0.370		<0.370		ND	0.28
SS-1	-	-	5/30/1991	<4.90		<4.90		<4.90		<4.90		<4.90		<4.90		<4.90		ND	3.7
SS-2	-	-	5/30/1991	<2.70		<2.70		<2.70		<2.70		<2.70		<2.70		<2.70		ND	2.0
SLR Pre RI Assessment (2006-2007)																			
GP-1	GP1-10	10.0	5/4/2006	**4.26**		<3.80		<3.80		<3.80		**4.70**		<3.80		<3.80		**0.47**	**3.1**
GP-4	GP4-4.5	4.5	5/11/2006	<0.0214		<0.0214		<0.0214		<0.0214		<0.0214		<0.0214		<0.0214		ND	0.016
GP-5	GP5-6.5	6.5	5/4/2006	<0.154		<0.154		<0.154		<0.154		<0.154		<0.154		<0.154		ND	0.116
GP-9	GP9-6	6.0	5/1/2006	**137**		<88.8		<88.8		<88.8		**201**		<88.8		<88.8		**16**	**78**
GP-9	GP9-12	12.0	5/1/2006	**40.1**		**26.3**		**30.6**		**17.7**		**30.2**		<6		**10.1**		**36**	**37**
GP-10	GP10-3	3.0	5/1/2006	**18.7**		**48.5**		**53.2**		**40.8**		**59.1**		<15.3		**30.0**		**63**	**64**
GP-10	GP10-11	11.0	5/1/2006	**34.5**		**20.9**		**25.0**		**13.8**		**35.4**		<7		**7.14**		**29**	**30**
GP-11	GP11-12	12.0	5/4/2006	**33.6**		**20.2**		**20.2**		**17.9**		**27.0**		<8		<8		**28**	**28**
GP-12	GP12-8	8.0	5/2/2006	**152**		**104**		**92.8**		**102**		**261**		<84.2		<84.2		**158**	**158**
GP-13	GP13-11.5	11.5	5/1/2006	<0.404		<0.404		<0.404		<0.404		<0.404		<0.404		<0.404		ND	0.305
GP-14	GP14-6	6.0	5/1/2006	**6.77**		<4.25		<4.25		<4.25		**7.83**		<4.25		<4.25		**0.76**	**3.7**
GP-15	GP15-10	10.0	5/1/2006	<0.388		<0.388		<0.388		<0.388		<0.388		<0.388		<0.388		ND	0.29
GP-16	GP16-8	8.0	5/1/2006	<0.823		<0.823		<0.823		<0.823		<0.823		<0.823		<0.823		ND	0.62
GP-17	GP17-5	5.0	5/1/2006	<0.734		<0.734		<0.734		<0.734		<0.734		<0.734		<0.734		ND	0.55
GP-18	GP18-8	8.0	5/1/2006	<0.0162		<0.0162		**0.0250**		<0.0162		**0.0164**		<0.0162		<0.0162		**0.003**	**0.014**
GP-22	GP22-6.5	6.5	5/4/2006	**0.125**		**0.170**		**0.194**		**0.110**		**0.140**		**0.0327**		**0.0997**		**0.23**	**0.23**
GP-24	GP24-6	6.0	5/3/2006	**0.0950**		**0.112**		**0.0843**		**0.0957**		**0.119**		<0.0289		**0.0650**		**0.14**	**0.15**
GP-29	GP29-8	8.0	5/4/2006	**0.459**		**0.534**		**0.681**		**0.323**		**0.626**		**0.120**		**0.347**		**0.73**	**0.73**
GP-34	GP34-8	8.0	5/3/2006	<0.152		<0.152		**0.375**		<0.152		**0.497**		<0.152		<0.152		**0.042**	**0.053**
GP-37	GP37-8	8.0	5/2/2006	<0.0335		<0.0335		<0.0335		<0.0335		<0.0335		<0.0335		<0.0335		ND	0.025
GP-39	GP39-9	9.0	5/2/2006	<0.0296		<0.0296		<0.0296		<0.0296		<0.0296		<0.0296		<0.0296		ND	0.022
GP-41	GP41-8	8.0	5/2/2006	<0.0749		<0.0749		<0.0749		<0.0749		<0.0749		<0.0749		<0.0749		ND	0.57
GP-42	GP42-8	8.0	5/2/2006	<0.0705		<0.0705		<0.0705		<0.0705		<0.0705		<0.0705		<0.0705		ND	0.053
GP-202	GP202-7.5	7.5	9/11/2006	**299**		**177**		**176**		**173**		**661**		**33.4**		**64.7**		**258**	**258**
GP206	GP206-4.5	4.5	9/12/2006	<0.350		<0.350		<0.350		<0.350		<0.350		<0.350		<0.350		ND	0.27
GP206	GP206-8.5	8.5	9/12/2006	**453**		**237**		**229**		**172**		**411**		<47.9		**83.1**		**335**	**337**
GP213	GP213-3	3.0	9/12/2006	**5.24**		**6.96**		**5.07**		**4.3**		**14.8**		**3.34**		**6.0**		**9.5**	**9.5**
GP214	GP214-6	6.0	9/12/2006	**5.57**		**4.27**		**4.13**		**2.70**		**4.74**		**0.689**		**1.71**		**5.8**	**5.8**
MW1	MW1-6.5	6.5	10/2/2006	**0.0334**		**0.0347**		**0.0293**		**0.0253**		**0.0497**		<0.0168		<0.0168		**0.044**	**0.050**
MW3	MW3-6.5	6.5	10/2/2006	<0.0156		<0.0156		<0.0156		<0.0156		<0.0156		<0.0156		<0.0156		ND	0.012
MW5	MW5-8.5	8.5	10/2/2006	**0.625**		<0.394		**0.394**		<0.394		**0.603**		<0.394		<0.394		**0.11**	**0.36**
TP1	TP1-Stockpile	Comp.	10/19/2006	**0.933**		**0.734**		**0.656**		**0.745**		**1.13**		<0.332		**0.406**		**1.0**	**1.0**
TP1	TP1-3-4.75	4.75	10/18/2006	**0.720**		**0.656**		**0.581**		**0.582**		**0.867**		<0.332		**0.530**		**0.91**	**0.92**
TP2	TP2-1-6	6	10/19/2006	**0.228**		**0.222**		**0.821**		**0.522**		**0.782**		<0.155		**0.196**		**0.40**	**0.41**
TP2	TP2-2-4.75	4.75	10/19/2006	<0.0146		<0.0146		<0.0146		<0.0146		<0.0146		<0.0146		<0.0146		ND	0.011
TP2	TP2-3-4.75	4.75	10/19/2006	<0.0791		<0.0791		**0.106**		<0.0791		**0.146**		<0.0791		<0.0791		**0.012**	**0.067**
TP2	TP2-4-7	7	10/19/2006	<0.0599		<0.0599		**0.0869**		<0.0599		**0.0686**		<0.0599		<0.0599		**0.009**	**0.051**
MW-6	MW6-407-10	10	4/20/2007	<0.751		<0.751		<0.751		<0.751		<0.751		<0.751		<0.751		ND	0.567
MW-6	MW6-407-14	14	4/20/2007	<0.385		<0.385		<0.385		<0.385		<0.385		<0.385		<0.385		ND	0.291

Table 4.1-4
Soil Analytical Results - cPAHs

Sample Location	Sample ID	Sample Depth (feet)	Sample Date	Carcinogenic Polynuclear Aromatic Hydrocarbons [A] (PAHs) (mg/Kg)															
				Benzo(a) anthracene		Benzo(a) pyrene		Benzo(b) fluoranthene		Benzo(k) fluoranthene		Chrysene		Dibenzo(a,h) anthracene		Indeno (1,2,3-cd) pyrene		TEQ U = 0	TEQ U = 1/2
				Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual		
SLR Initial RI Investigation (2009)																			
GP-303	GP-303-6	6	6/1/2009	**0.0028**	J, Q	**0.0022**	J, Q	**0.0025**	J, Q	<0.0072	Q	**0.0013**	J, Q	<0.0072	Q	<0.0072	Q	**0.003**	**0.004**
GP-304	GP-304-6	6	6/1/2009	**0.007**	J, Q	**0.0062**	J, Q	**0.007**	J, Q	**0.0023**	J, Q	**0.0044**	J, Q	<0.0074	Q	**0.0017**	J, Q	**0.008**	**0.009**
GP-305	GP-305-7	7	6/1/2009	**0.0028**	J, Q	**0.0021**	J, Q	**0.0043**	J, Q	<0.0066	Q	**0.0018**	J, Q	<0.0066	Q	<0.0066	Q	**0.003**	**0.004**
GP-306	GP-306-7	7	6/1/2009	**0.0038**	J, Q	**0.0037**	J, Q	**0.0056**	J, Q	**0.0023**	J, Q	**0.0021**	J, Q	<0.0066	Q	**0.0014**	J, Q	**0.005**	**0.005**
GP-307	GP-307-4FT	4	6/1/2009	**0.0015**	J, Q	<0.0074	Q	<0.0074	Q	<0.0074	Q	<0.0074	Q	<0.0074	Q	<0.0074	Q	**0.0002**	**0.005**
GP-308	GP-308-2FT	2	5/20/2009	<0.36		<0.36		<0.36		<0.36		<0.36		<0.36		<0.36		ND	0.272
GP-309	GP-309-5FT	5	5/20/2009	<0.0064	Q	<0.0064	Q	<0.0064	Q	<0.0064	Q	<0.0064	Q	<0.0064	Q	<0.0064	Q	ND	0.005
GP-310	GP-310-4.5FT	4.5	5/22/2009	**0.0066**	Q	**0.0086**	Q	**0.012**	Q	**0.0056**	J, Q	**0.0096**	Q	**0.0013**	J, Q	**0.0027**	J, Q	**0.012**	**0.012**
GP-311	GP-311-3.5FT	3.5	5/22/2009	**0.016**	Q	**0.014**	Q	**0.025**	Q	**0.0066**	J, Q	**0.016**	Q	**0.0022**	J, Q	**0.0054**	J, Q	**0.020**	**0.020**
GP-312	GP-312-3.5FT	3.5	5/22/2009	**0.009**	Q	**0.012**	Q	**0.017**	Q	**0.009**	Q	**0.012**	Q	**0.0022**	J, Q	**0.0051**	J, Q	**0.016**	**0.016**
GP-334	GP-334-3FT	3	5/22/2009	**0.0018**	J, Q	<0.0097	Q	<0.0097	Q	<0.0097	Q	<0.0097	Q	<0.0097	Q	<0.0097	Q	**0.0002**	**0.007**
GP-335	GP-335-7.5FT	7.5	5/22/2009	**0.016**	Q	**0.015**	Q	**0.024**	Q	**0.012**	Q	**0.018**	Q	**0.0021**	J, Q	**0.0045**	J, Q	**0.021**	**0.021**
GP-335	GP-335-9.5FT	9.5	5/23/2009	<0.0072	Q	<0.0072	Q	<0.0072	Q	<0.0072	Q	<0.0072	Q	<0.0072	Q	<0.0072	Q	ND	0.0054
HA-322	HA-322 1 FT 2	1	9/23/2009	**0.13**		**0.2**		**0.18**		**0.059**		**0.13**		**0.039**		**0.15**		**0.26**	**0.26**
HA-322	HA-322-2 1.5 FT	1.5	9/23/2009	**0.024**		**0.023**		**0.051**		**0.0091**	J	**0.027**		**0.011**	J	**0.028**		**0.036**	**0.036**
HA-323	HA-323 1 FT2	1	9/23/2009	**0.094**		**0.12**		**0.16**		**0.036**		**0.087**		**0.031**		**0.087**		**0.16**	**0.16**
HA-326	HA-326 2 FT2	2	9/24/2009	**0.049**		**0.059**		**0.081**		**0.021**		**0.04**		**0.018**		**0.045**		**0.081**	**0.081**
HA-326	HA-326-2 2.5 FT2	2.5	9/24/2009	**0.058**		**0.054**		**0.084**		**0.022**		**0.067**		**0.014**		**0.037**		**0.076**	**0.076**
HA-327	HA-327-1.5 FT 2	1.5	10/12/2009	**0.014**		**0.017**		**0.022**	J, J8	**0.007**		**0.014**		**0.0025**		**0.0058**	J, J8	**0.022**	**0.022**
HA-327	HA-327-2.5 FT 2	2.5	10/12/2009	**0.014**		**0.016**		**0.023**	J, J8	**0.008**		**0.016**		**0.0024**		**0.006**	J, J8	**0.022**	**0.022**
HA-328	HA-328-1 FT 2	1	10/12/2009	**0.034**		**0.03**	J8	**0.049**	J8	**0.02**	J8	**0.044**		**0.0046**	J,J8	**0.013**	J8	**0.043**	**0.043**
HA-328	HA-328-2.5 FT 2	2.5	10/12/2009	**0.023**		**0.025**	J8	**0.045**	J, J8	**0.012**	J,J8	**0.027**		**0.0047**	J,J8	**0.012**	J, J8	**0.035**	**0.035**
HA-329	HA-329-1 FT 2	1	10/12/2009	**66**		**87**		**100**		**42**		**110**		**16**		**34**		**114**	**114**
HA-330	HA-330-1 FT 2	1	10/13/2009	**0.38**		**0.42**		**1.1**	J, J8	**0.36**		**0.46**		**0.08**		**0.2**	J, J8	**0.64**	**0.64**
HA-331	HA-331-2 FT 2	2	10/13/2009	**0.017**		**0.023**		**0.032**	J, J8	**0.013**		**0.015**		**0.0035**		**0.008**	J, J8	**0.031**	**0.031**
HA-332	HA-332-1 FT 2	1	10/13/2009	**0.14**		**0.17**		**0.32**		**0.094**		**0.18**		**0.013**		**0.047**		**0.23**	**0.23**
HA-333	HA-333-3FT	3	10/13/2009	**0.017**		**0.026**		**0.054**		**0.012**		**0.026**		**0.0026**		**0.011**	J	**0.036**	**0.036**
SLR Additional Upland Assessment - Woodlife Area (2013)																			
GP-501	GP-501-3	3	3/14/2013	**1.2**	J	<8.9		**2.8**	J	<8.9		**1.6**	J	<8.9		<8.9		**0.136**	**6.2**
SLR Additional Upland Assessment - Knoll Area (2013)																			
TP-16	TP-16-11.5	11.5	11/14/2013	**0.057**	J	**0.084**		**0.086**		**0.045**	J	**0.072**		**0.022**	J	**0.052**	J	**0.11**	**0.11**
TP-17	TP-17-13	13.0	11/14/2013	**0.012**		**0.014**		**0.015**		**0.0061**	J	**0.017**		**0.0025**	J	**0.0066**	J	**0.018**	**0.018**
SLR Additional Upland Assessment - National Pole Area (2013)																			
GP-605	GP-605-13.5	13.5	12/18/2013	**5.4**		**2.6**		**3.3**		**0.92**		**6.4**		**0.25**		**0.69**		**3.7**	**3.7**
GP-605	GP-605-34.5	34.5	12/18/2013	**0.0071**	J	**0.0032**	J	**0.0042**	J	**0.0012**	J	**0.013**		<0.0071		**0.00082**	J	**0.0047**	**0.0050**
GP-606	GP-606-14.5	14.5	12/18/2013	**0.0012**	J	<0.0077		<0.0077		<0.0077		**0.0014**	J	<0.0077		<0.0077		**0.0001**	**0.00552**
GP-607	GP-607-24.5	24.5	12/18/2013	**0.016**		**0.023**		**0.031**		**0.0083**		**0.026**		**0.0038**	J	**0.0097**		**0.0301**	**0.03014**
SLR Additional Upland Assessment (2015)																			
GP-701	GP-701-5	5.0	7/9/2015	**0.0017**	J	**0.0029**	J	**0.0034**	J	<0.0064		**0.0031**	J	<0.0064		**0.0008**	J	**0.00352**	**0.00416**
GP-702	GP-702-4	4.0	7/9/2015	**0.058**	J	**0.085**	J	**0.13**		<0.13		**0.055**	J	**0.025**	J	**0.030**	J	**0.11**	**0.12**
GP-702	GP-702-14.5	14.5	7/9/2015	**34**		**17**		**22**		**7.0**		**26**		**1.9**		**6.2**		**24**	**24**
GP-703	703-P-8.5-9	8.5	7/21/2015	**22**		**12**		**14**		**4.8**		**24**		**1.3**		**3.5**		**17**	**17**
GP-704	704-P-13.5-14	13.5	7/21/2015	**38**		**23**		**27**		**8.6**		**35**		**2.7**		**7.2**		**32**	**32**
GP-705	GP-705-5	5.0	7/9/2015	**0.0020**	J	**0.0013**	J	**0.0016**	J	<0.0070		**0.0014**	J	<0.0070		<0.0070		**0.002**	**0.003**
GP-706	GP-706-4	4	7/8/2015	**0.0055**	J	**0.0077**	J	**0.0084**		**0.0042**	J	**0.018**		<0.0077		**0.0048**	J	**0.010**	**0.011**
GP-707	GP-707-4	4	7/6/2015	<0.0064		<0.0064		<0.0064		<0.0064		<0.0064		<0.0064		<0.0064		ND	**0.005**

Table 4.1-4
Soil Analytical Results - cPAHs

Sample Location	Sample ID	Sample Depth (feet)	Sample Date	Carcinogenic Polynuclear Aromatic Hydrocarbons [A] (PAHs) (mg/Kg)															
				Benzo(a) anthracene		Benzo(a) pyrene		Benzo(b) fluoranthene		Benzo(k) fluoranthene		Chrysene		Dibenzo(a,h) anthracene		Indeno (1,2,3-cd) pyrene		TEQ U = 0	TEQ U = 1/2
				Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual		
GP-708	GP-708-4	4	7/8/2015	**0.017**		**0.066**		**0.081**		**0.021**		**0.027**		**0.0037**	J	**0.050**		**0.084**	**0.084**
GP-708	GP-708-6	6	7/8/2015	**0.73**	E	**5.3**	E	<0.0085		**0.51**		**0.77**	E	**0.066**		**1.8**	E	**5.6**	**5.6**
GP-709	GP-709-5	5.0	7/7/2015	**430**		**230**		**330**		**87**		**980**		**42**		**94**		**338**	**338**
GP-709	GP-709-42	42.0	7/7/2015	**180**		**110**		**140**		**41**		**130**		**15**		**38**		**153**	**153**
GP-710	GP-710-4	4.0	7/8/2015	<0.0073		<0.0073		<0.0073		<0.0073		<0.0073		<0.0073		<0.0073		ND	**0.006**
GP-710	GP-710-35	35.0	7/8/2015	<0.0072		<0.0072		<0.0072		<0.0072		<0.0072		<0.0072		<0.0072		ND	**0.005**
GP-711	GP-711-3	3.0	7/8/2015	**0.025**		**0.034**		<0.0071		<0.0071		**0.020**		<0.0071		**0.0099**		**0.038**	**0.039**
GP-711	GP-711-6	6.0	7/8/2015	**0.014**		**0.021**		**0.020**		<0.0085		**0.014**		<0.0085		**0.0074**	J	**0.043**	**0.044**
GP-712	GP-712-5	5.0	7/7/2015	**9.4**		**5.3**		**6.7**		**2.8**		**5.9**		**0.59**		**2.2**		**7.5**	**7.5**
GP-712	GP-712-8	8.0	7/7/2015	**6.1**		**3.4**		**6.2**		**5.2**		**4.2**		**0.35**		**1.2**		**5.3**	**5.3**
MW-7	MW7-12.5	12.5	8/14/2015	**0.00158**	J	**0.00103**	J	**0.0013**	J	<0.0069		**0.00176**	J	<0.0069		<0.0069		**0.001**	**0.002**
MW-8B	MW8B-54	54.0	8/12/2015	**0.0125**		**0.00609**	J	**0.00737**		**0.00379**	J	**0.0124**		<0.0073		**0.00187**	J	**0.009**	**0.009**
MW-9B	MW9B-35.5	35.5	8/14/2015	<0.0373		<0.0373		<0.0373		<0.0373		**0.00519**	J	<0.0373		<0.0373		**0.00005**	**0.028**
MW-10B	MW10B-35	35.0	8/13/2015	**0.00419**	J	**0.0023**	J	**0.00309**	J	**0.00115**	J	**0.0055**	J	<0.0070		**0.00082**	J	**0.003**	**0.004**
SLR Source Control Evaluation (2018-2019)																			
NTD	NTD-SED-0418	--	4/4/2018	**0.0567**		**0.0516**		**0.0677**		**0.02**		**0.108**		**0.0133**		**0.0285**		**0.071**	**0.071**
	NTD-SED-A	0-1	7/9/2018	**0.29**		**0.235**		**0.312**		**0.076**	J	**0.439**		<0.0135		**0.143**		**0.321**	**0.322**
	NTD-SED-B	0-1	7/9/2018	**0.117**	J	**0.141**	J	**0.251**		**0.0685**	J	**0.147**		**0.0515**	J	**0.14**	J	**0.205**	**0.205**
MW-12	GP-MW-12-SS	0-12	4/25/2019	**0.00225**	J	**0.00248**	J	**0.00335**	J	**0.00106**	J	**0.00223**	J	<0.0069		**0.0015**	J	**0.003**	**0.004**
MW-13	GP-MW-13-SS	0-12	4/25/2019	**0.00227**	J	**0.00216**	J	**0.0023**	J	**0.000788**	J	**0.00206**	J	<0.0069		**0.00105**	J	**0.003**	**0.003**
MW-14	GP-MW-14-SS	0-12	4/25/2019	**0.00395**	J	**0.00447**	J	**0.00465**	J	**0.00158**	J	**0.00513**	J	<0.0069		**0.00185**	J	**0.006**	**0.006**
MW-16	GP-MW-16-SS	0-12	4/26/2019	**0.00551**	J	**0.0063**	J	**0.0109**		**0.00271**	J	**0.0214**		<0.0071		**0.00231**	J	**0.009**	**0.009**
MW-17	GP-MW-17-SS	0-12	4/26/2019	**0.00489**	J	**0.00609**	J	**0.0118**		**0.00358**	J	**0.00968**		**0.00128**	J	**0.00434**	J	**0.009**	**0.009**
GP-801	GP-801-SS	0-12	4/26/2019	**0.012**		**0.0184**		**0.0232**		**0.00824**		**0.0228**		**0.00297**	J	**0.0112**		**0.024**	**0.024**
GP-802	GP-802-SS	0-12	4/26/2019	**0.000989**	J	**0.00257**	J	**0.00441**	J	**0.00151**	J	**0.0012**	J	<0.0067		**0.00204**	J	**0.003**	**0.004**
Intial PCL (per Table 4.1.2.1-1)				**-**		**-**		**-**		**-**		**-**		-		**-**		**0.19 (mB)**	

Notes

- indicates Not Sampled or Not Analyzed for specific constituent

BOLD = Analytes detected at or above the laboratory practical quantitation limit (PQL)

<0.40 indicates not detected above the laboratory PQL of 0.40 mg/Kg (milligrams per Kilogram)

Only those analytes with greater than 5% frequency of detection are listed

Laboratory qualifiers defined on Table 4.1-21

A - Polynuclear Aromatic Compounds (PAHs) per EPA Method 8270M-SIM or 8270C

TEQ U=0 indicates Toxic Equivalent Quotient (TEQ) using Toxicity equivalency factors (TEFs) per Table 708-2 in WAC 173-340-900 assuming Non-Detect values as 0

TEQ U=1/2 indicates TEQ using TEFs per Table 708-2 in WAC 173-340-900 assuming Non-Detect values as 1/2 detection limit

Table 4.1-5
Soil Analytical Results - other PAHs

Sample Location	Sample ID	Sample Depth (feet)	Sample Date	Polynuclear Aromatic Hydrocarbons [A] (PAHs) (mg/Kg)																					
				Methyl naphthalene; 1-		Methyl naphthalene; 2-		Acenaph-thylene		Acenaphthene		Anthracene		Benzo(ghi) perylene		Fluoranthene		Fluorene		Naphthalene		Phenanthrene		Pyrene	
				Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual
Parametrix Sampling Event (1991)																									
GS-1	-	-	5/24/1991	-		<0.370		-		<0.370		<0.370		<0.370		<0.370		<0.370		<0.370		<0.370		<0.370	
GS-2	-	-	5/24/1991	-		<0.40		-		<0.40		<0.40		<0.40		<0.40		<0.40		<0.40		<0.40		<0.40	
GS-4	-	-	5/24/1991	-		<0.370		-		<0.370		<0.370		<0.370		<0.370		<0.370		<0.370		<0.370		<0.370	
SS-1	-	-	5/30/1991	-		<4.90		-		<4.90		<4.90		<4.90		<4.90		<4.90		<4.90		<4.90		<4.90	
SS-2	-	-	5/30/1991	-		<2.70		-		<2.70		<2.70		<2.70		<2.70		<2.70		<2.70		<2.70		<2.70	
SLR Pre RI Assessment (2006-2007)																									
GP-1	GP1-10	10.0	5/4/2006	-		<3.8		<3.80		**7.0**		<3.80		<3.80		**19**		**9.8**		<3.80		**34**		**14**	
GP-4	GP4-4.5	4.5	5/11/2006	-		-		<0.0214		**0.039**		<0.0214		<0.0214		<0.0214		<0.0214		<0.0214		<0.0214		<0.0214	
GP-5	GP5-6.5	6.5	5/4/2006	-		-		<0.154		**1.9**		**0.28**		<0.154		**0.87**		**1.6**		**0.22**		**4.0**		**0.42**	
GP-9	GP9-6	6.0	5/1/2006	-		**362**		<88.8		**499**		**460**		<88.8		**577**		**421**		**1,060**		**1,080**		**496**	
GP-9	GP9-12	12.0	5/1/2006	-		-		<6.47		**118**		**32**		**11**		**171**		**100**		**294**		**318**		**119**	
GP-10	GP10-3	3.0	5/1/2006	-		<15.3		<15.3		<15.3		**156**		**40**		**19.6**		<15.3		<15.3		**24.3**		**30**	
GP-10	GP10-11	11.0	5/1/2006	-		-		<6.94		**101**		**32**		**8.0**		**155**		**90**		**238**		**301**		**115**	
GP-11	GP11-12	12.0	5/4/2006	-		-		<8.36		**113**		**28**		<8		**159**		**92**		**292**		**294**		**97**	
GP-12	GP12-8	8.0	5/2/2006	-		<84.2		<84.2		**287**		**185**		<84.2		**629**		**271**		<84.2		**705**		**577**	
GP-13	GP13-11.5	11.5	5/1/2006	-		<0.404		<0.404		<0.404		<0.404		<0.404		<0.404		<0.404		<0.404		<0.404		<0.404	
GP-14	GP14-6	6.0	5/1/2006	-		**15**		<4.25		**27**		**22**		<4.25		**33**		**24**		**38**		**60**		**24**	
GP-15	GP15-10	10.0	5/1/2006	-		<0.388		<0.388		**1.3**		<0.388		<0.388		**0.94**		**2.8**		**0.45**		**1.8**		**0.66**	
GP-16	GP16-8	8.0	5/1/2006	-		<0.823		<0.823		<0.823		<0.823		<0.823		<0.823		<0.823		<0.823		<0.823		<0.823	
GP-17	GP17-5	5.0	5/1/2006	-		<0.734		<0.734		<0.734		<0.734		<0.734		<0.734		<0.734		<0.734		<0.734		<0.734	
GP-18	GP18-8	8.0	5/1/2006	-		-		<0.0162		<0.0162		<0.0162		<0.0162		**0.0292**		<0.0162		<0.0162		<0.0162		**0.072**	
GP-22	GP22-6.5	6.5	5/4/2006	-		-		**0.037**		<0.0158		**0.0313**		**0.11**		**0.35**		**0.019**		**0.019**		**0.12**		**0.23**	
GP-24	GP24-6	6.0	5/3/2006	-		-		<0.0289		<0.0289		<0.0289		**0.074**		**0.19**		<0.0289		**0.049**		**0.11**		**0.18**	
GP-29	GP29-8	8.0	5/4/2006	-		-		**0.059**		**0.22**		**0.520**		**0.41**		**1.3**		**0.25**		**0.36**		**1.3**		**0.86**	
GP-34	GP34-8	8.0	5/3/2006	-		-		<0.152		<0.152		<0.152		**0.18**		**0.18**		<0.152		<0.152		**0.21**		**0.22**	
GP-37	GP37-8	8.0	5/2/2006	-		-		<0.0335		<0.0335		<0.0335		<0.0335		<0.0335		<0.0335		**0.036**		**0.041**		<0.0335	
GP-39	GP39-9	9.0	5/2/2006	-		-		<0.0296		<0.0296		<0.0296		<0.0296		<0.0296		<0.0296		<0.0296		<0.0296		<0.0296	
GP-41	GP41-8	8.0	5/2/2006	-		-		<0.0749		<0.0749		<0.0749		<0.0749		<0.0749		<0.0749		<0.0749		<0.0749		<0.0749	
GP-42	GP42-8	8.0	5/2/2006	-		-		<0.0705		<0.0705		<0.0705		<0.0705		<0.0705		<0.0705		<0.0705		<0.0705		<0.0705	
GP-202	GP202-7.5	7.5	9/11/2006	-		-		<32.7		**786**		**894**		**73**		**1,020**		**684**		**2,490**		**2,390**		**841**	
GP206	GP206-4.5	4.5	9/12/2006	-		<0.350		<0.350		<0.350		<0.350		<0.350		<0.350		<0.350		<0.350		<0.350		<0.350	
GP206	GP206-8.5	8.5	9/12/2006	-		**1,410**		<47.9		**1,510**		**453**		**97**		**2,060**		**1,450**		**3,860**		**3,770**		**1,850**	
GP213	GP213-3	3.0	9/12/2006	-		**4.1**		<1.87		<1.87		**3.6**		**13**		**6.6**		<1.87		**8.5**		**5.7**		**8.8**	
GP214	GP214-6	6.0	9/12/2006	-		**16**		<0.501		**21**		**4.9**		**1.7**		**25**		**15**		**79**		**42**		**20**	
MW1	MW1-6.5	6.5	10/2/2006	-		-		<0.0168		<0.0168		<0.0168		**0.02**		**0.0588**		<0.0168		<0.0168		**0.0379**		**0.0724**	
MW3	MW3-6.5	6.5	10/2/2006	-		-		<0.0156		<0.0156		<0.0156		<0.0156		<0.0156		<0.0156		<0.0156		<0.0156		<0.0156	
MW5	MW5-8.5	8.5	10/2/2006	-		-		<0.394		**3.4**		**0.587**		<0.394		**2.38**		**2.03**		**39.5**		**5.57**		**2.1**	
TP1	TP1-Stockpile	Comp.	10/19/2006	-		-		<0.332		<0.332		**496**		**0.428**		**1.95**		<0.332		<0.332		**2.27**		**1.63**	
TP1	TP1-3-4.75	4.75	10/18/2006	-		-		<0.332		<0.332		<0.332		**0.655**		**1.54**		<0.332		<0.332		**1.36**		**1.46**	
TP2	TP2-1-6	6	10/19/2006	-		-		<0.155		<0.155		<0.155		**0.224**		**1.02**		<0.155		<0.155		**0.260**		**0.780**	
TP2	TP2-2-4.75	4.75	10/19/2006	-		-		<0.0146		<0.0146		<0.0146		<0.0146		<0.0146		<0.0146		<0.0146		<0.0146		<0.0146	
TP2	TP2-3-4.75	4.75	10/19/2006	-		-		<0.0791		**0.160**		<0.0791		<0.0791		**0.196**		**0.156**		<0.0791		**0.432**		**0.199**	
TP2	TP2-4-7	7	10/19/2006	-		-		<0.0599		<0.0599		<0.0599		<0.0599		**0.0756**		<0.0599		<0.0599		**0.0646**		**0.0712**	
MW-6	MW6-407-10	10	4/20/2007	-		<0.751		<0.751		<0.751		<0.751		<0.751		<0.751		<0.751		<0.751		<0.751		<0.751	
MW-6	MW6-407-14	14	4/20/2007	-		<0.385		<0.385		**0.15**		<0.385		<0.385		<0.385		<0.385		<0.385		<0.385		<0.385	

Table 4.1-5
Soil Analytical Results - other PAHs

Sample Location	Sample ID	Sample Depth (feet)	Sample Date	Polynuclear Aromatic Hydrocarbons [A] (PAHs) (mg/Kg)																			
				Methyl naphthalene; 1-		Methyl naphthalene; 2-		Acenaph-thylene		Acenaphthene		Anthracene		Benzo(ghi) perylene		Fluoranthene		Fluorene		Naphthalene		Phenanthrene		Pyrene	
				Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual
SLR Initial RI Investigation (2009)																									
GP-303	GP-303-6	6	6/1/2009	<0.0072	Q	<0.40		**0.0018**	J, Q	<0.0072	Q	<0.0072	Q	<0.0072	Q	**0.002**	J, Q	<0.0072	Q	**0.0052**	J, Q	**0.0028**	J, Q	**0.0019**	J, Q
GP-304	GP-304-6	6	6/1/2009	**0.0037**	J,Q	<0.41		**0.0052**	J, Q	**0.0023**	J, Q	**0.0027**	J, Q	**0.0021**	J, Q	**0.0075**	Q	**0.0032**	J, Q	**0.021**	Q	**0.0088**	Q	**0.0096**	Q
GP-305	GP-305-7	7	6/1/2009	<0.0066	Q	<0.36		<0.0066		<0.0066	Q	<0.0066	Q	<0.0066	Q	**0.0013**	J, Q	<0.0066	Q	<0.0066	Q	<0.0066	Q	**0.0018**	J, Q
GP-306	GP-306-7	7	6/1/2009	<0.0066	Q	<0.36		<0.0066		<0.0066	Q	<0.0066	Q	**0.0016**	J, Q	**0.0046**	J, Q	<0.0066	Q	<0.0066	Q	**0.0035**	J, Q	**0.005**	J, Q
GP-307	GP-307-4FT	4	6/1/2009	<0.0074	Q	<0.41		<0.0074	Q	<0.0074	Q	<0.0074	Q	<0.0074	Q	<0.0074	Q	<0.0074	Q	**0.0021**	J, Q	<0.0074	Q	<0.0074	Q
GP-308	GP-308-2FT	2	5/20/2009	-		<0.36		<0.036		<0.36		<0.36		<0.36		<0.36		<0.36		<0.36		<0.36		<0.36	
GP-309	GP-309-5FT	5	5/20/2009	<0.0064	Q	<0.35		<0.0064		<0.0064	Q	<0.0064	Q	<0.0064	Q	<0.0064	Q	<0.0064	Q	<0.0064	Q	<0.0064	Q	<0.0064	Q
GP-310	GP-310-4.5FT	4.5	5/22/2009	<0.0065	Q	<0.36		**0.002**	J, Q	<0.0065	Q	**0.002**	J, Q	**0.0028**	J, Q	**0.023**	Q	**0.002**	J, Q	**0.0016**	J, Q	**0.027**	Q	**0.025**	Q
GP-311	GP-311-3.5FT	3.5	5/22/2009	**0.033**	Q	<9.9	O	**0.024**	Q	**0.019**	Q	**0.016**	Q	**0.0094**	Q	**0.081**	Q	**0.016**	Q	**0.27**	Q	**0.12**	Q	**0.085**	Q
GP-312	GP-312-3.5FT	3.5	5/22/2009	**0.0023**	J,Q	<0.40		**0.0052**	J, Q	<0.0073	Q	**0.0035**	J, Q	**0.0065**	J, Q	**0.024**	Q	**0.0024**	J, Q	**0.007**	J, Q	**0.022**	Q	**0.028**	Q
GP-334	GP-334-3FT	3	5/22/2009	**0.0076**	J,Q	<0.53		**0.0021**	J, Q	<0.0097	Q	<0.0097	Q	<0.0097	Q	**0.0024**	J, Q	<0.0097	Q	**0.018**	Q	**0.01**	Q	**0.0034**	J, Q
GP-335	GP-335-7.5FT	7.5	5/22/2009	**0.0030**	J,Q	<0.41	Q	**0.003**	J, Q	<0.0075	Q	**0.0039**	J, Q	**0.0053**	J, Q	**0.03**	Q	**0.0016**	J, Q	**0.012**	Q	**0.021**	Q	**0.033**	Q
GP-335	GP-335-9.5FT	9.5	5/23/2009	<0.0072	Q	<0.39		<0.0072	Q	<0.0072	Q	<0.0072	Q	<0.0072	Q	<0.0072	Q	<0.0072	Q	<0.0072	Q	<0.0072	Q	<0.0072	Q
HA-322	HA-322 1 FT 2	1	9/23/2009	**0.025**		**0.041**		**0.091**		**0.022**		**0.073**		**0.22**		**0.35**		**0.038**		**0.12**		**0.41**		**0.36**	
HA-322	HA-322-2 1.5 FT	1.5	9/23/2009	**0.068**		**0.15**		**0.071**		**0.18**		**0.037**		**0.037**		**0.11**		**0.043**		**0.37**		**0.14**		**0.091**	
HA-323	HA-323 1 FT2	1	9/23/2009	**0.0069**	J	**0.016**		**0.0083**	J	**0.029**		**0.016**		**0.1**		**0.14**		**0.0085**	J	**0.067**		**0.083**		**0.13**	
HA-326	HA-326 2 FT2	2	9/24/2009	**0.002**	J	**0.0045**	J	**0.0058**	J	**0.005**	J	**0.016**		**0.056**		**0.067**		**0.0029**	J	**0.0048**	J	**0.032**		**0.066**	
HA-326	HA-326-2 2.5 FT2	2.5	9/24/2009	**0.030**		**0.080**		**0.015**		**0.015**		**0.03**		**0.048**		**0.12**		**0.012**		**0.2**		**0.14**		**0.1**	
HA-327	HA-327-1.5 FT 2	1.5	10/12/2009	<0.0071		<0.0071		<0.0071		**0.0022**	J	**0.0049**	J	**0.006**	J, J8	**0.021**		<0.0071		<0.0071		**0.011**		**0.028**	
HA-327	HA-327-2.5 FT 2	2.5	10/12/2009	**0.010**		**0.011**		**0.0031**	J	**0.033**		**0.014**		**0.0062**	J, J8	**0.037**		**0.024**		**0.07**		**0.043**		**0.047**	
HA-328	HA-328-1 FT 2	1	10/12/2009	**0.021**		**0.058**		**0.013**		**0.0051**	J	**0.015**		**0.018**	J8	**0.036**		**0.0086**	J	**0.048**		**0.044**		**0.059**	
HA-328	HA-328-2.5 FT 2	2.5	10/12/2009	**0.037**		**0.069**		**0.018**		**0.024**		**0.022**		**0.015**	J8	**0.047**		**0.023**		**0.27**		**0.069**		**0.077**	
HA-329	HA-329-1 FT 2	1	10/12/2009	**21**		**7.1**		**7.1**		**66**		**26**		**34**		**37**		**37**		**37**		**63**		**34**	
HA-330	HA-330-1 FT 2	1	10/13/2009	**0.099**		**0.17**		**0.22**		**0.17**		**0.24**		**0.2**	J8	**0.84**		**0.12**		**1**		**0.38**		**1.1**	
HA-331	HA-331-2 FT 2	2	10/13/2009	<0.0077		<0.0077		**0.0067**	J	**0.0057**	J	**0.0076**	J	**0.0085**	J8	**0.024**		**0.0049**	J	**0.0064**	J	**0.013**		**0.036**	
HA-332	HA-332-1 FT 2	1	10/13/2009	**0.012**	J	**0.029**		**0.013**	J	**0.027**		**0.029**		**0.039**		**0.29**		**0.012**	J	**0.2**		**0.12**		**0.29**	
HA-333	HA-333-3FT	3	10/13/2009	**0.019**		**0.047**		**0.013**	J	**0.018**		**0.012**	J	**0.011**	J	**0.052**		**0.0098**	J	**0.14**		**0.049**		**0.044**	
SLR Additional Upland Assessment - Woodlife Area (2013)																									
GP-501	GP-501-3	3	3/14/2013	-		<8.9		<8.9		<8.9		<8.9		<8.9		**3.0**	J	<8.9		**2.6**	J	**4.0**	J	<8.9	
SLR Additional Upland Assessment - Knoll Area (2013)																									
TP-16	TP-16-11.5	11.5	11/14/2013	**0.033**	J	**0.05**	J	**0.0098**	J	**0.062**	J	**0.031**	J	**0.086**		**0.086**		**0.026**	J	**0.16**	J	**0.076**		**0.098**	
TP-17	TP-17-13	13.0	11/14/2013	**0.05**	J	**0.0051**	J	**0.00096**	J	**0.004**	J	**0.008**		**0.0098**		**0.036**		**0.004**	**J**	**0.019**		**0.024**		**0.029**	
SLR Additional Upland Assessment - National Pole Area (2013)																									
GP-605	GP-605-13.5	13.5	12/18/2013	**10**		**20**		**0.23**		**25**		**9.6**		**0.84**		**26**		**18**		**82**		**62**		**22**	
GP-605	GP-605-34.5	34.5	12/18/2013	**0.15**		**0.15**		**0.00075**	J	**0.18**		**0.099**		**0.001**	J	**0.045**		**0.08**		**0.89**		**0.19**		**0.038**	
GP-606	GP-606-14.5	14.5	12/18/2013	**0.012**	J	**0.0045**	J	<0.0077		**0.035**		**0.0038**	J	<0.0077		**0.0074**	J	**0.015**		**0.14**		**0.013**		**0.0055**	J
GP-607	GP-607-24.5	24.5	12/18/2013	**0.011**	J	**0.0077**	J	**0.00088**	J	**0.075**		**0.011**		**0.012**		**0.037**		**0.023**		**0.032**		**0.028**		**0.036**	
Intial PCL (per Table 4.1.2.1-1)				**0.004**	gwl	**0.088**	gwl	**33**	gwl	**5.0**	gwl	**110**	gwl	**33**	gwl	**32**	gwl	**5.1**	gwl	**0.24**	gwl	**33**	gwl	**33**	gwl

Notes

- indicates Not Sampled or Not Analyzed for specific constituent

BOLD = Analytes detected at or above the laboratory practical quantitation limit (PQL)

<0.40 indicates not detected above the laboratory PQL of 0.40 mg/Kg (milligrams per Kilogram)

Only those analytes with greater than 5% frequency of detection are listed

Laboratory qualifiers defined on Table 4.1-21

A - Polynuclear Aromatic Compounds (PAHs) per EPA Method 8270M-SIM or 8270C

Table 4.1-6
Soil Analytical Results - SVOCs

Sample Location	Sample ID	Sample Depth (feet)	Sample Date	Semivolatile Organic Compounds (SVOCs) [A] per 8270C Method (mg/Kg)											
				Acetophenone		Biphenyl;1,1'-		Carbazole		Dibenzofuran		Methylphenol; 3-, 4-		Phenol	
				Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual
Parametrix Sampling Event (1991)															
GS-1	-	-	5/24/1991	-		-		-		<0.370		-		<0.370	
GS-2	-	-	5/24/1991	-		-		-		<0.40		-		<0.40	
GS-4	-	-	5/24/1991	-		-		-		<0.370		-		<0.370	
SS-1	-	-	5/30/1991	-		-		-		<4.90		-		<4.90	
SS-2	-	-	5/30/1991	-		-		-		<2.70		-		<2.70	
SLR Pre RI Assessment (2006-2007)															
GP-1	GP1-10	10.0	5/4/2006	-		-		<3.8		**4.9**		<3.8		<3.8	
GP-9	GP9-6	6.0	5/1/2006	-		-		**232**		**276**		<88.8		<88.8	
GP-10	GP10-3	3.0	5/1/2006	-		-		**47**		<15.3		<15.3		<15.3	
GP-12	GP12-8	8.0	5/2/2006	-		-		<84.2		**143**		<84.2		<84.2	
GP-13	GP13-11.5	11.5	5/1/2006	-		-		<0.404		<0.404		<0.404		<0.404	
GP-14	GP14-6	6.0	5/1/2006	-		-		**8.1**		**16**		<4.25		<4.25	
GP-15	GP15-10	10.0	5/1/2006	-		-		**3.3**		**1.5**		<0.388		<0.388	
GP-16	GP16-8	8.0	5/1/2006	-		-		<0.823		<0.823		<0.823		<0.823	
GP-17	GP17-5	5.0	5/1/2006	-		-		<0.734		<0.734		<0.734		<0.734	
GP206	GP206-4.5	4.5	9/12/2006	-		-		-		<0.350		<0.350		<0.350	
GP206	GP206-8.5	8.5	9/12/2006	-		-		-		**937**		<47.9		<47.9	
GP213	GP213-3	3.0	9/12/2006	-		-		-		**2.25**		<1.87		<1.87	
GP214	GP214-6	6.0	9/12/2006	-		-		-		**10.4**		<0.501		<0.501	
TP1	TP1-Stockpile	Comp.	10/19/2006	-		-		<1.19		<1.19		<1.19		<1.19	
TP2	TP2-4-7	7	10/19/2006	-		-		<1.47		<1.47		<1.47		<1.47	
MW-6	MW6-407-10	10	4/20/2007	-		-		<0.751		<0.751		<0.751		<0.751	
MW-6	MW6-407-14	14	4/20/2007	-		-		<0.385		<1.17		<0.385		<0.385	
SLR Initial RI Investigation (2009)															
GP-303	GP-303-6	6	6/1/2009	<0.040		<0.40		<0.40		<0.40		<0.40		<0.40	
GP-304	GP-304-6	6	6/1/2009	<0.041		<0.41		<0.41		<0.41		<0.41		<0.41	
GP-305	GP-305-7	7	6/1/2009	<0.036		<0.36		<0.36		<0.36		<0.36		<0.36	
GP-306	GP-306-7	7	6/1/2009	<0.036		<0.36		<0.36		<0.36		<0.36		<0.36	
GP-307	GP-307-4FT	4	5/20/2009	-		-		-		-		<0.41		<0.41	

Table 4.1-6
Soil Analytical Results - SVOCs

Sample Location	Sample ID	Sample Depth (feet)	Sample Date	Semivolatile Organic Compounds (SVOCs) [A] per 8270C Method (mg/Kg)											
				Acetophenone		Biphenyl;1,1'-		Carbazole		Dibenzofuran		Methylphenol; 3-, 4-		Phenol	
				Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual
GP-308	GP-308-2FT	2	5/20/2009	-		-		-		-		<0.36		<0.36	
GP-309	GP-309-5FT	5	5/20/2009	-		-		-		-		<0.35		<0.35	
GP-310	GP-310-4.5FT	4.5	5/22/2009	<0.036		<0.36		<0.36		<0.36		<0.36		<0.36	
GP-311	GP-311-3.5FT	3.5	5/22/2009	<0.99	O	<9.9	O	<9.9	O	<9.9	O	<9.9	O	<9.9	O
GP-312	GP-312-3.5FT	3.5	5/22/2009	<0.040		<0.40		<0.40		<0.40		<0.40		<0.40	
GP-334	GP-334-3FT	3	5/22/2009	<0.053		<0.53		<0.53		<0.53		<0.53		<0.53	
GP-335	GP-335-7.5FT	7.5	5/22/2009	<0.041	Q	<0.41	Q	<0.41	Q	<0.41	Q	<0.41	Q	<0.41	Q, J3
GP-335	GP-335-9.5FT	9.5	5/23/2009	<0.039		<0.39		<0.39		<0.39		<0.39		<0.39	
HA-322	HA-322 1 FT	1	9/23/2009	**0.06**	J, J3	**0.045**	J, J3	**0.027**	J	**0.05**	J, J3	<0.47		**0.062**	J
HA-322	HA-322-2 1.5 FT	1.5	9/23/2009	**0.068**	J	<0.95		**0.077**	J	**0.13**	J	**0.08**	J	**0.066**	J
HA-323	HA-323 1 FT	1	9/23/2009	<0.74		<0.74		<0.74		<0.74		<0.74		<0.74	
HA-326	HA-326 2 FT	2	9/24/2009	<0.42		<0.42		**0.014**	J	<0.42		<0.42		<0.42	
HA-326	HA-326-2 2.5 FT	2.5	9/24/2009	<0.62	J3	<0.62	J3	<0.62		<0.62	J3	<0.62		**0.11**	J
HA-327	HA-327-1.5 FT 2	1.5	10/12/2009	<0.40		<0.40		<0.40		<0.40		<0.40		<0.40	
HA-327	HA-327-2.5 FT	2.5	10/12/2009	<0.48		<0.48		**0.067**	J	**0.073**	J	<0.48		<0.48	
HA-328	HA-328-1 FT	1	10/12/2009	<0.55		<0.55		<0.55		<0.55		<0.55		<0.55	
HA-328	HA-328-2.5 FT	2.5	10/12/2009	<0.83		<0.83		<0.83		<0.83		<0.83		<0.83	
HA-329	HA-329-1 FT	1	10/12/2009	<0.88		**0.79**	J	**10**	J	**15**	J	<0.88		<0.88	
HA-330	HA-330-1 FT	1	10/13/2009	<1.3		<1.3		**0.13**	J	**0.18**	J	**0.21**	J	**0.087**	J
HA-331	HA-331-2 FT	2	10/13/2009	<0.43		<0.43		<0.43		<0.43		<0.43		<0.43	
HA-332	HA-332-1 FT	1	10/13/2009	<1.3		<1.3		**0.039**	J	**0.047**	J	**0.12**	J	<1.3	
HA-333	HA-333-3 FT	3	10/13/2009	<0.86		<0.86		**0.052**	J	**0.041**	J	**0.18**	J	**0.078**	J
SLR Additional Upland Assessment - Woodlife Area (2013)															
GP-501	GP-501-3	3	3/14/2013	<90		<90		<90		<8.9		<90		<90	
SLR Additional Upland Assessment - Knoll Area (2013)															
TP-16	TP-16-11.5	11.5	11/14/2013	<4		<4		<4		<0.39		<4		<4	
TP-17	TP-17-13	13.0	11/14/2013	<1.9		<1.9		<1.9		<0.18		**0.061**	J	<1.9	
Intial PCL (per Table 4.1.2.1-1)				8,000	mB	0.333	pql	0.333	pql	0.333	pql	4,000	mB	0.76	gwl

Notes

- indicates Not Sampled or Not Analyzed for specific constituent

BOLD = Analytes detected at or above the laboratory practical quantitation limit (PQL)

<0.40 indicates not detected above the laboratory PQL of 0.40 mg/Kg (milligrams per Kilogram)

Only those analytes with greater than 5% frequency of detection are listed

Laboratory qualifiers defined on Table 4.1-21

A - Semivolatile Organic Compounds (SVOCs) per EPA 8270C Method

Table 4.1-7
Soil Analytical Results - VOCs

Sample Location	Sample ID	Sample Depth (feet)	Sample Date	Volatile Organic Compounds (VOCs) [A] (mg/Kg)																							
				Acetone		Benzene		Butanone; 2-(MEK)		Carbon disulfide		Ethylbenzene		Methylene Chloride		Tetrachloroethylene		Toluene		Trichloroethylene		Naphthalene		1,2,4-Trimethylbenzene		Xylenes (Total)	
				Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual
Parametrix Sampling Event (1991)																											
GS-1	GS-1	-	5/24/1991	-		<0.006		-		-		<0.006		-		-		<0.006		-		<0.370		-		<0.006	
GS-2	GS-2	-	5/24/1991	-		<0.006		-		-		<0.006		-		-		<0.006		-		<0.40		-		<0.006	
GS-3	GS-3	-	5/24/1991	-		<0.015		-		-		<0.015		-		-		**0.09**		-		<0.370		-		**0.054**	
GS-4	GS-4	-	5/30/1991	-		<0.006		-		-		<0.006		-		-		<0.006		-		<0.370		-		<0.006	
SS-1	SS-1	-	5/30/1991	-		<0.038		-		-		<0.038		-		-		<0.038		-		<4.90		-		<0.038	
SS-2	SS-2	-	5/30/1991	-		<0.042		-		-		<0.042		-		-		<0.042		-		<2.70		-		<0.042	
RZA Sampling Event (1992)																											
C1	C1-S1	2.5-4.0	8/27/1992	-		<0.05		-		-		<0.05		-		-		<0.05		-		-		-		<0.05	
C2	C2-S2	7.5-9.0	8/27/1992	-		<0.05		-		-		<0.05		-		-		<0.05		-		-		-		<0.05	
C6	C6-S1	2.5-4.0	8/27/1992	-		<0.05		-		-		<0.05		-		-		<0.05		-		-		-		<0.05	
SLR Pre RI Assessment (2006-2007)																											
GP-3	GP3-9	9.0	5/4/2006	<15.6		<0.125		<6.23		<6.23		<0.623		<3.12		<0.623		**71**		<0.623		<1.25		<0.623		<1.873	
GP-14	GP14-6	6	5/1/2006	<15.6		<0.125		<6.24		<6.24		<0.624		<3.12		<0.624		<0.624		<0.624		**59**		<0.624		<1.874	
GP-34	GP34-8	8	5/3/2006	<2.81		<0.0225		<1.13		<1.13		<0.113		<0.563		<0.113		<0.113		<0.113		<0.152		<0.113		<0.338	
GP201	GP201-4.5	4.5	9/11/2006	<2.88		<0.023		<1.15		<1.15		<0.115		<0.576		<0.115		<0.115		<0.115		<0.230		<0.115		<0.345	
GP213	GP213-3	3.0	9/12/2006	<2.76		**0.053**		<1.10		<1.10		<0.110		<0.552		<0.110		**0.19**		<0.110		**1.1**		**0.13**		**0.15**	
GP214	GP214-6	6.0	9/12/2006	<18.6		<0.148		<7.42		<7.42		<0.742		<3.71		<0.742		<0.742		<0.742		**74**		<0.742		<2.222	
GP215	GP215-4.5	4.5	9/11/2006	<27.5		<0.022		<1.10		<1.10		<0.110		<0.550		<0.110		<0.110		<0.110		<0.220		<0.110		<0.330	
TP1	TP1-1-4.75	4.75	10/18/2006	<2.73		<0.109		<1.09		<1.09		<0.109		<0.546		<0.109		<0.109		<0.109		<0.218		<0.109		<0.327	
TP1	TP1-2-4.75	4.75	10/18/2006	<2.74		<0.110		<1.10		<1.10		<0.110		<0.548		<0.110		<0.110		<0.110		<0.219		<0.110		<0.329	
TP1	TP1-3-4.75	4.75	10/18/2006	<3.09		<0.124		<1.24		<1.24		<0.124		<0.618		<0.124		**0.53**		<0.124		<0.247		<0.124		<0.371	
TP1	TP1-4-5.75	5.75	10/18/2006	<2.83		<0.113		<1.13		<1.13		<0.113		<0.567		<0.113		<0.113		<0.113		<0.227		<0.113		<0.340	
TP1	TP1-5-4.75	4.75	10/19/2006	<3.01		<0.121		<1.21		<1.21		<0.121		<0.603		<0.121		**0.28**		<0.121		<0.241		**0.12**		**0.46**	
TP1	TP1-Stockpile	Comp.	10/19/2006	<14.7		<0.588		<5.88		<5.88		<0.588		<2.94		<0.588		**75**		<0.588		<1.18		**0.75**		**1.2**	
MW-6	MW6-407-10	10	4/20/2007	<2.82		<0.0226		<1.13		<1.13		<0.113		<0.564		<0.113		<0.113		<0.113		<0.751		<0.113		<0.226	
MW-6	MW6-407-14	14	4/20/2007	<2.9		<0.0232		<1.16		<1.16		<0.116		<0.579		<0.116		<0.116		<0.116		<0.385		<0.116		<0.232	
SLR Initial RI Investigation (2009)																											
GP-303	GP-303-6FT	6	6/1/2009	**0.046**	J	<0.0012		<0.012		**0.0053**		<0.0012		<0.0060		<0.0012		<0.0060		<0.0012		-		-		<0.0036	
GP-304	GP-304-6FT	6	6/1/2009	**0.021**	J	**0.00043**	J	<0.012		<0.0012		<0.0012		<0.0062		<0.0012		<0.0062		<0.0012		-		-		<0.0037	
GP-305	GP-305-7FT	7	6/1/2009	<0.055		<0.0011		<0.011		<0.0011		<0.0011		<0.0055		<0.0011		<0.0055		<0.0011		-		-		<0.0033	J3
GP-306	GP-306-7FT	7	6/1/2009	<0.055		<0.0011		<0.011		<0.0011		<0.0011		<0.0055		<0.0011		<0.0055		<0.0011		-		-		<0.0033	J3
GP-307	GP-307-4FT	4	5/20/2009	<0.062		<0.0012		<0.012		<0.0012		<0.0012		<0.0062		<0.0012		<0.0062		<0.0012		<0.0062		<0.0012		<0.0037	
GP-308	GP-308-2FT	2	5/20/2009	<0.055		<0.0011		<0.011		<0.0011		<0.0011		<0.0055		<0.0011		<0.0055		<0.0011		<0.36		<0.0011		<0.0033	
GP-309	GP-309-5FT	5	5/20/2009	**0.057**		<0.0011		<0.011		<0.0011		<0.0011		<0.0053		<0.0011		<0.0053		<0.0011		<0.0064	Q	<0.0011		<0.0033	
GP-310	GP-310-4.5FT	4.5	5/22/2009	**0.034**	J	<0.0011		**0.003**	J	<0.0011		<0.0011		<0.0054		<0.0011		<0.0054		<0.0011		-		-		<0.0032	
GP-311	GP-311-3.5FT	3.5	5/22/2009	**0.046**	J	<0.0015		<0.015		**0.0019**		<0.0015		<0.0075		<0.0015		<0.0075		<0.0015		-		-		<0.0045	
GP-312	GP-312-3.5FT	3.5	5/22/2009	**0.033**	J	<0.0012		**0.0039**	J	<0.0012		<0.0012		<0.0060		<0.0012		<0.0060		<0.0012		-		-		<0.0036	
GP-334	GP-334-3FT	3	5/22/2009	**0.061**	J	**0.0014**	J	<0.017		<0.0017		<0.0017		<0.0086		**0.0063**		<0.0086		<0.0017		-		-		<0.0051	
GP-335	GP-335-7.5FT	7.5	5/22/2009	**0.25**	Q	**0.0015**	Q	**0.0061**	Q, J	**0.038**	Q	<0.0014	Q	<0.0068	Q	**0.033**	Q	<0.0068	Q	**0.018**	Q	-		-		<0.0041	Q
GP-335	GP-335-9.5FT	9.5	5/22/2009	<0.060		<0.0012		<0.012		<0.0012		<0.0012		<0.0060		**0.00098**	J	<0.0060		**0.002**		-		-		<0.0036	
HA-322	HA-322-2 1.5 FT	1.5	9/23/2009	**1.6**		<0.014		**0.340**		**0.02**		<0.014		**0.34**		<0.014		<0.071		<0.014		-		-		<0.043	
HA-327	HA-327-2.5 FT	2.5	10/12/2009	**0.054**	J	<0.0014		**0.005**	J	**0.0041**		<0.0014		<0.0072		<0.0014		<0.0072		<0.0014		-		-		<0.0043	
HA-328	HA-328-1 FT	1	10/12/2009	**0.20**		**0.0014**	J	**0.0082**	J	**0.0036**		<0.0018		<0.0091		<0.0018		<0.0091		<0.0018		-		-		<0.0054	
HA-328	HA-328-2.5 FT	2.5	10/12/2009	**0.14**		<0.0025		**0.015**	J	**0.0022**	J	<0.0025		**0.004**	J	<0.0025		<0.012		<0.0025		-		-		<0.0074	
HA-329	HA-329-1 FT	1	10/12/2009	**0.12**	J	**0.0026**	J	**0.011**	J	**0.0084**		**0.018**		<0.013		<0.0026		**0.0042**	J	<0.0026		-		-		**0.024**	
HA-330	HA-330-1 FT	1	10/13/2009	<0.190		<0.0038		<0.038		**0.0023**	J	<0.0038		<0.019		<0.0038		<0.019		<0.0038		-		-		<0.011	
HA-331	HA-331-2 FT	2	10/13/2009	<0.064		<0.0013		<0.013		<0.0013		<0.0013		**0.00081**	J	<0.0013		<0.0064		<0.0013		-		-		<0.0039	
HA-332	HA-332-1 FT	1	10/13/2009	**350**		<0.0039		**0.170**		<0.0039		<0.0039		<0.020		<0.0039		<0.020		<0.0039		-		-		<0.012	
HA-333	HA-333-3 FT	3	10/13/2009	**0.10**	J	<0.0026		<0.026		**0.0026**		<0.0026		<0.013		<0.0026		<0.013		<0.0026		-		-		<0.0078	

Table 4.1-7
Soil Analytical Results - VOCs

Sample Location	Sample ID	Sample Depth (feet)	Sample Date	Volatile Organic Compounds (VOCs) [A] (mg/Kg)																							
				Acetone		Benzene		Butanone; 2-(MEK)		Carbon disulfide		Ethylbenzene		Methylene Chloride		Tetrachloroethylene		Toluene		Trichloroethylene		Naphthalene		1,2,4-Trimethylbenzene		Xylenes (Total)	
				Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual
SLR Additional Upland Assessment - Woodlife Area (2013)																											
GP-501	GP-501-3	3	3/14/2013	<0.34		<0.0067		<0.067		<0.0067		**0.0052**	J	**0.0098**	J	<0.0067		**0.04**		<0.0067		-		-		**0.046**	
SLR Additional Upland Assessment - Knoll Area (2013)																											
TP-10	TP-10-10	10.0	11/13/2013	**0.022**	J	<0.0011		<0.011		**0.00098**	J	<0.0011		<0.0054		<0.0011		<0.0054		<0.0011		-		-		<0.0033	
TP-11	TP-11-2	2.0	11/13/2013	**0.10**		**0.001**	J	**0.0038**	J	<0.0012		<0.0012		<0.0059		<0.0012		**0.00042**	J	<0.0012		-		-		<0.0035	
TP-12	TP-12-12.5	12.5	11/13/2013	**0.028**	J	<0.0011		<0.011		**0.0043**		<0.0011		<0.0055		<0.0011		<0.0055		<0.0011		-		-		<0.0033	
TP-13	TP-13-12	12.0	11/13/2013	**0.035**	J	<0.0011		<0.011		**0.0076**		<0.0011		<0.0056		<0.0011		**0.0004**	J	<0.0011		-		-		<0.0034	
TP-14	TP-14-12	12.0	11/14/2013	**0.04**	J	**0.00084**	J	<0.011		**0.0087**		<0.0011		**0.0037**	J	<0.0011		**0.0007**	J	<0.0011		-		-		<0.0033	
TP-15	TP-15-9	9.0	11/14/2013	**0.04**	J	**0.0011**		<0.011		**0.0043**		<0.0011		**0.003**	J	<0.0011		**0.0008**	J	<0.0011		-		-		<0.0034	
TP-16	TP-16-11.5	11.5	11/14/2013	**1.2**		**0.017**		**0.11**		**0.26**		**0.002**	J	**0.0084**	J	**0.0076**		**0.0079**	J	**0.0019**	J	-		-		**0.0048**	J
TP-17	TP-17-13	13.0	11/14/2013	**0.71**		**0.0035**		**0.074**		<0.0014		<0.0014		**0.0035**	J	<0.0014		**0.0012**	J	<0.0014		-		-		<0.0043	
SLR Additional Upland Assessment (2015)																											
GP-701	GP-701-5	5.0	7/9/2015	-		<0.0011		-		-		<0.0011		-		-		<0.0054		-		<0.0054		<0.0011		<0.0032	
GP-702	GP-702-4	4.0	7/9/2015	-		<0.0010		-		-		<0.0010		-		-		<0.0053		-		<0.0053		<0.0010		<0.0032	
GP-702	GP-702-14.5	14.5	7/9/2015	-		<0.027		-		-		**0.11**		-		-		**0.059**	J	-		**210**		**0.35**		**0.27**	
GP-703	703-P-8.5-9	8.5	7/21/2015	-		**0.091**	J	-		-		**2.1**		-		-		**0.85**		-		**1,800**		**7.7**		**5.8**	
GP-704	704-P-13.5-14	13.5	7/21/2015	-		**0.11**	J	-		-		**0.26**		-		-		**0.26**	J	-		**160**		**0.27**		**0.48**	
GP-705	GP-705-5	5.0	7/9/2015	-		**0.00057**	J	-		-		<0.0012		-		-		**0.00089**	J	-		<0.0058		<0.0012		<0.0035	
GP-706	GP-706-4	4.0	7/8/2015	-		<0.0013		-		-		<0.0013		-		-		<0.0064		-		<0.0064		<0.0013		<0.0038	
GP-707	GP-707-4	4.0	7/6/2015	-		<0.0011		-		-		<0.0011		-		-		<0.0053		-		<0.0053		<0.0011		<0.0032	
GP-708	GP-708-4	4.0	7/8/2015	-		<0.0015		-		-		<0.0015		-		-		<0.0076		-		**0.038**		<0.0015		<0.0046	
GP-708	GP-708-6	6.0	7/8/2015	-		**0.00060**	J	-		-		**0.0074**		-		-		**0.0016**	J	-		**200**		**0.012**		**0.012**	
GP-709	GP-709-5	5.0	7/7/2015	-		**0.0023**		-		-		**0.053**		-		-		**0.010**		-		**1,500**		**2.9**	J	**0.20**	
GP-709	GP-709-42	42.0	7/7/2015	-		**0.82**		-		-		**4.5**		-		-		**4.3**		-		**4,100**		**13**	J	**11**	
GP-710	GP-710-4	4.0	7/8/2015	-		<0.0012		-		-		<0.0012		-		-		<0.0060		-		<0.0060		<0.0012		<0.0036	
GP-710	GP-710-35	35.0	7/8/2015	-		**0.014**		-		-		**0.012**		-		-		**0.0043**	J	-		**7.5**		**0.00778**		**0.028**	
GP-711	GP-711-3	3.0	7/8/2015	-		<0.0012		-		-		<0.0012		-		-		<0.0059		-		<0.0059		<0.0012		<0.0035	
GP-711	GP-711-6	6.0	7/8/2015	-		<0.0014		-		-		<0.0014		-		-		<0.0071		-		**0.0042**	J	<0.0014		<0.0042	
GP-712	GP-712-5	5.0	7/7/2015	-		**0.0062**		-		-		**0.050**		-		-		**0.0055**	J	-		**110**		<1.9		**0.098**	
GP-712	GP-712-8	8.0	7/7/2015	-		**0.0012**	J	-		-		**0.0030**		-		-		**0.0014**	J	-		**9.8**		**0.0042**		**0.0066**	
MW-7	MW7-12.5	12.5	8/14/2015	-		<0.0012		-		-		<0.0012		-		-		<0.0057		-		**0.005**	J,J4	<0.0012		<0.0034	
MW-8B	MW8B-54	54.0	8/12/2015	-		<0.0012		-		-		<0.0012		-		-		<0.0061		-		**0.007**	J4	<0.0012		<0.0036	
MW-9B	MW9B-35.5	35.5	8/14/2015	-		<0.0012		-		-		<0.0012		-		-		<0.0062		-		<0.0062	J4	<0.0012		<0.0037	
MW-10B	MW10B-35	35.0	8/13/2015	-		<0.0012		-		-		<0.0012		-		-		<0.0058		-		**0.001**	J,J4	<0.0012		<0.0035	
SLR Source Control Evaluation (2018-2019)																											
NTD	NTD-SED-0418	--	4/4/2018	-		**0.000762**	J	-		-		-		-		-		-		-		**0.0237**		-		-	
	NTD-SED-A	0-1	7/9/2018	-		**0.000713**	J	-		-		-		-		-		-		-		**0.0691**		-		-	
	NTD-SED-B	0-1	7/9/2018	-		0.00137		-		-		-		-		-		-		-		**0.0178**		-		-	
MW-11	GP-MW-11-SS	0-12	4/25/2019	<0.0303		**0.000853**	J	<0.0303		-		**0.00112**	J	<0.0303		**0.00242**	J	**0.0043**	J	<0.00121		**0.00812**	J	**0.00405**	J	<0.00787	
MW-12	GP-MW-12-SS	0-12	4/25/2019	<0.0286		<0.00115		<0.0286		-		<0.00286		<0.00286		<0.00286		<0.00573		<0.00115		<0.0143		<0.00573		<0.00745	
MW-15	GP-MW-15-SS	0-12	4/26/2019	<0.0408		<0.00163		<0.0408		-		<0.00408		<0.00408		**0.00162**	J	**0.00268**	J	<0.00163		**0.00883**	J	<0.00815		<0.0106	
MW-17	GP-MW-17-SS	0-12	4/26/2019	<0.0311		<0.00124		<0.0311		-		<0.0311		<0.0311		**0.000919**	J	<0.00621		<0.00124		<0.0155		<0.00621		<0.00808	
GP-801	GP-801-SS	0-12	4/26/2019	<0.0294		**0.000507**	J	<0.0294		-		<0.00294		<0.0294		<0.00294		<0.00589		<0.00118		<0.0147		**0.00167**	J	<0.00765	
GP-802	GP-802-SS	0-12	4/26/2019	<0.0280		<0.00112		<0.0280		-		<0.00280		<0.0280		<0.00280		<0.00560		<0.00112		<0.0140		<0.00560		<0.00728	
Intial PCL (per Table 4.1.2.1-1)				2.1	gwl	0.0017	gwl	48,000	mB	0.27	gwl	0.34	gwl	0.002	pql	0.0028	gwl	0.27	gwl	0.0015	gwl	0.24	gwl	0.025	gwl	0.83	gwl

Notes

- indicates Not Sampled or Not Analyzed for specific constituent

BOLD = Analytes detected at or above the laboratory practical quantitation limit (PQL)

<0.40 indicates not detected above the laboratory PQL of 0.40 mg/Kg (milligrams per Kilogram)

Only those analytes with greater than 5% frequency of detection are listed

Laboratory qualifiers defined on Table 4.1-21

A - Volaile Organic Compounds (VOCs) per EPA 8260B Method

Table 4.1-8
Soil Analytical Results - PCB Aroclors

Sample Location	Sample ID	Sample Depth (feet)	Sample Date	Polychlorinated Biphenyl (PCB) Aroclors [A] (mg/Kg)																
				Aroclor 1016		Aroclor 1221		Aroclor 1232		Aroclor 1242		Aroclor 1248		Aroclor 1254		Aroclor 1260		Total PCBs
				Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	
RZA Sampling Event (1992)																		
C1	C1-S1	2.5-4.0	8/27/1992	<0.050		<0.050		<0.050		<0.050		<0.050		<0.050		<0.050		ND
C2	C2-S2	7.5-9.0	8/27/1992	<0.050		<0.050		<0.050		<0.050		<0.050		<0.050		<0.050		ND
SLR Pre RI Assessment (2006-2007)																		
GP34	GP34-8	8.0	5/3/2006	<0.0376		<0.0756		<0.0376		<0.0376		<0.0376		<0.0376		<0.0376		ND
SLR Initial RI Investigation (2009)																		
SS-313	SS-313	1.0	6/4/2009	<0.020		<0.020		<0.020		<0.020		<0.020		<0.020		<0.020		ND
SS-314	SS-314	1.0	6/4/2009	<0.018		<0.018		<0.018		<0.018		<0.018		<0.018		<0.018		ND
SS-315	SS-315	Surface	6/4/2009	<0.020		<0.020		<0.020		<0.020		<0.020		<0.020		<0.020		ND
SS-316	SS-316	Surface	6/4/2009	<0.019		<0.019		<0.019		<0.019		<0.019		<0.019		<0.019		ND
SS-317	SS-317	Surface	6/4/2009	<0.044		<0.044		<0.044		<0.044		<0.044		<0.044		<0.044		ND
SS-318	SS-318	Surface	6/4/2009	<0.018		<0.018		<0.018		<0.018		<0.018		<0.018		**0.02**		**0.02**
SS-319	SS-319	Surface	6/4/2009	<0.023		<0.023		<0.023		<0.023		<0.023		<0.023		<0.023		ND
SS-320	SS-320	Surface	6/4/2009	<0.017		<0.017		<0.017		<0.017		<0.017		<0.017		<0.017		ND
SS-321	SS-321	Surface	6/4/2009	<0.018		<0.018		<0.018		<0.018		<0.018		<0.018		<0.018		ND
GP-303	GP-303-6	6.0	6/1/2009	<0.020		<0.020		<0.020		<0.020		<0.020		<0.020		<0.020		ND
GP-304	GP-304-6	6.0	6/1/2009	<0.021		<0.021		<0.021		<0.021		<0.021		<0.021		<0.021		ND
GP-305	GP-305-7	7.0	6/1/2009	<0.019		<0.019		<0.019		<0.019		<0.019		<0.019		<0.019		ND
GP-306	GP-306-7	7.0	6/1/2009	<0.019		<0.019		<0.019		<0.019		<0.019		<0.019		<0.019		ND
GP-307	GP-307-4FT	4.0	5/20/2009	<0.021		<0.021		<0.021		<0.021		<0.021		<0.021		<0.021		ND
GP-308	GP-308-2FT	2.0	5/20/2009	<0.019		<0.019		<0.019		<0.019		<0.019		<0.019		<0.019		ND
GP-309	GP-309-5FT	5.0	5/20/2009	<0.018		<0.018		<0.018		<0.018		<0.018		<0.018		<0.018		ND
GP-310	GP-310-4.5FT	4.5	5/22/2009	<0.018		<0.018		<0.018		<0.018		<0.018		<0.018		<0.018		ND
GP-311	GP-311-3.5FT	3.5	5/22/2009	<0.025		<0.025		<0.025		<0.025		<0.025		<0.025		<0.025		ND
GP-312	GP-312-3.5FT	3.5	5/22/2009	<0.020		<0.020		<0.020		<0.020		<0.020		<0.020		<0.020		ND
GP-334	GP-334-3FT	3.0	5/22/2009	<0.028		<0.028		<0.028		<0.028		<0.028		<0.028		<0.028		ND
GP-335	GP-335-7.5FT	7.5	5/22/2009	<0.021	Q	<0.021	Q	<0.021	Q	<0.021	Q	<0.021	Q	**0.054**	Q	<0.021	Q	**0.054**
GP-335	GP-335-9.5FT	9.5	5/22/2009	<0.020		<0.020		<0.020		<0.020		<0.020		<0.020		<0.020		ND
SLR Additional Upland Assessment - Knoll Area (2013)																		
TP-10	TP-10-10	10.0	11/13/2013	<0.018		<0.018		<0.018		<0.018		<0.018		<0.018		<0.018		ND
TP-11	TP-11-2	2.0	11/13/2013	<0.020		<0.020		<0.020		<0.020		<0.020		<0.020		<0.020		ND
TP-12	TP-12-12.5	12.5	11/13/2013	<0.019		<0.019		<0.019		<0.019		<0.019		<0.019		<0.019		ND
TP-13	TP-13-12	12.0	11/13/2013	<0.019		<0.019		<0.019		<0.019		<0.019		<0.019		<0.019		ND
TP-14	TP-14-12	12.0	11/14/2013	<0.019		<0.019		<0.019		<0.019		<0.019		<0.019		<0.019		ND
TP-15	TP-15-9	9.0	11/14/2013	<0.019		<0.019		<0.019		<0.019		<0.019		**0.018**	J	<0.019		**0.018**
TP-16	TP-16-11.5	11.5	11/14/2013	<0.040		<0.040		<0.040		<0.040		<0.040		<0.040		<0.040		ND
TP-17	TP-17-13	13.0	11/14/2013	<0.019		<0.019		<0.019		<0.019		<0.019		<0.019		<0.019		ND
Intial PCL (per Table 4.1.2.1-1)				-		-		-		-		-		-		-		0.5 (mB)

Notes

- indicates Not Sampled or Not Analyzed for specific constituent

BOLD = Analytes detected at or above the laboratory practical quantitation limit (PQL)

<0.40 indicates not detected above the laboratory PQL of 0.40 mg/Kg (milligrams per Kilogram)

Only those analytes with greater than 5% frequency of detection are listed

Laboratory qualifiers defined on Table 4.1-21

A - Polychlorinated Biphenyl (PCB) Aroclors per EPA Method 8082.

Table 4.1-9
Soil Analytical Results - PCB Congeners

Sample Location	Sample ID	Sample Depth (feet)	Sample Date	PCB Congeners [A] (pg/g)			
				Total PCBs		TEQ U=1/2	
				Value	Qual	Value	Qual
SLR Additional Upland Assessment - Knoll Area (2013)							
JW-BL-303	JW-BL-303-130919	0-1	9/9/2013	**2,514**	J	**0.056**	J
JW-BL-304	JW-BL-304-130919	0-1	9/9/2013	**1,636**	J	**0.049**	J
JW-BL-305	JW-BL-305-130919	0-1	9/9/2013	**1,163**	J	**0.040**	J
JW-BL-306	JW-BL-306-130919	0-1	9/9/2013	**3,343**	J	**0.062**	J
JW-BL-307	JW-BL-307-130919	0-1	9/9/2013	**10,614**	J	**0.066**	J
SLR Source Control Evaluation (2018-2019)							
NTD	NTD-SED-0418	--	4/4/2018	**50,600**		**6.2**	
	NTD-SED-A	0-1	7/9/2018	**29,600**		**1.2**	
	NTD-SED-B	0-1	7/9/2018	**30,100**		**0.96**	
MW-11	GP-MW-11-SS	0-12	4/25/2019	**178**		**0.017**	
MW-12	GP-MW-12-SS	0-12	4/25/2019	**321**		**0.030**	
MW-13	GP-MW-13-SS	0-12	4/25/2019	**546**		**0.023**	
MW-14	GP-MW-14-SS	0-12	4/25/2019	**768**		**0.021**	
MW-15	GP-MW-15-SS	0-12	4/26/2019	**3,240**		**0.057**	
MW-16	GP-MW-16-SS	0-12	4/26/2019	**7,070**		**0.89**	
MW-17	GP-MW-17-SS	0-12	4/26/2019	**365**		**0.057**	
GP-801	GP-801-SS	0-12	4/26/2019	**1,840**		**0.025**	
GP-802	GP-802-SS	0-12	4/26/2019	**4,250**		**0.031**	
Intial PCL (per Table 4.1.2.1-1)				500,000		-	

Notes

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BOLD = Analytes detected at or above the laboratory practical quantitation limit (PQL)

<0.40 indicates not detected above the laboratory PQL of 0.40 mg/Kg (milligrams per Kilogram)

Only those analytes with greater than 5% frequency of detection are listed

Laboratory qualifiers defined on Table 4.1-21

A - Polychlorinated Biphenyl (PCB) Congeners per EPA Method 1668

Total PCBs indicates sum of 209 PCB congeners

TEQ U=1/2 indicates TEQ using TEFs for dioxin-like compounds per World Health Organization (WHO) assuming Non-Detect values as 1/2 detection limit

Table 4.1-10
Soil Analytical Results - Metals

Sample Location	Sample ID	Sample Depth	Sample Date	Metals [A] (mg/Kg)																							
				Antimony		Arsenic		Beryllium		Cadmium		Chromium		Copper		Lead		Nickel		Selenium		Silver		Thallium		Zinc		Mercury	
				Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual
SLR Initial RI Investigation (2009)																											
SS-313	SS-313	1.0	6/4/2009	**0.88**	J	<1.2		**0.74**		**0.72**		**27**		**9.3**		**7.1**		**30**		<1.2		<0.58		<1.2		**33**		**0.01**	J
SS-314	SS-314	1.0	6/4/2009	**0.99**	J	<1.0		**0.94**		**0.76**		**24**		**6.9**		**3.5**		**33**		<1.0		<1.0	O	<1.0		**31**		**0.01**	J
SS-319	SS-319	Surface	6/4/2009	<1.4		**1.3**	J	**0.32**		**2.0**		**18**		**64**		**26**		**13**		<1.4		<0.68		<6.8	O	**550**		**0.038**	
GP-303	GP-303-6	6.0	6/1/2009	<1.2		**1.9**		<1.2	O	**0.32**		**25**		**14**		**5.6**		**24**		<1.2		**0.79**		**3.2**		**37**		**0.14**	
GP-304	GP-304-6	6.0	6/1/2009	**3.6**		<6.2	O	**0.25**		**0.27**	J	**27**		**18**		**3.9**		**30**		**0.9**	J	**1.1**		<6.2	O	**32**		**0.047**	
GP-305	GP-305-7	7.0	6/1/2009	<1.1	J6, J3	**7.0**	J3	<1.1	O	**0.35**		**27**		**15**		**4.6**		**24**		<1.1		**0.96**		**4.5**		**40**		**0.019**	J
GP-306	GP-306-7	7.0	6/1/2009	<1.1		**4.4**		<1.1	O	**0.31**		**25**		**14**		**5.4**		**24**		<1.1		**0.94**		**4.2**		**36**		**0.015**	J
GP-307	GP-307-4FT	4.0	5/20/2009	<1.2		**3.9**		<1.2	O	<0.31		**31**		**18**		**3.7**		**32**		<1.2		**0.75**		**9.0**		**46**		<0.025	
GP-308	GP-308-2FT	2.0	5/20/2009	**1.8**	J6	<1.1		**1.0**		**0.67**		**40**	J6	**4.9**	P1	**2.6**		**43**	J3, J6	<1.1		<0.55		<1.1		**24**	J6	**0.024**	
GP-309	GP-309-5FT	5.0	5/20/2009	**2.2**		<5.3	O	**1.1**		**0.71**		**34**		**9.9**		**2.2**		**40**		<1.1		<0.53		<5.3	O	**23**		<0.021	
GP-310	GP-310-4.5FT	4.5	5/22/2009	<1.1	J6	**2.4**	P1	<1.1	O	**0.29**		**31**	J6	**12**		**3.0**	J3	**40**		<1.1	P1	**0.91**		**8.9**		**30**		**0.013**	J
GP-311	GP-311-3.5FT	3.5	5/22/2009	**4.0**		**8.2**		<1.5	O	**0.51**		**30**		**88**		**27**		**37**		<1.5		**1.2**		**12**		**61**		**0.016**	J
GP-312	GP-312-3.5FT	3.5	5/22/2009	**2.4**		**2.0**		<2.4	O	**0.39**		**38**		**19**		**13**		**41**		**0.53**	J	**1.1**		**11**		**44**		**0.039**	
GP-334	GP-334-3FT	3.0	5/22/2009	**1.5**	J	<16	O	<0.81	O	**0.21**	J	**26**		**66**		**8.7**		**39**		<8.1	O	**0.45**	J	<160	O	<12	O	**0.01**	J
GP-335	GP-335-7.5FT	7.5	5/22/2009	<1.2		**7.4**	J	<1.2	O	<3.1	O	**55**	B	**14**		**7.6**		**25**		<12	O	<6.3	O	**12**	J	**53**		**0.24**	
GP-335	GP-335-9.5FT	9.5	5/22/2009	**4.0**		<1.2		<1.2	O	**0.35**		**31**		**32**		**6.1**		**100**		<6.0	O	**0.91**		**8.8**		**40**		**0.019**	J
Intial PCL (per Table 4.1.2.1-1)				0.272	gwl	20	mA	3.16	gwl	1	back	135	TEE	36	back	24	back	48	back	0.5	pql	0.69	gwl	0.1	gwl	300	gwl	0.105	gwl

Notes

- indicates Not Sampled or Not Analyzed for specific constituent

BOLD = Analytes detected at or above the laboratory practical quantitation limit (PQL)

<0.40 indicates not detected above the laboratory PQL of 0.40 mg/Kg (milligrams per Kilogram)

Only those analytes with greater than 5% frequency of detection are listed

Laboratory qualifiers defined on Table 4.1-21

A - Metals per 6020 method and 7471 method (Mercury)

Table 4.1-11
Soil Analytical Results - Dioxins/Furans

Sample Location	Sample Label	Sample Depth (feet)	Dioxins and Furans [A]	
			U = 0	U = 0.5
			Value	Value
SLR Initial RI Investigation (2009)				
SS-301	SS-301 (Ash)	-	**477**	**478**
GP-302	GP-302-1	1.0	**4,151**	**4,151**
GP-309	GP-309-5	5.0	**5.3**	**5.8**
SLR Phase 2 Upland Soil and Groundwater (2012)				
401-P	401-P	2.0	**23**	**23**
402-P	402-P	3.0	**21**	**21**
403-P	403-P	3.0	**247**	**247**
404-P	404-P	3.0	**3.1**	**3.3**
SLR Additional Upland Assessment - Woodlife Area (2013)				
GP-501	GP-501-1	1.0	**26,817**	**26,817**
GP-501	GP-501-5	5.0	**115**	**115**
GP-503	GP-503-1	1.0	**12,411**	**12,412**
GP-503	GP-503-3	3.0	**60**	**60**
GP-503	GP-503-5	5.0	**3.6**	**4.0**
GP-504	GP-504-1	1.0	**60**	**60**
GP-505	GP-505-1	1.0	**332**	**332**
GP-505	GP-505-3	3.0	**2.0**	**2.1**
GP-506	GP-506-1	1.0	**18**	**18**
GP-507	GP-507-1	1.0	**133**	**134**
GP-507	GP-507-3	3.0	**0.16**	**0.59**
GP-508	GP-508-1	1.0	**17**	**17**
GP-508	GP-508-3	3.0	**30**	**30**
GP-510	GP-510-1	1.0	**0.87**	**1.3**
GP-510	GP-510-3	3.0	**6.1**	**6.1**
GP-511	GP-511-1	1.0	**0.27**	**0.68**
GP-512	GP-512-1	1.0	**114**	**114**
SLR Source Control Evaluation (2018-2019)				
NTD	NTD-SED-0418	--	**102**	**102**
	NTD-SED-A	0-1	**98**	**98**
	NTD-SED-B	0-1	**170**	**170**
MW-11	GP-MW-11-SS	0-12	**4.3**	**4.4**
MW-12	GP-MW-12-SS	0-12	**0.17**	**0.38**
MW-12	P-MW-12-SS-18-	18-19	**4.1**	**4.1**
MW-13	GP-MW-13-SS	0-12	**0.17**	**0.38**
MW-14	GP-MW-14-SS	0-12	**0.13**	**0.30**
MW-16	GP-MW-16-SS	0-12	**8.3**	**8.3**
MW-17	GP-MW-17-SS	0-12	**0.51**	**0.74**
GP-801	GP-801-SS	0-12	**2.0**	**2.0**
GP-802	GP-802-SS	0-12	**4.4**	**4.5**
Intial PCL (per Table 4.1.2.1-1)			5.7 (pql)	

Notes

- indicates Not Sampled or Not Analyzed for specific constituer

BOLD = Analytes detected at or above the laboratory practical

<0.40 indicates not detected above the laboratory PQL of 0.40

Laboratory qualifiers defined on Table 4.1-21

A - Dioxins and Furans per EPA Method 1613 or 8290

TEQ U=0 indicates Toxic Equivalent Quotient (TEQ) using Toxic

TEQ U=1/2 indicates TEQ using TEFs per WHO assuming Non-D

Table 4.1-12
Groundwater Analytical Results - TPH

Sample Location	Sample ID	Sample Date	Hydrocarbon Identification [A] (µg/L)						Total Petroleum Hydrocarbons [B] (µg/L)					
			TPH Gasoline		TPH Diesel		TPH Heavy Oil		TPH-Gx Gasoline Range		TPH-Dx Diesel Range		TPH-Dx Heavy Oil Range	
			Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual
RZA Sampling Event (1992)														
MW-1	MW-1	9/4/1992	-		-		-		<50		-		-	
MW-2	MW-2	9/4/1992	-		-		-		<50		-		-	
SLR Pre RI Assessment (2006-2007)														
GP-1	GP1-GW	5/4/2006	<238		<600		<600		-		-		-	
GP-2	GP2-GW	5/4/2006	**DET**		<600		<600		-		-		-	
GP-3	GP3-GW	5/4/2006	**DET**		<600		<600		-		-		-	
GP-4	GP4-GW	5/11/2006	**DET**		**DET**		<600		**372**		<238		<476	
GP-5	GP5-GW	5/4/2006	**DET**		**DET**		<600		-		-		-	
GP-6	GP6-GW	5/2/2006	<238		<600		<600		-		-		-	
GP-7	GP7-GW	5/2/2006	<238		<600		<600		-		-		-	
GP-8	GP8-GW	5/2/2006	<236		<594		<594		-		-		-	
GP-9	GP9-GW	5/1/2006	**DET**		**DET**		**DET**		**6,710**		**23,100**		<943	
GP-10	GP10-GW	5/1/2006	**DET**		**DET**		**DET**		**9,140**		**41,800**		**5,940**	
GP-11	GP11-GW	5/4/2006	**DET**		**DET**		**DET**		-		-		-	
GP-12	GP12-GW	5/2/2006	<236		**DET**		<594		-		<472		<943	
GP-13	GP13-GW	5/1/2006	**DET**		**DET**		**DET**		**179**		<472		<943	
GP-14	GP14-GW	5/1/2006	**DET**		**DET**		**DET**		**292**		**10,900**		**1,240**	
GP-15	GP15-GW	5/1/2006	**DET**		**DET**		<594		-		**1,330**		<943	
GP-16	GP16-GW	5/1/2006	**DET**		**DET**		<594		-		**492**		<943	
GP-17	GP17-GW	5/1/2006	<236		**DET**		<594		-		<472		<943	
GP-18	GP18-GW	5/1/2006	<236		<594		<594		-		-		-	
GP-19	GP19-GW	5/1/2006	<236		<594		<594		-		-		-	
GP-20	GP20-GW	5/4/2006	<238		<600		**DET**		-		-		-	
GP-21	GP21-GW	5/4/2006	<238		<600		<600		-		-		-	
GP-22	GP22-GW	5/4/2006	<238		<600		<600		-		-		-	
GP-23	GP23-GW	5/1/2006	<236		<594		<594		-		-		-	
GP-24	GP24-GW	5/3/2006	<238		**DET**		**DET**		-		<476		**1,480**	
GP-26	GP26-GW	5/3/2006	<238		<600		<600		-		-		-	
GP-27	GP27-GW	5/3/2006	<238		<600		<600		-		-		-	
GP-29	GP29-GW	5/4/2006	<238		<600		**DET**		-		-		-	
GP-31	GP31-GW	5/3/2006	<238		**DET**		**DET**		-		-		-	
GP-33	GP33-GW	5/3/2006	<238		<600		<600		-		-		-	
GP-34	GP34-GW	5/3/2006	<238		<600		<600		-		-		-	
GP-35	GP35-GW	5/4/2006	<238		<600		<600		-		-		-	
GP-36	GP36-GW	5/3/2006	<238		<600		<600		-		-		-	
GP-37	GP37-GW	5/2/2006	<236		<594		<594		-		-		-	
GP-38	GP38-GW	5/2/2006	<236		<594		<594		-		-		-	
GP-39	GP39-GW	5/2/2006	<236		<594		<594		-		-		-	
GP-40	GP40-GW	5/2/2006	<236		<594		<594		-		-		-	

Table 4.1-12
Groundwater Analytical Results - TPH

Sample Location	Sample ID	Sample Date	Hydrocarbon Identification [A] (µg/L)						Total Petroleum Hydrocarbons [B] (µg/L)					
			TPH Gasoline		TPH Diesel		TPH Heavy Oil		TPH-Gx Gasoline Range		TPH-Dx Diesel Range		TPH-Dx Heavy Oil Range	
			Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual
GP-41	GP41-GW	5/2/2006	<236		<594		<594		-		-		-	
GP-42	GP42-GW	5/2/2006	<236		<594		<594		-		-		-	
GP-201	GP201-GW	9/11/2006	<238		<600		<600		-		-		-	
GP-204	GP204-GW	9/11/2006	<238		**DET**		**DET**		-		**2,990**		**3,990**	
GP-205	GP205-GW	9/11/2006	<238		<600		<600		-		-		-	
GP-208	GP208-GW	9/11/2006	**DET**	J	**DET**		**DET**		-		**36,000**		**1,920**	
GP-209	GP209-GW	9/11/2006	<238		<600		<600		-		-		-	
GP-210	GP210-GW	9/11/2006	<238		<600		<600		-		-		-	
GP-211	GP211-GW	9/11/2006	<238		<600		<600		-		-		-	
GP-212	GP212-GW	9/11/2006	<238		<600		<600		-		-		-	
GP-214	GP214-GW	9/11/2006	**DET**		**DET**		**DET**		**4,000**		**16,800**		**1,260**	
GP-215	GP215-GW	9/11/2006	**DET**		**DET**		<600		**2,580**		**11,500**		<952	
MW-1	MW1-1106	11/14/2006	<238		<600		<600		-		-		-	
MW-2	MW2-1106	11/14/2006	<238		<600		<600		-		-		-	
MW-3	MW3-1106	11/14/2006	<238		<600		<600		-		-		-	
MW-4	MW4-1106	11/14/2006	<238		<600		<600		-		-		-	
MW-5	MW5-1106	11/14/2006	<238		<600		<600		-		-		-	
MW-6	MW6-507	5/11/2007	<238		<600		<600		-		<476		<952	
SLR Initial RI Investigation (2009)														
GP-303	GP-303-GW	6/1/2009	<100		<100		<500		-		-		-	
GP-304	GP-304-GW	6/1/2009	<100		**250**		<500		-		**160**		<250	
GP-305	GP-305-GW	6/1/2009	<100		<100		<500		-		-		-	
GP-306	GP-306-GW	6/1/2009	<100		<100		<500		-		-		-	
GP-307	GP-307-GW	5/20/2009	<100		<100		<500		-		-		-	
GP-308	GP-308-GW	5/20/2009	<100		**310**		**540**		-		**450**		**320**	
GP-309	GP-309A-GW	5/22/2009	<100		<100		<500		-		-		-	
GP-310	GP-310-GW	5/22/2009	<100		**120**		<500		-		**270**		**280**	
GP-311	GP-311-GW	5/22/2009	<100		**39**	J	<500		-		-		-	
GP-312	GP312-GW	5/22/2009	<100		**150**		<500		-		**240**		**480**	
GP-334	GP334-GW	5/22/2009	<100		<100		<500		-		-		-	
GP-335	GP335-GW	5/22/2009	<100		<100		<500		-		-		-	
MW-1	MW-1-GW	10/29/2009	-		-		-		-		**130**		<250	
MW-4	MW-4-GW	10/29/2009	-		-		-		-		<100		<250	
HA-322	HA-322-GW	9/23/2009	<100		**43**	J	<500		-		**49**		<250	
HA-323	HA-323-GW	9/23/2009	<100		**49**	J	**330**	J	-		**83**		<250	
HA-324	HA-324-GW	10/12/2009	<100		**39**	J	<500		-		<100		<250	
HA-325	HA-325-GW	9/24/2009	<100		**78**	J	<500		-		**69**		<250	
HA-326	HA-326-GW	10/12/2009	<100		**78**	J	<500		-		<100		<250	
HA-327	HA-327-GW	10/12/2009	<100		**430**		<500		-		-		-	
HA-328	HA-328-GW	10/12/2009	**62**	J	<100		<500		<100		<100		<250	

Table 4.1-12
Groundwater Analytical Results - TPH

Sample Location	Sample ID	Sample Date	Hydrocarbon Identification [A] (µg/L)						Total Petroleum Hydrocarbons [B] (µg/L)					
			TPH Gasoline		TPH Diesel		TPH Heavy Oil		TPH-Gx Gasoline Range		TPH-Dx Diesel Range		TPH-Dx Heavy Oil Range	
			Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual
HA-329	HA-329-GW	10/13/2009	**120**		**11,000**		**1,800**		**4,300**		**15,000**		**170**	J
HA-330	HA-330-GW	10/13/2009	<100		**67**	J	<500		-		-		-	
HA-331	HA-331-GW	10/13/2009	<100		<100		<500		-		-		-	
HA-332	HA-332-GW	10/13/2009	<100		**58**	J	<500		-		-		-	
MW-1	MW-1-GW (Low Tide)	5/24/2012	**56**	J	**99**	J	ND		**35**	J	**290**		**210**	J
MW-1	MW-1-GW (High Tide)	5/24/2012	**37**	J	**120**		**290**	J	<100		**100**		**170**	J
MW-5	MW-5-GW (Low Tide)	5/24/2012	**43**	J	**140**		ND		**120**		**470**		**290**	
MW-5	MW-5-GW (High Tide)	5/24/2012	**34**	J	**130**		ND		**150**		**290**		**190**	J
SLR Additional Upland Assessment - Knoll Area (2013)														
GP-601	GP-601-W	11/18/2013	<100		**270**		**220**		-		**290**	T8	**280**	T8
GP-602	GP-602-W	11/18/2013	<100		**56**	J	<500		-		-		-	
GP-603	GP-603-W	11/18/2013	<100		**360**		**920**		-		**980**	T8	**260**	T8
GP-604	GP-604-W	11/18/2013	**70**	J	**190**		**220**	J	**372**		<238		<476	
SLR Additional Upland Assessment - National Pole Area (2013)														
GP-605	GP-605-W	12/18/2013	-		-		-		**1,000**		**19,000**		**810**	
GP-606	GP-606-W	12/18/2013	-		-		-		**150**		**770**		**150**	J
GP-607	GP-607-W	12/18/2013	-		-		-		<100		**240**		**86**	J
SLR Additional Upland Assessment (2015)														
GP-701	GP-701-GW	7/9/2015	-		-		-		<100		**55**	J	**94**	J
GP-702	GP-702-GW	7/9/2015	-		-		-		<100		**260**		<250	
GP-703	GP-703-P-W	7/21/2015	-		-		-		<100		**770**		**170**	J
GP-704	GP-704-P-W	7/21/2015	-		-		-		**1,900**		**14,000**		<5,000	
GP-705	GP-705-GW	7/9/2015	-		-		-		<100		**110**		**170**	J
GP-706	GP-706-GW	7/8/2015	-		-		-		**33**	J	**820**		**370**	
GP-707	GP-707-GW	7/6/2015	-		-		-		<100		**260**		<250	
GP-708	GP-708-GW	7/8/2015	-		-		-		**950**		**12,000**		**470**	
GP-709	GP-709-GW	7/7/2015	-		-		-		**1,800**		**32,000**		**4,900**	
GP-710	GP-710-GW	7/8/2015	-		-		-		**2,300**		**26,000**		**480**	
GP-711	GP-711-GW	7/8/2015	-		-		-		**1,700**		**36,000**	E	**4,400**	
GP-712	GP-712-GW	7/7/2015	-		-		-		**940**		**10,000**		**1,900**	
SLR Quarterly Groundwater Monitoring Well Sampling (Highest Measured Value Shown) [C] (2015-2020)														
MW-1	MW-1-GW	Various	-		-		-		**45**	J	**333**		**386**	
MW-2	MW-2-GW	Various	-		-		-		**58**	J	ND		**243**	
MW-3	MW-3-GW	1/15/2018	-		-		-		**-**		**163**		**451**	
MW-4	MW-4-GW	Various	-		-		-		**44**		**259**		**262**	
MW-5	MW-5-GW	Various	-		-		-		**69**	J	**2,380**		**565**	
MW-6	MW-6-GW	Various	-		-		-		**38**	J	**62**		**173**	
MW-7	MW-7-GW	Various	-		-		-		**37**	J	**217**		**242**	
MW-8A	MW-8A-GW	Various	-		-		-		**2,760**		**119,000**		**22,800**	
MW-8B	MW-8B-GW	Various	-		-		-		**3,160**		**225,000**		**50,000**	

Table 4.1-12
Groundwater Analytical Results - TPH

Sample Location	Sample ID	Sample Date	Hydrocarbon Identification [A] (µg/L)						Total Petroleum Hydrocarbons [B] (µg/L)					
			TPH Gasoline		TPH Diesel		TPH Heavy Oil		TPH-Gx Gasoline Range		TPH-Dx Diesel Range		TPH-Dx Heavy Oil Range	
			Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual
MW-9A	MW-9A-GW	Various	-		-		-		**221**		**154**		**157**	
MW-9B	MW-9B-GW	Various	-		-		-		**34**	J	ND		ND	
MW-10A	MW-10A-GW	Various	-		-		-		**2,890**		**66,900**		**33,200**	
MW-10B	MW-10B-GW	Various	-		-		-		**300**		**1,410**		**234**	
MW-11A	MW-11A-GW	7/30/2019	-		-		-		**-**		**584**		**176**	
MW-17	MW-17-GW	7/30/2019	-		-		-		**-**		**251**		**119**	
SLR Source Control Evaluation (2018-2019)														
NTD Weep Holes	NTD-SW-EAST-0418	4/5/2018	-		-		-		-		**534**		**266**	
	NTD-SW-WEST-0418	4/5/2018	-		-		-		-		**776**		**550**	
NTD Inlets	NTD-SW-3"-0418	4/4/2018	-		-		-		-		**218**		**374**	
	NTD-SW-8"-0418	4/4/2018	-		-		-		-		**316**		**362**	
SEEP-N-2	SEEP-N-2	5/15/2018	-		-		-		-		<66		<82.5	
SEEP-N-14	SEEP-N-14	5/15/2018	-		-		-		-		<66		<82.5	
SEEP-N-18	SEEP-N-18	5/15/2018	-		-		-		-		<66		**470**	
SEEP-S-1	SEEP-S-1	5/14/2018	-		-		-		-		<66		<82.5	
SEEP-S-9	SEEP-S-9	5/14/2018	-		-		-		-		**115**	J	**239**	J
SEEP-S-14	SEEP-S-14	5/15/2018	-		-		-		-		<66		<82.5	
SEEP-S-16	SEEP-S-16	5/14/2018	-		-		-		-		<66		<82.5	
MW-11B	MW-11B -0519	5/3/2019	-		-		-		-		<200		<250	
MW-17	MW-17-0519	5/3/2019	-		-		-		-		**130**	J	<250	
GP-801	GP-801-GW	4/26/2019	-		-		-		-		**324**		**396**	
GP-802	GP-802-GW	4/26/2019	-		-		-		-		<200		<250	
Intial PCL (per Table 4.1.2.1-2)			-		-		-		800/1000		500	gw-b	500	gw-b

Notes

- indicates Not Sampled or Not Analyzed for specific constituent

BOLD = Analytes detected at or above the laboratory practical quantitation limit (PQL)

<0.40 indicates not detected above the laboratory PQL of 0.40 µg/L (micrograms per Liter)

Only those analytes with greater than 5% frequency of detection are listed

Laboratory qualifiers defined on Table 4.1-21

A - Hydrocarbon Identification per NW-TPH Methodology. TPH-HCID method is a qualitative and semi-quantitative screen to determine the presence and type of petroleum products that may exist. DET indicates the presence of the hydrocarbon range is confirmed.

B - Total Petroleum Hydrocarbons (TPH) per NWTPH-Gx Method, Washington State Method 418.1 modified, 8015 Method, or NWTPH-Dx Method

C - Only highest detected value shown for quarterly groundwater sampling events. Full analytical results are included in Appendix G

Table 4.1-13
Groundwater Analytical Results - cPAHs

Sample Location	Sample ID	Sample Date	Carcinogenic Polynuclear Aromatic Compounds (cPAHs) [A]														TEQ U = 0	TEQ U = 1/2
			Benzo(a) anthracene		Benzo(a) pyrene		Benzo(b) fluoranthene		Benzo(k) fluoranthene		Chrysene		Dibenzo(a,h) anthracene		Indeno (1,2,3-cd) pyrene			
			Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual		
SLR Pre RI Assessment (2006-2007)																		
GP-4	GP4-GW	5/11/2006	<4.72		<4.72		<4.72		<4.72		<4.72		<4.72		<4.72		ND	3.56
GP-6	GP6-GW	5/2/2006	<0.0952		<0.0952		<0.0952		<0.0952		<0.0952		<0.190		<0.0952		ND	0.08
GP-7	GP7-GW	5/2/2006	<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		ND	3.59
GP-9	GP9-GW	5/1/2006	**100**		**61.6**		**59.4**		**56.3**		**167**		<47.2		<47.2		**85**	**90**
GP-10	GP10-GW	5/1/2006	**226**		**163**		**157**		**149**		**178**		<94.3		<94.3		**218**	**227**
GP-11	GP11-GW	5/4/2006	**11.8**		**6.65**		**7.05**		**5.64**		**22.8**		<9.52		<4.76		**9.3**	**10**
GP-12	GP12-GW	5/2/2006	<4.72		<4.72		<4.72		<4.72		<4.72		<4.72		<4.72		ND	3.56
GP-13	GP13-GW	5/1/2006	<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		ND	3.59
GP-14	GP14-GW	5/1/2006	<47.6		<47.6		<47.6		<47.6		<47.6		<47.6		<47.6		ND	35.94
GP-15	GP15-GW	5/1/2006	<4.72		<4.72		<4.72		<4.72		<4.72		<4.72		<4.72		ND	3.56
GP-16	GP16-GW	5/1/2006	<4.72		<4.72		<4.72		<4.72		<4.72		<4.72		<4.72		ND	3.56
GP-17	GP17-GW	5/1/2006	<4.72		<4.72		<4.72		<4.72		<4.72		<4.72		<4.72		ND	3.56
GP-18	GP18-GW	5/1/2006	<0.0943		<0.0943		<0.0943		<0.0943		<0.0943		<0.189		<0.0943		ND	0.08
GP-19	GP19-GW	5/1/2006	<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		ND	3.59
GP-22	GP22-GW	5/4/2006	<4.72		<4.72		<4.72		<4.72		<4.72		<4.72		<4.72		ND	3.56
GP-23	GP23-GW	5/1/2006	<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		ND	3.59
GP-24	GP24-GW	5/3/2006	<4.72		<4.72		<4.72		<4.72		<4.72		<4.72		<4.72		ND	3.56
GP-27	GP27-GW	5/4/2006	<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		ND	3.59
GP-29	GP29-GW	5/4/2006	<4.72		<4.72		<4.72		<4.72		<4.72		<4.72		<4.72		ND	3.56
GP-31	GP31-GW	5/3/2006	<0.0952		<0.0952		<0.0952		<0.0952		<0.0952		<0.190		<0.0952		ND	0.08
GP-34	GP34-GW	5/3/2006	<190		<190		<190		<190		<190		<190		<190		ND	143.45
GP-35	GP35-GW	5/4/2006	<0.0943		<0.0943		<0.0943		<0.0943		<0.0943		<0.189		<0.0943		ND	0.08
GP-36	GP36-GW	5/3/2006	<4.72		<4.72		<4.72		<4.72		<4.72		<4.72		<4.72		ND	3.56
GP-41	GP41-GW	5/2/2006	<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		ND	3.59
GP-42	GP42-GW	5/2/2006	<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		ND	3.59
GP-204	GP204-GW	9/11/2006	<0.0943		<0.0943		<0.0943		<0.0943		<0.0943		<0.189		<0.0943		ND	0.08
GP-208	GP208-GW	9/12/2006	**47.6**		**27.4**		**27.5**		**10.1**		**56.1**		<9.43		**9.28**		**37**	**38**
GP-211	GP211-GW	9/11/2006	<0.0943		<0.0943		<0.0943		<0.0943		<0.0943		<0.189		<0.0943		ND	0.08
GP-214	GP214-GW	9/12/2006	<47.2		<47.2		<47.2		<47.2		<47.2		<47.2		<47.2		ND	35.64
GP-215	GP215-GW	9/12/2006	<47.2		<47.2		<47.2		<47.2		<47.2		<47.2		<47.2		ND	35.64
MW1	MW1-1106	11/14/2006	<4.95		<4.95		<4.95		<4.95		<4.95		-		<4.95		ND	3.49
MW2	MW2-1106	11/14/2006	<4.90		<4.90		<4.90		<4.90		<4.90		-		<4.90		ND	3.45
MW3	MW3-1106	11/14/2006	<4.90		<4.90		<4.90		<4.90		<4.90		-		<4.90		ND	3.45
MW4	MW4-1106	11/14/2006	<4.90		<4.90		<4.90		<4.90		<4.90		-		<4.90		ND	3.45
MW5	MW5-1106	11/14/2006	<4.90		<4.90		<4.90		<4.90		<4.90		-		<4.90		ND	3.45
MW1	MW1-407	4/19/2007	<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		ND	3.59
MW2	MW2-407	4/19/2007	<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		ND	3.59
MW3	MW3-407	4/19/2007	<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		ND	3.59
MW4	MW4-407	4/19/2007	<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		ND	3.59
MW5	MW5-407	4/19/2007	<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		ND	3.59
MW6	MW6-507	5/11/2007	<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		ND	3.59
SLR Initial RI Investigation (2009)																		
GP-303	GP-303-GW	6/1/2009	<0.05	Q	<0.05	Q, J3	<0.05	Q	<0.05	Q	<0.05	Q	<0.05	Q	<0.05	Q	ND	0.038
GP-304	GP-304-GW	6/1/2009	<0.050	Q	**0.03**	J,Q,J3	**0.036**	J, Q	**0.026**	J, Q	**0.034**	J, Q	<0.050	Q	**0.022**	J,Q	**0.039**	**0.044**

Table 4.1-13
Groundwater Analytical Results - cPAHs

Sample Location	Sample ID	Sample Date	Carcinogenic Polynuclear Aromatic Compounds (cPAHs) [A]															
			Benzo(a) anthracene		Benzo(a) pyrene		Benzo(b) fluoranthene		Benzo(k) fluoranthene		Chrysene		Dibenzo(a,h) anthracene		Indeno (1,2,3-cd) pyrene		TEQ U = 0	TEQ U = 1/2
			Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual		
GP-305	GP-305-GW	6/1/2009	<0.050	Q	<0.050	Q, J3	<0.050	Q	<0.050	Q	<0.050	Q	<0.050	Q	<0.050	Q	ND	0.038
GP-306	GP-306-GW	6/1/2009	<0.050	Q	<0.050	Q, J3	<0.050	Q	<0.050	Q	<0.050	Q	<0.050	Q	<0.050	Q	ND	0.038
GP-307	GP-307-GW	5/20/2009	<0.050	Q	<0.050	Q, J3	<0.050	Q	<0.050	Q	<0.050	Q	<0.050	Q	<0.050	Q	ND	0.038
GP-308	GP-308-GW	5/20/2009	<10		<10		<10		<10		<10		<10		<10		ND	7.550
GP-309	GP-309-GW	5/22/2009	<0.050	Q	<0.050	Q, J3	<0.050	Q	<0.050	Q	<0.050	Q	<0.050	Q	<0.050	Q	ND	0.038
GP-310	GP-310-GW	5/22/2009	<0.050	Q	<0.050	Q, J3	<0.050	Q	<0.050	Q	<0.050	Q	<0.050	Q	<0.050	Q	ND	0.038
GP-311	GP-311-GW	5/22/2009	<0.050	Q	<0.050	Q, J3	<0.050	Q	<0.050	Q	<0.050	Q	<0.050	Q	<0.050	Q	ND	0.038
GP-312	GP-312-GW	5/22/2009	<0.050	Q	<0.050	Q, J3	<0.050	Q	<0.050	Q	<0.050	Q	<0.050	Q	<0.050	Q	ND	0.038
GP-334	GP-334-GW	5/22/2009	<0.050	Q	<0.050	Q, J3	<0.050	Q	<0.050	Q	<0.050	Q	<0.050	Q	<0.050	Q	ND	0.038
GP-335	GP-335-GW	5/22/2009	<0.050	Q	<0.050	Q, J3	<0.050	Q	<0.050	Q	<0.050	Q	<0.050	Q	<0.050	Q	ND	0.038
HA-322	HA-322-GW2	9/23/2009	<0.050		<0.050		<0.050		<0.050		<0.050		<0.050		<0.050		ND	0.038
HA-323	HA-323-GW	9/23/2009	**0.55**		**0.78**		**0.82**		**0.48**		**0.68**		**0.2**		**0.59**		**1.51**	**1.51**
HA-324	HA-324-GW	10/12/2009	<0.050		<0.050		<0.050		<0.050		<0.050		<0.050		<0.050		ND	0.038
HA-325	HA-325-GW	9/24/2009	**0.07**		**0.07**		**0.084**		**0.034**		**0.071**		<0.050		**0.052**		**0.095**	**0.097**
HA-328	HA-328-GW	10/12/2009	<0.050		<0.050		<0.050		<0.050		<0.050		<0.050		<0.050		ND	0.038
HA-329	HA-329-GW	10/13/2009	**7.3**		**5.8**		**7.9**		**2.7**		**8.3**		**0.74**	**J**	**2.2**		**7.97**	**7.97**
SLR Additional Upland Assessment - Knoll Area (2013)																		
GP-601	GP-601-W	11/18/2013	**0.55**		**0.26**		**0.34**		**0.14**		**0.56**		**0.01**	J	**0.16**		**0.386**	**0.386**
SLR Additional Upland Assessment - National Pole Area (2013)																		
GP-605	GP-605-W	12/18/2013	**34**		**37**		**41**		**20**		**90**		**6.0**		**16**		**50**	**50**
GP-606	GP-606-W	12/18/2013	**0.31**		**0.15**		**0.18**		**0.075**	J	**0.31**		**0.012**	J	**0.041**	J	**0.215**	**0.215**
GP-607	GP-607-W	12/18/2013	**2.6**		**2.3**		**2.9**		**1.1**		**2.2**		**0.33**		**0.99**		**3.114**	**3.114**
SLR Additional Upland Assessment (2015)																		
GP-701	GP-701-GW	7/9/2015	**0.034**	J	<0.10		**0.017**	J	<0.10		**0.033**	J	<0.10		<0.10		**0.005**	**0.070**
GP-702	GP-702-GW	7/9/2015	**0.32**		**0.092**	J	**0.13**		**0.046**	J	**0.23**		<0.10		<0.10		**0.144**	**0.154**
GP-703	GP-703-P-W	7/21/2015	**1.1**		**0.38**		**0.51**		**0.21**		**0.95**		<0.05		**0.078**		**0.579**	**0.582**
GP-704	GP-704-P-W	7/21/2015	**3.1**		**1.6**		**2.0**		**0.79**		**2.3**		<0.10		**0.44**		**2.26**	**2.26**
GP-705	GP-705-GW	7/9/2015	**0.030**	J	**0.035**	J	**0.048**	J	<0.10	J	**0.026**	J	<0.10		<0.10		**0.043**	**0.058**
GP-706	GP-706-GW	7/8/2015	**0.057**	J	**0.045**	J	**0.064**	J	<0.15		**0.054**	J	<0.15		<0.15		**0.058**	**0.080**
GP-707	GP-707-GW	7/6/2015	**0.26**		<0.10		<0.10		<0.10		<2.0		<0.10		<0.10		**0.026**	**0.106**
GP-708	GP-708-GW	7/8/2015	**3.7**		**2.1**		**2.4**		**0.95**		**3.3**		**0.20**		**0.47**		**2.91**	**2.91**
GP-709	GP-709-GW	7/7/2015	**5.5**		**3.6**		**5.2**		**1.8**		**4.5**		**0.40**		**0.93**		**5.03**	**5.03**
GP-710	GP-710-GW	7/8/2015	**0.84**		**0.44**		**0.63**		**0.20**		**1.2**		**0.041**		**0.094**		**0.633**	**0.633**
GP-711	GP-711-GW	7/8/2015	**0.12**	J	**0.10**	J	**0.16**		**0.042**	J	**0.16**		**0.016**	J	**0.057**	J	**0.141**	**0.141**
GP-712	GP-712-GW	7/7/2015	**9.2**		**7.5**		**9.7**		**2.9**		**7.1**		**1.5**		**3.1**		**10**	**10**
SLR Quarterly Groundwater Monitoring Well Sampling (Highest Measured Value Shown) [B] (2015-2020)																		
MW-1	MW-1-GW	7/31/2019	**0.019**		**0.017**		**0.019**		**0.019**		**0.021**		**0.016**		**0.018**		**0.026**	**0.026**
MW-2	MW-2-GW	3/29/2016	**0.009**	J	<0.05		**0.003**	J	<0.05		<0.05		<0.05		<0.05		**0.001**	**0.034**
MW-3	MW-3-GW	7/31/2019	**0.002**	J	**0.003**	J	**0.003**	J	<0.01		**0.004**	J	<0.01		**0.002**	J	**0.005**	**0.005**
MW-4	MW-4-GW	12/10/2015	**0.005**	J	<0.05		**0.01**	J	<0.05		<0.05		<0.05		<0.05		**0.002**	**0.034**
MW-5	MW-5-GW	1/17/2019	**3.4**		**1.9**		**2.6**		**0.72**		**2.3**		**0.22**		**0.74**		**2.7**	**2.7**
MW-6	MW-6-GW	7/10/2018	**0.27**		**0.12**		**0.18**		**0.060**		**0.24**		**0.009**	J	**0.029**		**0.17**	**0.17**
MW-7	MW-7-GW	7/10/2018	**0.047**	J	**0.022**	J	**0.029**	J	<0.05		**0.052**		<0.05		<0.05		**0.03**	**0.04**
MW-8A	MW-8A-GW	1/31/2017	**2,020**		**1,110**		**1,580**		**533**		**1,300**		**21**		**426**		**1,581**	**1,581**
MW-8B	MW-8B-GW	12/11/2015	**1,830**		**998**		**1,320**		**463**		**1,460**		**128**		**300**		**1,417**	**1,417**

Table 4.1-13
Groundwater Analytical Results - cPAHs

Sample Location	Sample ID	Sample Date	Carcinogenic Polynuclear Aromatic Compounds (cPAHs) [A]															
			Benzo(a) anthracene		Benzo(a) pyrene		Benzo(b) fluoranthene		Benzo(k) fluoranthene		Chrysene		Dibenzo(a,h) anthracene		Indeno (1,2,3-cd) pyrene		TEQ U = 0	TEQ U = 1/2
			Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual		
MW-9A	MW-9A-GW	1/15/2018	**0.236**		**0.044**	J	**0.069**		**0.0258**	J	**0.147**		**0.005**	J	<0.05		**0.14**	**0.14**
MW-9B	MW-9B-GW	7/10/2018	**0.041**	J	<0.05		**0.019**	J	<0.05		**0.028**	J	<0.05		<0.05		**0.01**	**0.04**
MW-10A	MW-10A-GW	3/29/2016	**1,060**		**601**		**723**		**296**		**822**		**70**		**181**		**842**	**842**
MW-10B	MW-10B-GW	1/30/2017	**1.7**		**0.62**		**0.88**		**0.33**		**1.2**		<0.05		**0.21**		**0.95**	**0.95**
MW-11A	MW-11A-GW	7/30/2019	**0.004**	J	**0.004**	J	**0.005**	J	**0.004**	J	**0.005**	J	**0.004**	J	**0.004**	J	**0.006**	**0.006**
MW-13	MW-13-GW	8/1/2019	**0.007**	J	**0.006**	J	**0.006**	J	**0.006**	J	**0.009**	J	**0.005**	J	**0.005**	J	**0.009**	**0.009**
MW-15	MW-15-GW	7/31/2019	<0.01		<0.01		<0.01		<0.01		**0.001**	J	<0.01		<0.01		**0.00001**	**0.008**
SLR Source Control Evaluation (2018-2019)																		
NTD Weep Holes	NTD-SW-EAST-0418	4/5/2018	<0.00410		<0.0116		<0.00212		<0.0136		<0.0108		<0.00396		<0.0148		ND	0.008
	NTD-SW-WEST-0418	4/5/2018	<0.00410		<0.0116		<0.00212		<0.0136		<0.0108		<0.00396		<0.0148		ND	0.008
NTD Inlets	NTD-SW-3"-0418	4/4/2018	<0.00410		<0.0116		<0.00212		<0.0136		<0.0108		<0.00396		<0.0148		ND	0.008
	NTD-SW-8"-0418	4/4/2018	<0.00410		<0.0116		<0.00212		<0.0136		<0.0108		<0.00396		<0.0148		ND	0.008
SEEP-N-2	SEEP-N-2	5/15/2018	<0.00410		<0.0116		<0.00212		<0.0136		<0.0108		<0.00396		<0.0148		ND	0.008
SEEP-N-14	SEEP-N-14	5/15/2018	<0.00410		<0.0116		<0.00212		<0.0136		<0.0108		<0.00396		<0.0148		ND	0.008
SEEP-N-18	SEEP-N-18	5/15/2018	<0.00410		<0.0116		**0.0025**	J,B	<0.0136		<0.0108		<0.00396		<0.0148		**0.0003**	**0.008**
SEEP-S-1	SEEP-S-1	5/14/2018	<0.00410		<0.0116		<0.00212		<0.0136		<0.0108		<0.00396		<0.0148		ND	0.008
SEEP-S-9	SEEP-S-9	5/14/2018	<0.00410		<0.0116		**0.00429**	J,B	<0.0136		<0.0108		<0.00396		<0.0148		**0.0004**	**0.008**
SEEP-S-14	SEEP-S-14	5/15/2018	<0.00410		<0.0116		<0.00212		<0.0136		<0.0108		<0.00396		<0.0148		ND	0.008
SEEP-S-16	SEEP-S-16	5/14/2018	<0.00410		<0.0116		**0.00415**	J,B	<0.0136		<0.0108		<0.00396		<0.0148		**0.0004**	**0.008**
MW-11A	MW-11A-0519	5/3/2019	<0.01		<0.01		<0.01		<0.01		**0.001**	J	<0.01		<0.01		**0.015**	**0.008**
MW-11B	MW-11B -0519	5/3/2019	<0.01		<0.01		<0.01		<0.01		<0.01		<0.01		<0.01		ND	0.008
MW-12	MW-12-0519	5/3/2019	**0.002**	J	<0.01		<0.01		<0.01		**0.004**	J	<0.01		**0.002**	J	**0.0004**	**0.007**
MW-13	MW-13-0519	5/3/2019	**0.018**		**0.014**		**0.016**		**0.007**	J	**0.022**		**0.004**	J	**0.011**		**0.02**	**0.02**
MW-14	MW-14-0519	5/3/2019	**0.001**	J	<0.01		<0.01		<0.01		**0.002**	J	<0.01		<0.01		**0.0001**	**0.007**
MW-16	MW-16-0519	5/3/2019	<0.01		<0.01		<0.01		<0.01		**0.001**	J	<0.01		<0.01		**0.00001**	**0.008**
MW-17	MW-17-0519	5/3/2019	<0.01		<0.01		<0.01		<0.01		<0.01		<0.01		<0.01		ND	0.008
GP-801	GP-801-GW	4/26/2019	**0.104**	D	**0.122**	D	**0.099**	J,D	**0.061**	JD	**0.160**	D	**0.052**	J,D	**0.123**	D	**0.17**	**0.17**
GP-802	GP-802-GW	4/26/2019	<0.01		<0.01		<0.01		<0.01		**0.001**	J	<0.01		<0.01		**0.015**	**0.008**
Intial PCL (per Table 4.1.2.1-2)			-		-		-		-		-		-		-		0.015 (pql)	

Notes

- indicates Not Sampled or Not Analyzed for specific constituent

BOLD = Analytes detected at or above the laboratory practical quantitation limit (PQL)

<0.40 indicates not detected above the laboratory PQL of 0.40 µg/L (micrograms per Liter)

Only those analytes with greater than 5% frequency of detection are listed

Laboratory qualifiers defined on Table 4.1-21

A - Polynuclear Aromatic Compounds (PAHs) per EPA Method 8270M-SIM, 8270C, or 8310LL

B - Only highest detected value shown for quarterly groundwater sampling events. Full analytical results are included in Appendix G

TEQ U=0 indicates Toxic Equivalent Quotient (TEQ) using Toxicity equivalency factors (TEFs) per Table 708-2 in WAC 173-340-900 assuming Non-Detect values as 0

TEQ U=1/2 indicates TEQ using TEFs per Table 708-2 in WAC 173-340-900 assuming Non-Detect values as 1/2 detection limit

Table 4.1-14
Groundwater Analytical Results - other PAHs

Sample Location	Sample ID	Sample Date	Polynuclear Aromatic Compounds (PAHs) [A] (µg/L)																					
			1-Methyl naphthalene		2-Methyl naphthalene		Acenaphthylene		Acenaphthene		Anthracene		Benzo(ghi) perylene		Fluoranthene		Fluorene		Naphthalene		Phenanthrene		Pyrene	
			Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual
SLR Pre RI Assessment (2006-2007)																								
GP-4	GP4-GW	5/11/2006	-		<4.72		<4.72		<4.72		<4.72		<4.72		<4.72		<4.72		<4.72		<4.72		<4.72	
GP-6	GP6-GW	5/2/2006	-		-		<0.0952		<0.952		<0.952		<0.952		<0.952		<0.952		<0.952		<0.952		<0.952	
GP-7	GP7-GW	5/2/2006	-		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76	
GP-9	GP9-GW	5/1/2006	-		**1,250**		<47.2		**859**		**271**		<47.2		**469**		**504**		**13,900**		**1,090**		**423**	
GP-10	GP10-GW	5/1/2006	-		**1,100**		<94.3		**1,130**		**221**		<94.3		**1,050**		**779**		**12,200**		**2,090**		**883**	
GP-11	GP11-GW	5/4/2006	-		-		<7.14		**289**		**56.6**		<4.76		**66.0**		**154**		**7,920**		**231**		**48.9**	
GP-12	GP12-GW	5/2/2006	-		<4.72		<4.72		**63.3**		<4.72		<4.72		**16.2**		**35.5**		<4.72		**24.4**		**15.5**	
GP-13	GP13-GW	5/1/2006	-		<4.76		<4.76		**60.2**		<4.76		<4.76		<4.76		**10.0**		<4.76		<4.76		<4.76	
GP-14	GP14-GW	5/1/2006	-		**184**		<47.6		**401**		<47.6		<47.6		**89.2**		**166**		**948**		**306**		**59.2**	
GP-15	GP15-GW	5/1/2006	-		**55.2**		<4.72		**517**		**6.18**		<4.72		**12.2**		**200**		**7.88**		**84.4**		**7.04**	
GP-16	GP16-GW	5/1/2006	-		<4.72		<4.72		**252**		<4.72		<4.72		<4.72		**100**		<4.72		**33.3**		<4.72	
GP-17	GP17-GW	5/1/2006	-		**8.55**		<4.72		**52.4**		<4.72		<4.72		<4.72		**8.62**		<4.72		<4.72		<4.72	
GP-18	GP18-GW	5/1/2006	-		-		<0.0943		<0.0943		<0.0943		<0.0943		**0.185**		<0.0943		**0.0960**		**0.119**		**1.31**	
GP-19	GP19-GW	5/1/2006	-		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76	
GP-22	GP22-GW	5/4/2006	-		<4.72		<4.72		<4.72		<4.72		<4.72		<4.72		<4.72		<4.72		<4.72		<4.72	
GP-23	GP23-GW	5/1/2006	-		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76	
GP-24	GP24-GW	5/3/2006	-		<4.72		<4.72		<4.72		<4.72		<4.72		<4.72		<4.72		<4.72		<4.72		<4.72	
GP-27	GP27-GW	5/4/2006	-		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76	
GP-29	GP29-GW	5/4/2006	-		<4.72		<4.72		**11.7**		<4.72		<4.72		<4.72		<4.72		<4.72		<4.72		<4.72	
GP-31	GP31-GW	5/3/2006	-		-		<0.0952		<0.0952		<0.0952		<0.0952		<0.0952		<0.0952		<0.0952		<0.0952		<0.0952	
GP-34	GP34-GW	5/3/2006	-		<190		<190		<190		<190		<190		<190		<190		<190		<190		<190	
GP-35	GP35-GW	5/4/2006	-		-		<0.0943		<0.0943		<0.0943		<0.0943		<0.0943		<0.0943		**0.397**		<0.0943		<0.0943	
GP-36	GP36-GW	5/3/2006	-		<4.72		<4.72		**4.78**		<4.72		<4.72		<4.72		<4.72		<4.72		<4.72		<4.72	
GP-41	GP41-GW	5/2/2006	-		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76	
GP-42	GP42-GW	5/2/2006	-		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76	
GP-204	GP204-GW	9/11/2006	-		-		--		**0.11**		<0.0943		<0.0943		**0.218**		<0.0943		**0.122**		<0.0943		**0.211**	
GP-208	GP208-GW	9/12/2006	-		-		<11.8		**437**		**88.7**		**24.3**		**191**		**245**		**9,080**		**766**		**179**	
GP-211	GP211-GW	9/11/2006	-		-		<0.142		**27.9**		**0.268**		<0.0943		<0.0943		**8.14**		**0.35**		**5.19**		<0.0943	
GP-214	GP214-GW	9/12/2006	-		**514**		<47.2		**363**		<47.2		<47.2		**83.9**		**103**		**1,320**		**243**		**59.7**	
GP-215	GP215-GW	9/12/2006	-		**548**		<47.2		**295**		<47.2		<47.2		<47.2		<47.2		**619**		<47.2		<47.2	
MW1	MW1-1106	11/14/2006	-		<4.95		-		<4.95		<4.95		<4.95		<4.95		<4.95		<4.95		<4.95		<4.95	
MW2	MW2-1106	11/14/2006	-		<4.9		-		<4.9		<4.9		<4.9		<4.9		<4.9		<4.9		<4.9		<4.9	
MW3	MW3-1106	11/14/2006	-		<4.9		-		<4.9		<4.9		<4.9		<4.9		<4.9		<4.9		<4.9		<4.9	
MW4	MW4-1106	11/14/2006	-		<4.9		-		<4.9		<4.9		<4.9		<4.9		<4.9		<4.9		<4.9		<4.9	
MW5	MW5-1106	11/14/2006	-		<4.9		-		<4.9		<4.9		<4.9		<4.9		<4.9		<4.9		<4.9		<4.9	
MW1	MW1-407	4/19/2007	-		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76	
MW2	MW2-407	4/19/2007	-		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76	
MW3	MW3-407	4/19/2007	-		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76	
MW4	MW4-407	4/19/2007	-		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76	
MW5	MW5-407	4/19/2007	-		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76	
MW6	MW6-507	5/11/2007			<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76		<4.76	
SLR Initial RI Investigation (2009)																								
GP-303	GP-303-GW	6/1/2009	<0.25	Q	<0.25	Q	<0.050	Q	<0.05	Q	<0.05	Q	<0.05	Q, J3	<0.05	Q	<0.05	Q	<0.25	Q	<0.05	Q	<0.05	Q
GP-304	GP-304-GW	6/1/2009	**0.48**	Q	**0.18**	J, Q	**0.027**	Q	**2.2**	Q	**0.029**	J, Q	**0.031**	J, Q, J3	**0.051**	Q	**0.18**	Q	**0.09**	J, Q	**0.07**	Q	**0.06**	**Q**
GP-305	GP-305-GW	6/1/2009	<0.25		<0.25	Q	<0.050	Q	<0.050	Q	<0.050	Q	<0.050	Q, J3	<0.050	Q	<0.050	Q	<0.25	Q	<0.050	Q	<0.050	Q
GP-306	GP-306-GW	6/1/2009	<0.25	Q	<0.25	Q	<0.050	Q	<0.050	Q	<0.050	Q	<0.050	Q, J3	<0.050	Q	<0.050	Q	<0.25	Q	<0.050	Q	<0.050	Q
GP-307	GP-307-GW	5/20/2009	**1.0**	Q	**1.9**	J, Q	<0.050	Q	**2.6**	Q	**0.083**	Q	<0.050	J3, Q	**0.14**	Q	**1**	Q	**22**	E, Q	**0.98**	Q	**0.11**	Q
GP-308	GP-308-GW	5/20/2009	-		**5.4**	J	<1.0		**9.8**	J	<10		<10		<10		**4.4**	J	**29**		<10		<10	
GP-309	GP-309-GW	5/22/2009	**0.016**	J, Q	**0.034**	J, Q	<0.050	Q	<0.050	Q	<0.050	Q	<0.050	Q, J3	<0.050	Q	**0.023**	J, Q	**0.054**	J, Q	**0.022**	J, Q	<0.050	Q

Table 4.1-14
Groundwater Analytical Results - other PAHs

Sample Location	Sample ID	Sample Date	Polynuclear Aromatic Compounds (PAHs) [A] (µg/L)																					
			1-Methyl naphthalene		2-Methyl naphthalene		Acenaphthylene		Acenaphthene		Anthracene		Benzo(ghi) perylene		Fluoranthene		Fluorene		Naphthalene		Phenanthrene		Pyrene	
			Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual
GP-310	GP-310-GW	5/22/2009	<0.25	Q	<0.25	Q	<0.050	Q	<0.050	Q	<0.050	Q	<0.050	Q. J3	<0.050	Q	<0.050	Q	<0.25	Q	<0.050	Q	**0.03**	J, Q
GP-311	GP-311-GW	5/22/2009	<0.25	Q	<0.25	Q	<0.050	Q	<0.050	Q	<0.050	Q	<0.050	Q. J3	<0.050	Q	<0.050	Q	<0.25	Q	<0.050	Q	<0.050	Q
GP-312	GP-312-GW	5/22/2009	<0.25	Q	<0.25	Q	<0.050	Q	**0.023**	J, Q	<0.050	Q	<0.050	J3, Q	**0.055**	Q	<0.050	Q	<0.25	Q	**0.022**	J, Q	**0.063**	Q
GP-334	GP-334-GW	5/22/2009	<0.25	Q	<0.25	Q	<0.050	Q	<0.050	Q	<0.050	Q	<0.050	Q, J3	<0.050	Q	<0.050	Q	<0.25	Q	<0.050	Q	<0.050	Q
GP-335	GP-335-GW	5/22/2009	<0.25	Q	<0.25	Q	<0.050	Q	<0.050	Q	<0.050	Q	<0.050	Q. J3	<0.050	Q	<0.050	Q	<0.25	Q	<0.050	Q	<0.050	Q
HA-323	HA-323-GW	9/23/2009	**0.088**	J	**0.14**	J	**0.099**		**0.88**		**0.18**		**0.75**		**1.1**		**0.094**		**0.23**	**J**	**0.47**		**1**	
HA-324	HA-324-GW	10/12/2009	<0.25		**0.028**	J	<0.050		**0.078**		**0.013**	J	<0.050		<0.050		<0.050		**0.095**	**J**	<0.050		<0.050	
HA-325	HA-325-GW	9/24/2009	**0.024**	J	**0.026**	J	<0.050		**0.63**		**0.028**	J	**0.068**		**0.12**		**0.031**	J	**0.063**	**J**	**0.071**		**0.13**	
HA-328	HA-328-GW	10/12/2009	<0.25		<0.25		<0.050		**0.018**	J	**0.013**	J	<0.050		<0.050		<0.050		**0.035**	**J**	**0.019**	**J**	<0.050	
HA-329	HA-329-GW	10/13/2009	**370**		**460**		<1.0		**340**		**16**		**2.4**		**42**		**170**		**4,200**		**190**		**33**	
SLR Additional Upland Assessment - Knoll Area (2013)																								
GP-601	GP-601-W	11/18/2013	**4.6**		**7.1**		**0.074**		**18**		**2.1**		**0.33**		**4.2**		**6.6**		**44**		**9.3**		**2.6**	
SLR Additional Upland Assessment - National Pole Area (2013)																								
GP-605	GP-605-W	12/18/2013	**160**		**200**		**1.8**		**190**		**140**		**17**		**90**		**110**		**2,800**		**210**		**74**	
GP-606	GP-606-W	12/18/2013	**29**		**21**		**0.099**	J	**34**		**1.7**		**0.051**	J	**2.9**		**9.7**		**24**		**12**		**2.2**	
GP-607	GP-607-W	12/18/2013	**1.7**		**0.48**		**0.045**	J	**12**		**1.8**		**1.1**		**12**		**13**		**1.2**		**17**		**8.9**	
SLR Quarterly Groundwater Monitoring Well Sampling (Highest Measured Value Shown) [B] (2015-2020)																								
MW-4	MW4-062316	6/23/2016	<0.25		<0.25		<0.05		**0.0302**	J	<0.05		**0.00236**	B,J	<0.05		<0.05		<0.25		<0.05		<0.05	
MW-5	MW5-062316	6/23/2016	**99.5**		**100**		**2.26**		**120**		**7.54**		**0.292**		**19.5**		**65.5**		**300**		**70.1**		**17.5**	
MW-6	MW6-062316	6/23/2016	<0.25		<0.25		<0.05		**0.113**		<0.05		**0.00257**	B,J	**0.0179**	J	**0.0201**	J	**0.0199**	J	<0.05		**0.0153**	J
MW-7	MW7-062416	6/24/2016	**0.293**		**4.04**		**0.193**		**21.5**		**0.146**		**0.00286**	B,J	**0.228**		**2.73**		**3.82**		**0.171**		**0.142**	
MW-8A	MW8A-062416	6/24/2016	**900**		**526**		**12.1**		**471**		**30.9**		**3.17**	J	**79**		**216**		**11,000**		**283**		**69**	
MW-8B	MW8B-062416	6/24/2016	**587**		**387**		**6.95**		**190**		**7.39**		**0.898**	J	**17**		**78.7**		**8,650**		**109**		**14.5**	
MW-9A	MW9A-062416	6/24/2016	<0.25		**0.23**	J	**0.0513**		**8.85**		**0.162**		**0.00322**	B,J	**0.875**		**0.951**		**0.0791**	J	**0.789**		**0.658**	
MW-9B	MW9B-062416	6/24/2016	<0.25		**0.0159**	J	<0.05		**0.0425**	J	**0.0257**	J	<0.05		**0.0435**	J	**0.0323**	J	**0.0712**	J	**0.086**		**0.0462**	J
MW-10A	MW10A-062416	6/24/2016	**734**		**446**		**11.9**		**458**		**38.4**		**6.92**		**147**		**256**		**5,730**		**462**		**146**	
MW-10B	MW10B-062416	6/24/2016	**9.42**		**11**		**0.315**		**25**		**5.67**		**0.00911**	B,J	**12.6**		**18.6**		**16.7**		**39**		**11.6**	
SLR Source Control Evaluation (2018-2019)																								
MW-11A	MW-11A-0519	5/3/2019	-		-		<1.00		**32**		<1.00		<1.00		<1.00		**19.1**		<1.00		**14.1**		-	
MW-11B	MW-11B -0519	5/3/2019	-		-		<1.00		<1.00		<1.00		<1.00		<1.00		<1.00		<1.00		<1.00		-	
MW-13	MW-13-0519	5/3/2019	-		-		<1.00		<1.00		<1.00		<1.00		<1.00		<1.00		<1.00		<1.00		-	
MW-14	MW-14-0519	5/3/2019	-		-		<1.00		<1.00		**0.36**	J	<1.00		<1.00		<1.00		<1.00		<1.00		-	
MW-16	MW-16-0519	5/3/2019	-		-		<1.00		<1.00		<1.00		<1.00		<1.00		<1.00		<1.00		<1.00		-	
MW-17	MW-17-0519	5/3/2019	-		-		<1.00		**15.9**		<1.00		<1.00		<1.00		<1.00		<1.00		<1.00		-	
GP-801	GP-801-GW	4/26/2019	-		-		<1.00		<1.00		<1.00		<1.00		<1.00		<1.00		0.801	J J3	<1.00		-	
GP-802	GP-802-GW	4/26/2019	-		-		<1.00		<1.00		<1.00		<1.00		<1.00		<1.00		<1.00		<1.00		-	
Intial PCL (per Table 4.1.2.1-2)			1.5	gw-b	32	gw-b	8	hh	30	hh	100	hh	8	hh	6	hh	10	hh	8.9	vi	8	hh	8	hh

Notes

- indicates Not Sampled or Not Analyzed for specific constituent

BOLD = Analytes detected at or above the laboratory practical quantitation limit (PQL)

<0.40 indicates not detected above the laboratory PQL of 0.40 µg/L (micrograms per Liter)

Only those analytes with greater than 5% frequency of detection are listed

Laboratory qualifiers defined on Table 4.1-21

A - Polynuclear Aromatic Compounds (PAHs) per EPA Method 8270M-SIM or 8270C

B - Only highest detected value shown for quarterly groundwater sampling events. Full analytical results are included in Appendix G

Table 4.1-15
Groundwater Analytical Results - SVOCs

Sample Location	Sample ID	Sample Date	Semivolatile Organic Compounds (SVOCs) (µg/L) [A]											
			1,1-Biphenyl		Carbazole		Dibenzofuran		2,4-Dimethyl phenol		3,4-Methylphenol (m,p-cresol)		Phenol	
			Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual
SLR Pre RI Assessment (2006-2007)														
GP-4	GP4-GW	5/11/2006	-		<4.72		<4.72		<4.72		<4.72		<4.72	
GP-7	GP7-GW	5/2/2006	-		<4.76		<4.76		<9.52		<4.76		<4.76	
GP-9	GP9-GW	5/1/2006	-		**681**		**425**		**3,890**		**492**		**251**	
GP-10	GP10-GW	5/1/2006	-		**499**		**599**		**10,300**		**228**		<94.3	
GP-12	GP12-GW	5/2/2006	-		**5.35**		**22.4**		<9.43		<4.72		<4.72	
GP-13	GP13-GW	5/1/2006	-		**9.57**		<4.76		<9.52		<4.76		<4.76	
GP-14	GP14-GW	5/1/2006	-		**54.1**		**127**		<95.2		<47.6		<47.6	
GP-15	GP15-GW	5/1/2006	-		**163**		**206**		<9.43		<4.72		<4.72	
GP-16	GP16-GW	5/1/2006	-		<4.72		**12.3**		<4.72		<4.72		<4.72	
GP-17	GP17-GW	5/1/2006	-		<4.72		<4.72		<9.43		<4.72		<4.72	
GP-19	GP19-GW	5/1/2006	-		<4.76		<4.76		<9.52		<4.76		<4.76	
GP-22	GP22-GW	5/4/2006	-		<4.72		<4.72		<9.43		<4.72		<4.72	
GP-23	GP23-GW	5/1/2006	-		<4.76		<4.76		<9.52		<4.76		<4.76	
GP-24	GP24-GW	5/3/2006	-		<4.72		<4.72		<9.43		<4.72		<4.72	
GP-27	GP27-GW	5/4/2006	-		<4.76		<4.76		<9.52		<4.76		<4.76	
GP-29	GP29-GW	5/4/2006	-		<4.72		<4.72		<9.43		<4.72		<4.72	
GP-34	GP34-GW	5/3/2006	-		<190		<190		<381		<190		<190	
GP-36	GP36-GW	5/3/2006	-		<4.72		<4.72		<9.43		<4.72		<4.72	
GP-41	GP41-GW	5/2/2006	-		<4.76		<4.76		<9.52		<4.76		<4.76	
GP-42	GP42-GW	5/2/2006	-		<4.76		<4.76		<9.52		<4.76		<4.76	
GP-214	GP214-GW	9/12/2006	-		**239**		**115**		<94.3		<47.2		<47.2	
GP-215	GP215-GW	9/12/2006	-		**394**		**65.4**		<94.3		<47.2		<47.2	
MW1	MW1-1106	11/14/2006	-		<4.95		<4.95		<9.90		<4.95		<4.95	
MW2	MW2-1106	11/14/2016	-		<4.90		<4.90		<9.80		<4.90		<4.90	
MW3	MW3-1106	11/14/2016	-		<4.90		<4.90		<9.80		<4.90		<4.90	
MW4	MW4-1106	11/14/2006	-		<4.90		<4.90		<9.80		<4.90		<4.90	
MW5	MW-1106	11/14/2006	-		<4.90		<4.90		<9.80		<4.90		<4.90	
MW1	MW1-407	4/19/2007	-		<4.76		<4.76		<9.52		<4.76		<4.76	
MW2	MW2-407	4/19/2007	-		<4.76		<4.76		<9.52		<4.76		<4.76	
MW3	MW3-407	4/19/2007	-		<4.76		<4.76		<9.52		<4.76		<4.76	
MW4	MW4-407	4/19/2007	-		<4.76		<4.76		<9.52		<4.76		<4.76	
MW5	MW5-407	4/19/2007	-		<4.76		<4.76		<9.52		<4.76		<4.76	
MW6	MW6-507	5/11/2007	-		<4.90		<4.76		<9.52		<4.76		<4.76	
SLR Initial RI Investigation (2009)														
GP-303	GP-303-GW	6/1/2009	<10		<10		<10		<10	J4	<10		<10	
GP-304	GP-304-GW	6/1/2009	<10		<10		<10		<10	J4	<10		<10	
GP-305	GP-305-GW	6/1/2009	<10		<10		<10		<10	J4	**2.6**		**1.2**	J
GP-306	GP-306-GW	6/1/2009	<10		<10		<10		<10	J4	<10		<10	

Table 4.1-15
Groundwater Analytical Results - SVOCs

Sample Location	Sample ID	Sample Date	Semivolatile Organic Compounds (SVOCs) (µg/L) [A]											
			1,1-Biphenyl		Carbazole		Dibenzofuran		2,4-Dimethyl phenol		3,4-Methylphenol (m,p-cresol)		Phenol	
			Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual
GP-307	GP-307-GW	5/20/2009	<10		<10		<10		<10		<10		<10	
GP-308	GP-308-GW	5/20/2009	<10		<10		**3.3**	J	<10	J4, Q	<10	Q	<10	
GP-309	GP-309-GW	5/22/2009	<10		<10		<10		<10		<10	J3	<10	
GP-310	GP-310-GW	5/22/2009	<10		<10		<10		<10		<10		<10	
GP-311	GP-311-GW	5/22/2009	<10		<10		<10		<10		<10	J3	<10	
GP-312	GP-312-GW	5/22/2009	<10		<10		<10		<10		<10		<10	
GP-334	GP-334-GW	5/22/2009	<10		<10		<10		<10		<10	J3	<10	
GP-335	GP-335-GW	5/22/2009	<10		<10		<10		<10		<10	J3	<10	
HA-322	HA-322-GW	9/23/2009	<10		<10		<10		<10		<10		<10	
HA-323	HA-323-GW	9/23/2009	<10		<10		<10		<10		<10		<10	
HA-324	HA-324-GW	10/12/2009	<10		<10		<10		<10		<10		<10	
HA-325	HA-325-GW	9/24/2009	<10		<10		<10		<10		<10		<10	
HA-328	HA-328-GW	10/12/2009	<10		<10		<10		<10		<10		<10	
HA-329	HA-329-GW	10/13/2009	**77**	J	**250**		**180**	J	**44**	J	**7.4**	J	**1.2**	J
SLR Additional Upland Assessment - Knoll Area (2013)														
GP-601	GP-601-W	11/18/2013	-		-		<1.0		<1.0		<1.0		<1.0	
SLR Source Control Evaluation (2018-2019)														
MW-11A	MW-11A-0519	5/3/2019	-		-		-		-		-		**1.3**	J
MW-11B	MW-11B -0519	5/3/2019	-		-		-		-		-		**2.9**	J
MW-13	MW-13-0519	5/3/2019	-		-		-		-		-		**1.4**	J
MW-14	MW-14-0519	5/3/2019	-		-		-		-		-		**9.5**	J
MW-16	MW-16-0519	5/3/2019	-		-		-		-		-		**1.3**	J
MW-17	MW-17-0519	5/3/2019	-		-		-		-		-		**3.1**	J
GP-801	GP-801-GW	4/26/2019	-		-		-		-		-		**19**	
GP-802	GP-802-GW	4/26/2019	-		-		-		-		-		**12**	
Intial PCL (per Table 4.1.2.1-2)			5.5	gw-b	-		16	gw-b	97	hh	400	gw-b	70,000	hh

Notes

- indicates Not Sampled or Not Analyzed for specific constituent

BOLD = Analytes detected at or above the laboratory practical quantitation limit (PQL)

<0.40 indicates not detected above the laboratory PQL of 0.40 µg/L (micrograms per Liter)

Only those analytes with greater than 5% frequency of detection are listed

Laboratory qualifiers defined on Table 4.1-21

A - Semivolaile Organic Compounds (SVOCs) per EPA 8270C Method

Table 4.1-16
Groundwater Analytical Results - VOCs

Sample Location	Sample ID	Sample Date	Volatile Organic Compounds (VOCs) [A] (µg/L)													
			Benzene		Ethylbenzene		Isopropyl benzene (Cumene)		Naphthalene		Toluene		1,2,4-Trimethyl benzene		Xylenes	
			Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual
SLR Pre RI Assessment (2006-2007)																
GP-2	GP2-GW	5/4/2006	<1.00		<1.00		<2.00		<2.00		<1.00		<1.00		<3.00	
GP-3	GP3-GW	5/4/2006	<500		<500		<1,000		<1,000		**60,300**		<500		<1,500	
GP-5	GP5-GW	5/4/2006	**3.13**		**4.21**		<2.00		**11.6**		<1.00		**1.95**		**5.47**	
GP-9	GP9-GW	5/1/2006	<100		<100		<200		**17,400**		**125**		<100		<300	
GP-10	GP10-GW	5/1/2006	**103**		<100		<200		**13,800**		**125**		<100		<300	
GP-12	GP12-GW	5/2/2006	<1.00		<1.00		<2.00		<2.00		<1.00		<1.00		<3.00	
GP-13	GP13-GW	5/1/2006	<1.00		<1.00		<2.00		<2.00		<1.00		<1.00		<3.00	
GP-14	GP14-GW	5/1/2006	<5.00		<5.00		<10.00		**800**		<5.00		<5.00		<15.00	
GP-19	GP19-GW	5/1/2006	<1.00		<1.00		<2.00		<2.00		<1.00		<1.00		<3.00	
GP-21	GP21-GW	5/4/2006	<1.00		<1.00		<2.00		<2.00		<1.00		<1.00		<3.00	
GP-22	GP22-GW	5/4/2006	<1.00		<1.00		<2.00		<2.00		<1.00		<1.00		<3.00	
GP-23	GP23-GW	5/1/2006	<1.00		<1.00		<2.00		<2.00		<1.00		<1.00		<3.00	
GP-24	GP24-GW	5/3/2006	<1.00		<1.00		<2.00		<2.00		<1.00		<1.00		<3.00	
GP-27	GP27-GW	5/3/2006	<1.00		<1.00		<2.00		<2.00		<1.00		<1.00		<3.00	
GP-29	GP29-GW	5/4/2006	<1.00		<1.00		<2.00		<2.00		<1.00		<1.00		<3.00	
GP-31	GP31-GW	5/3/2006	<1.00		<1.00		<2.00		<2.00		<1.00		<1.00		<3.00	
GP-34	GP34-GW	5/3/2006	<1.00		<1.00		<2.00		<2.00		<1.00		<1.00		<3.00	
GP-35	GP35-GW	5/4/2006	<1.00		<1.00		<2.00		<2.00		<1.00		<1.00		<3.00	
GP-36	GP36-GW	5/3/2006	<1.00		<1.00		<2.00		<2.00		<1.00		<1.00		<3.00	
GP-41	GP41-GW	5/2/2006	<1.00		<1.00		<2.00		<2.00		<1.00		<1.00		<3.00	
GP-42	GP42-GW	5/2/2006	<1.00		<1.00		<2.00		<2.00		<1.00		<1.00		<3.00	
GP-201	GP201-GW	9/11/2006	<1.00		<1.00		<2.00		<2.00		<1.00		<1.00		<3.00	
GP-202	GP202-P	9/11/2006	**145**		**114**		<200		**11,500**		**185**		<100		<300	
GP-204	GP204-GW	9/11/2006	<1.00		<1.00		<2.00		<2.00		<1.00		<1.00		<3.00	
GP-205	GP205-GW	9/12/2006	<1.00		<1.00		<2.00		<2.00		**1.05**		<1.00		<3.00	
GP-207	GP207-GW	9/12/2006	**204**		**222**		<100		**12,800**		**540**		**64.0**		**343**	
GP-208	GP208-GW	9/12/2006	<100		<100		<200		**11,400**		**121**		<100		<300	
GP-209	GP209-GW	9/12/2006	<1.00		<1.00		<2.00		<2.00		<1.00		<1.00		<3.00	
GP-210	GP210-GW	9/12/2006	<1.00		<1.00		<2.00		<2.00		<1.00		<1.00		<3.00	
GP-211	GP211-GW	9/12/2006	<1.00		<1.00		<2.00		<2.00		<1.00		<1.00		<3.00	
GP-212	GP212-GW	9/11/2006	<1.00		<1.00		<2.00		<2.00		<1.00		<1.00		<3.00	
GP-214	GP214-GW	9/12/2006	<50.0		<50.0		<100		**7,140**		<50.0		<50.0		<150	
GP-215	GP215-GW	9/12/2006	**66.3**		**77.8**		**6.72**		**474**		**1.18**		**33**		**36**	
MW-1	MW1-1106	11/14/2006	<1.00		<1.00		<2.00		<2.00		<1.00		<1.00		<3.00	
MW-2	MW2-1106	11/14/2006	<1.00		<1.00		<2.00		<2.00		<1.00		<1.00		<3.00	
MW-3	MW3-1106	11/14/2006	<1.00		<1.00		<2.00		<2.00		<1.00		<1.00		<3.00	
MW-4	MW4-1106	11/14/2006	<1.00		<1.00		<2.00		<2.00		<1.00		<1.00		<3.00	
MW-5	MW5-1106	11/14/2006	**9.46**		<1.00		<2.00		**11.1**		**4.12**		<1.00		**1.05**	
MW-5	MW5-407	4/19/2007	**1.38**		<1.00		**0.14**	J	**7.92**		<1.00		<1.00		**0.73**	J
MW-6	MW6-507	5/11/2007	<1.00		<1.00		<2.00		<2.00		<1.00		<1.00		<3.00	

Table 4.1-16
Groundwater Analytical Results - VOCs

Sample Location	Sample ID	Sample Date	Volatile Organic Compounds (VOCs) [A] (µg/L)													
			Benzene		Ethylbenzene		Isopropyl benzene (Cumene)		Naphthalene		Toluene		1,2,4-Trimethyl benzene		Xylenes	
			Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual
SLR Initial RI Investigation (2009)																
GP-303	GP-303-GW	6/1/2009	<0.50		<0.50		<0.50		<5.0		<0.50		-		<1.5	
GP-304	GP-304-GW	6/1/2009	<0.50		<0.50		<0.50		<5.0		<0.50		-		<1.5	
GP-305	GP-305-GW	6/2/2009	<0.50		<0.50		<0.50		<5.0		<0.50		-		<1.5	
GP-306	GP-306-GW	6/3/2009	<0.50		<0.50		<0.50		<5.0		<0.50		-		<1.5	
GP-307	GP-307-GW	5/20/2009	<0.50		<0.50		**1.1**		**42**		<0.50		**3.8**		**49**	
GP-308	GP-308-GW	5/20/2009	<0.50		<0.50		<0.50		**25**		<0.50		**0.93**		**33**	
GP-309	GP-309A-GW	5/22/2009	<1.0		<1.0		<1.0		-		<5.0		-		<3.0	
GP-310	GP-310-GW	5/22/2009	<1.0		<1.0		<1.0		-		**0.34**	J	-		<3.0	
GP-311	GP-311-GW	5/22/2009	<1.0		<1.0		<1.0		-		<5.0		-		<3.0	
GP-312	GP-312-GW	5/23/2009	<1.0		<1.0		<1.0		-		<5.0		-		<3.0	
GP-334	GP-334-GW	5/22/2009	<1.0		<1.0		<1.0		-		<5.0		-		<3.0	
GP-335	GP-335-GW	5/22/2009	<1.0		<1.0		<1.0		-		<5.0		-		<3.0	
HA-328	HA-328-GW	10/12/2009	<0.50	J3	<0.50	J3	<0.50	J3,J5	-		<0.50	J3	-		<1.5	J3
HA-329	HA-329-GW	10/13/2009	**2.2**		**26**		**3.1**		-		**11**		-		**48**	
SLR Phase 2 Upland Soil and Groundwater (2012)																
401-P	401P-GW	5/17/2012	<0.50		<0.50		<0.50		-		<0.50		-		<1.5	
403-P	403P-GW	5/17/2012	<0.50		<0.50		<0.50		-		<0.50		-		<1.5	
SLR Additional Upland Assessment - Knoll Area (2013)																
GP-601	GP-601-W	11/18/2013	<1.0		<1.0		<1.0		**28**		<5		<1.0		<1.0	
GP-602	GP-602-W	11/18/2013	<1.0		<1.0		<1.0		<5		<5		<1.0		<1.0	
GP-603	GP-603-W	11/18/2013	<1.0		<1.0		<1.0		<5		<5		<1.0		<1.0	
GP-604	GP-604-W	11/18/2013	<1.0		<1.0		<1.0		<5		<5		<1.0		<1.0	
SLR Additional Upland Assessment (2015)																
GP-701	GP-701-GW	7/9/2015	<0.50		<0.50		-		**0.35**	J	**0.40**	J	<0.50		<1.5	
GP-702	GP-702-GW	7/9/2015	<0.50		<0.50		-		**63**		**0.39**	J	<0.50		<1.5	
GP-703	GP-703-P-W	7/21/2015	<0.50		<0.50		-		**140**	B	<0.50		**0.36**	J	**0.34**	J
GP-704	GP-704-P-W	7/21/2015	**9.9**		68		-		**6,900**	B	**56**		**37**		**110**	
GP-705	GP-705-GW	7/9/2015	<0.50		<0.50		-		**4.2**		**0.31**	J	<0.50		<1.5	
GP-706	GP-706-GW	7/8/2015	**0.49**	J	<0.50		-		**1.9**		**0.38**	J	**0.53**		**0.88**	J
GP-707	GP-707-GW	7/6/2015	<0.50		<0.50		-		<0.50		<0.50		<0.50		<1.5	
GP-708	GP-708-GW	7/8/2015	**0.88**		**7.3**		-		**7,000**		**3.8**		**16**		**17**	
GP-709	GP-709-GW	7/7/2015	**14**		**35**		-		**8,400**	J4	**100**		**18**		**81**	
GP-710	GP-710-GW	7/8/2015	**67**		**51**		-		**6,600**		**64**		**17**		**99**	
GP-711	GP-711-GW	7/8/2015	**46**		**65**		-		**7,700**		**14**		**19**		**77**	
GP-712	GP-712-GW	7/7/2015	**6.2**		**16**		-		**2,100**	J4	**4.4**		**16**		**26**	
SLR Quarterly Groundwater Monitoring Well Sampling (Highest Measured Value Shown) [B] (2015-2020)																
MW-1	MW-1-GW	Various	ND		ND		-		ND		ND		ND		ND	
MW-2	MW-2-GW	Various	ND		ND		-		**1.1**	J	ND		ND		ND	
MW-3	MW-3-GW	Various	ND		ND		-		ND		ND		ND		ND	
MW-4	MW-4-GW	Various	ND		ND		-		ND		ND		ND		ND	

Table 4.1-16
Groundwater Analytical Results - VOCs

Sample Location	Sample ID	Sample Date	Volatile Organic Compounds (VOCs) [A] (µg/L)													
			Benzene		Ethylbenzene		Isopropyl benzene (Cumene)		Naphthalene		Toluene		1,2,4-Trimethyl benzene		Xylenes	
			Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual
MW-5	MW-5-GW	Various	**0.61**		ND		-		**1,110**	J0	ND		**0.71**		ND	
MW-6	MW-6-GW	Various	ND		ND		-		**0.0199**	J	ND		ND		ND	
MW-7	MW-7-GW	Various	ND		ND		-		**3.82**		ND		ND		ND	
MW-8A	MW-8A-GW	Various	**160**		**40**		-		**14,400**		**73**		**38**		**110**	
MW-8B	MW-8B-GW	Various	**125**		**62**		-		**15,900**		**169**		**37**		**133**	
MW-9A	MW-9A-GW	Various	ND		ND		-		**4.5**		ND		**0.36**	J	ND	
MW-9B	MW-9B-GW	Various	ND		ND		-		**0.81**		ND		ND		ND	
MW-10A	MW-10A-GW	Various	**69**		**88**		-		**9,990**		**126**		**38**		**140**	
MW-10B	MW-10B-GW	Various	ND		**1.6**		-		**1,880**		**1.3**		**2.8**		**3.3**	
SLR Source Control Evaluation (2018-2019)																
NTD Weep Holes	NTD-SW-EAST-0418	4/5/2018	<0.5		-		-		**5.94**		-		-		-	
	NTD-SW-WEST-0418	4/5/2018	<0.5		-		-		**0.558**	J	-		-		-	
NTD Inlets	NTD-SW-3"-0418	4/4/2018	<0.5		-		-		**3.45**		-		-		-	
	NTD-SW-8"-0418	4/4/2018	<0.5		-		-		**0.25**		-		-		-	
SEEP-N-2	SEEP-N-2	5/15/2018	<0.0896		-		-		<0.174	J0	-		-		-	
SEEP-N-14	SEEP-N-14	5/15/2018	<0.0896		-		-		<0.174	J0	-		-		-	
SEEP-N-18	SEEP-N-18	5/15/2018	<0.0896		-		-		<0.174	J0	-		-		-	
SEEP-S-1	SEEP-S-1	5/14/2018	<0.0896		-		-		<0.174	J0	-		-		-	
SEEP-S-9	SEEP-S-9	5/14/2018	<0.0896		-		-		<0.174	J0	-		-		-	
SEEP-S-14	SEEP-S-14	5/15/2018	<0.0896		-		-		<0.174	J0	-		-		-	
SEEP-S-16	SEEP-S-16	5/14/2018	<0.0896		-		-		<0.174	J0	-		-		-	
MW-11A	MW-11A-0519	5/3/2019	<0.50		<0.50		<0.50		**0.188**	J B	<0.50		**0.151**	J	<1.5	
MW-11B	MW-11B -0519	5/3/2019	<0.50		<0.50		<0.50		<2.5		<0.50		<0.50		<1.5	
MW-12	MW-12-0519	5/3/2019	**0.207**	J	<0.50		<0.50		<2.5		<0.50		<0.50		<1.5	
MW-17	MW-17-0519	5/3/2019	<0.50		<0.50		<0.50		<2.5		<0.50		<0.50		<1.5	
GP-801	GP-801-GW	4/26/2019	<0.50		<0.50		<0.50		**1.52**	J	<0.50		<0.50		<1.5	
GP-802	GP-802-GW	4/26/2019	<0.50		<0.50		<0.50		<2.5		<0.50		<0.50		<1.5	
Intial PCL (per Table 4.1.2.1-2)			1.6	hh	31	hh	720	vi	8.9	vi	130	hh	240	vi	330	vi

Notes

- indicates Not Sampled or Not Analyzed for specific constituent

BOLD = Analytes detected at or above the laboratory practical quantitation limit (PQL)

<0.40 indicates not detected above the laboratory PQL of 0.40 µg/L (micrograms per Liter)

Laboratory qualifiers defined on Table 4.1-21

A - Volaile Organic Compounds (VOCs) per EPA 8260B Method

B - Only highest detected value shown for quarterly groundwater sampling events. Full analytical results are included in Appendix G

Table 4.1-17
Groundwater Analytical Results - PCB Congeners

Sample Location	Sample ID	Sample Date	Polychlorinated Biphenyls [A] (pg/L)			
			Total PCBs		TEQ:U=1/2	
			Value	Qual	Value	Qual
SLR Source Control Evaluation (2018-2019)						
NTD Weep Holes	NTD-SW-EAST-0418	4/5/2018	**653**		**0.102**	
	NTD-SW-WEST-0418	4/5/2018	**562**		**0.0866**	
NTD Inlets	NTD-SW-3"-0418	4/4/2018	**80**		**0.121**	
	NTD-SW-8"-0418	4/4/2018	**344**		**0.122**	
SEEP-S-1	SEEP-S-1	5/14/2018	**460**		**0.573**	
SEEP-S-9	SEEP-S-9	5/14/2018	**72**		**0.592**	
SEEP-S-14	SEEP-S-14	5/15/2018	**72**		**0.542**	
SEEP-S-16	SEEP-S-16	5/14/2018	**16,200**		**1.11**	
	DUPLICATE-0518	5/14/2018	**16,200**		**0.142**	
GP-801	GP-801-GW	4/26/2019	**17,600**		**0.39**	
GP-802	GP-802-GW	4/26/2019	**174**		**0.11**	
MW-1	MW-1-0719	7/31/2019	**150**		**0.099**	
MW-2	MW-2-0719	7/31/2019	**116**		**0.095**	
MW-3	MW-3-0719	7/31/2019	**784**		**0.12**	
	MW-3-0220	2/18/2020	**230**		**0.22**	
MW-4	MW-4-0719	7/31/2019	**186**		**0.13**	
MW-5	MW-5-0719	7/30/2019	**126**		**0.14**	
MW-6	MW-6-0719	7/31/2019	**115**		**0.14**	
MW-7	MW-7-0719	7/30/2019	**388**		**0.17**	
MW-8A	MW-8A-0719	7/30/2019	**826**		**2.5**	
MW-9A	MW-9A-0719	7/31/2019	**195**		**0.16**	
MW-10A	MW-10A-0719	7/31/2019	**3,520**		**1.1**	
	MW-10A-0220	2/18/2020	**5,550**		**0.21**	
MW-11A	MW-11A-0719	7/30/2019	**176**		**0.10**	
MW-12	MW-12-0519	5/3/2019	**8,790**		**0.15**	
	MW-12-0719	7/30/2019	**5,270**		**0.18**	
	MW-12-0220	2/18/2020	**3,350**		**0.16**	
MW-13	MW-13-0519	5/3/2019	**29,800**		**0.13**	
	MW-13-0719	8/1/2019	**5,980**		**0.15**	
	MW-13-0220	2/19/2020	**20,100**		**0.21**	
MW-14	MW-14-0519	5/3/2019	**16,100**		**0.15**	
	MW-14-0719	8/1/2019	**10,200**		**0.16**	
	MW-14-0220	2/19/2020	**10,100**		**0.24**	
MW-15	MW-15-0519	5/3/2019	**125**		**0.15**	
	MW-15-0719	7/31/2019	**222**		**0.17**	
MW-16	MW-16-0519	5/3/2019	**286**		**0.092**	
	MW-16-0719	7/31/2019	**238**		**0.096**	
MW-17	MW-17-0519	5/3/2019	**164**		**0.043**	
	MW-17-0719	7/30/2019	**181**		**0.067**	
MW-18	MW-18-1019	10/25/2019	**3,190**		**0.11**	
	MW-18-0220	2/18/2020	**2,050**		**0.16**	
MW-19	MW-19-1019	10/25/2019	**21,700**		**0.11**	
	MW-19-0220	2/18/2020	**22,400**		**0.21**	
MW-20	MW-20-1019	10/25/2019	**20**		**0.052**	
Intial PCL (per Table 4.1.2.1-2)			1,210	pql	-	

Notes

- indicates Not Sampled or Not Analyzed for specific constituent

BOLD = Analytes detected at or above the laboratory practical quantitation limit (PQL)

<0.40 indicates not detected above the laboratory PQL of 0.40 pg/L (picograms per liter)

Laboratory qualifiers defined on Table 4.1-21

A - Polychlorinated Biphenyl (PCB) Congeners per EPA Method 1668

Total PCBs indicates sum of 209 PCB congeners

TEQ U=1/2 indicates TEQ using TEFs for dioxin-like compounds per World Health Organization (WHO) assuming Non-Detect values as 1/2 detection limit

Table 4.1-18
Groundwater Analytical Results - Metals

Sample Location	Sample Label	Sample Date	Metals [A] (ug/L)																									
			Antimony		Arsenic		Beryllium		Cadmium		Chromium [B]		Copper		Lead		Nickel		Selenium		Silver		Thallium		Zinc		Mercury	
			Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual
SLR Initial RI Investigation (2009)																												
GP-303	GP-303-GW	6/1/2009	**1.4**		**30**		<2.0		<5.0		**15**		**35**		**23**		<20		<20		<10		**0.23**	J	**45**		<0.20	
GP-304	GP-304-GW	6/1/2009	**0.7**	J	**8**		**9.5**		**16**		**620**		**460**		**260**		**820**		<20		<10		<1.0		**720**		**0.08**	J
GP-305	GP-305-GW	6/1/2009	**0.38**	J	**41**		<2.0		<5.0		**16**		**35**		**11**		**11**	J	<20		<10		**0.23**	J, P1	**52**		<0.20	
GP-306	GP-306-GW	6/1/2009	**0.55**	J	**14**		<2.0		<5.0		**4.3**	J	**17**	J	<5.0		<20		<20		**3.2**	J	<1.0		**16**	J	<0.20	
GP-307	GP-307-GW	5/20/2009	<1.0		**4.0**		<2.0		<5.0		<10		**23**		**13**		<20		**24**		<10		<1.0		**230**		<0.20	
GP-308	GP-308-GW	5/20/2009	<1.0		<5.0		<2.0		<5.0		<10		<20		**9.4**		<20		<20		<10		<1.0		<30		<0.20	
GP-309A	GP-309A-GW	5/22/2009	**0.48**	J	**4.4**		<2.0		<5.0		<10		<20		<5.0		<20		<20		**6.9**	J	<1.0		<30		<0.20	
GP-310	GP-310-GW	5/22/2009	**3.9**		**14**		<2.0		**1**	J	**30**		**33**		**26**		**22**		<20		<10		<1.0		**50**		<0.20	
GP-311	GP-311-GW	5/22/2009	**0.8**	J	**8.6**		<2.0		**2.7**	J	<10		<20		<5.0		<20		<20		**5.4**	J	<1.0		<30		<0.20	
GP-312	GP-312-GW	5/22/2009	**0.75**	J	**3.5**		<2.0		**1.4**	J	**6**	J	<20		**2.8**	J	<20		<20		<10		<1.0		**11**	J	<0.20	
GP-334	GP-334-GW	5/22/2009	<1.0		**11**		<2.0		<5.0		**8.9**	J	**26**		**5.2**		<20		<20		<10		<1.0		<30		<0.20	
GP-335	GP-335-GW	5/22/2009	<1.0		**17**		<2.0		<5.0		<10		**11**	J	<5.0		<20		<40	O	<10		<1.0		<30		<0.20	
MW-1	MW-1-GW	10/29/2009	<1.0		**4.1**		<2.0		<5.0		**1.7**	J	<20		<5.0		<20		**92**		<10		<1.0		**69**		<0.20	
MW-1	MW-1-GW (dissolved)	10/29/2009	**0.28**	J	**3.2**		<2.0		<5.0		<10		<20		<5.0		<20		<20		<10		<1.0		<30		<0.20	
MW-2	MW-2-GW	10/29/2009	**0.59**	J, P1	**9.7**		<2.0		<25	O	<10		<20		<5.0		<20		**70**		<10		<5.0	O	**110**		<0.20	
MW-2	MW-2-GW (dissolved)	10/29/2009	**0.69**	J	**8.3**		<2.0		<5.0		<10		<20		<5.0		<20		<100	O	<10		<1.0		**7.9**	J	<0.20	
MW-4	MW-4-GW	10/29/2009	<1.0		**3.1**		<2.0		<5.0		<10		<20		**2.5**	J	<20		**7.4**	J	<10		<1.0		**34**		<0.20	
MW-4	MW-4-GW (dissolved)	10/29/2009	<1.0		**3.1**		<2.0		<5.0		<10		<20		<5.0		<20		<20		<10		<1.0		**9.4**	J	<0.20	
MW-5	MW-5-GW	10/29/2009	**18**		**0.8**	J	<2.0		<5.0		<10		**15**	J	<5.0		<20		**89**		<10		<1.0		**83**		<0.20	
MW-5	MW-5-GW (dissolved)	10/29/2009	**18**		**0.82**	J	<2.0		**1.5**	J	<10		<20		<5.0		**9.9**	J	<20		<10		<1.0		**13**	J	<0.20	
MW-6	MW-6-GW	10/29/2009	**0.38**	J	**11**		<2.0		<5.0		<10		<20		<5.0		<20		**15**	J	<10		<1.0		**37**		<0.20	
MW-6	MW-6-GW (dissolved)	10/29/2009	**0.73**	J	**6**		<2.0		<5.0		<10		<20		<5.0		**12**	J	<100	O	<10		<1.0		**11**	J	<0.20	
SLR Phase 2 Upland Soil and Groundwater (2012)																												
MW-1	MW-1-GW	5/24/2012	<1.0		**10**		<1.0		<0.50		**5.1**		**0.56**	J	**0.32**	J	**2.9**		**2.2**		<1.0		<1.0		<10		<0.20	
MW-1	MW-1-GW (dissolved)	5/24/2012	<1.0		**2.9**		<1.0		<0.50		<2.0		**0.56**	J	<1.0		**3.2**		<1.0		<1.0		<1.0		<10		**0.02**	J
MW-6	MW-6-GW	5/24/2012	**0.47**	J	**4.8**		<1.0		<0.50		**1.6**	J	**3**		<1.0		**2**		**0.63**	J	<1.0		<1.0		<10		**0.02**	J
MW-6	MW-6-GW (dissolved)	5/24/2012	**0.87**	J	**4.5**		<1.0		<0.50		**1.3**	J	**3.9**		<1.0		**2.3**		<1.0		<1.0		<1.0		<10		**0.02**	J
405P	405P-GW	5/17/2012	**1.7**		**38**		**0.53**	J	**1.6**		**290**		**300**		**61**		**440**		**2**	J	**0.75**	**J**	**0.19**	J	**240**		<0.20	
405P	405P-GW (dissolved)	5/17/2012	<1.0		**7.3**		<1.0		<0.50		<2.0		**0.65**	J	<1.0		**11**		**8.6**		<1.0		<1.0		<10		<0.20	
SLR Source Control Evaluation (2018-2019)																												
MW-11A	MW-11A-0519	5/3/2019	<2		**6.0**		<2		<2		**21**		**6.3**		**1.0**		**4.17**		**0.49**		<2		<2		**6.85**		<0.20	
MW-12	MW-12-0519	5/3/2019	**6.6**		**19**		<2		<2		**4.8**		**7.3**		**11**		**7.67**		<2		<2		<2		**27.7**		<0.20	
MW-13	MW-13-0519	5/3/2019	**2.1**		**4.4**		<2		<2		**2.5**		**46**		**24**		**2.96**		**0.683**		<2		<2		**20**		**0.066**	
MW-14	MW-14-0519	5/3/2019	<2		**17**		<2		<2		**3.6**		**7.4**		**2.1**		**2.85**		**0.413**		<2		<2		**9.27**		<0.20	
MW-15	MW-15-0519	5/3/2019	<2		**0.59**		<2		<2		**1.3**		**1.2**		<2		<2		<2		<2		<2		<25		<0.20	
MW-16	MW-16-0519	5/3/2019	<2		**3.0**		<2		<2		**1.2**		**3.5**		**1.8**		**1.34**		<2		<2		<2		**3.95**		<0.20	
MW-17	MW-17-0519	5/3/2019	<2		**44**		<2		<2		**6.4**		**2.3**		**0.91**		**2.1**		**0.391**		<2		<2		**3.76**		<0.20	
Intial PCL (per Table 4.1.2.1-2)			90	hh	5	mA	270	sw-b	7.9	ma	240,000	sw-b	3.1	ma	8.1	ma	8.2	ma	71	ma	26,000	sw-b	0.22	sw-b	81	ma	0.025	ma

Notes

- indicates Not Sampled or Not Analyzed for specific constituent

BOLD = Analytes detected at or above the laboratory practical quantitation limit (PQL)

<0.40 indicates not detected above the laboratory PQL of 0.40 µg/L (micrograms per Liter)

Only those analytes with greater than 5% frequency of detection are listed

Laboratory qualifiers defined on Table 4.1-21

A - Metals per 6020 method and 7471 method (Mercury)

Table 4.1-19
Groundwater Analytical Results - Dioxins/Furans

Sample Location	Sample Label	Sample Date	Dioxins and Furans (pg/L) [A]																																			
			2,3,7,8-Tetra CDD		1,2,3,7,8-Penta CDD		1,2,3,4,7,8-Hexa CDD		1,2,3,6,7,8-Hexa CDD		1,2,3,7,8,9-Hexa CDD		1,2,3,4,6,7,8-Hepta CDD		Octa CDD		2,3,7,8-Tetra CDF D		1,2,3,7,8-Penta CDF		2,3,4,7,8-Penta CDF		1,2,3,4,7,8-Hexa CDF		1,2,3,6,7,8-Hexa CDF		2,3,4,6,7,8-Hexa CDF		1,2,3,7,8,9-Hexa CDF		1,2,3,4,6,7,8-Hepta CDF		1,2,3,4,7,8,9-Hepta CDF		Octa CDF		U = 0	U = 0.5
			Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Value
SLR Initial RI Investigation (2009)																																						
GP-302	GP-302-GW	5/20/2009	**2.51**	J	**13.2**	J	**25**	J	**147**		**53**		**4,630**		**50,300**	D	**4.05**	J	**12.6**	J	**15.1**	J	**38.2**	J	<58.4	F	**27.7**	J	**11.7**	J	**1,060**		**68.1**		**3,250**		**125**	**128**
GP-309	GP-309-GW	5/22/2009	<0.519		<0.559		<0.481		**0.888**		<0.545		**15.3**		**139**		<0.528		**0.643**		**0.712**		**0.91**		**0.679**		<0.546		<0.547		<2.2		<0.635		**2.95**		**0.68**	**1.4**
SLR Phase 2 Upland Soil and Groundwater (2012)																																						
403-P	403-P-GW	5/17/2012	<10.1		<50.7		<50.7		<50.7		<50.7		**7.08**	J	**63.4**	J	<10.1		<50.7		<50.7		<50.7		<50.7		<50.7		<50.7		**2.47**	EMPC, J	<50.7		**7.79**	EMPC, J	**0.12**	**57**
MW-6	MW-6-GW	5/24/2012	<10.3		<51.4		<51.4		<51.4		<51.4		<51.4		**54.2**	EMPC,J	<10.3		<51.4		<51.4		<51.4		<51.4		<51.4		<51.4		<51.4		<51.4		<103		**0.016**	**2.4**
SLR Additional Upland Assessment - Woodlife Area (2013)																																						
GP-501	GP-501-GW	3/14/2013	**1.66**	J	**11.7**	J	**41.7**		**3,990**		**237**		**82,100**	E	**742,000**	E	**213**		**628**		**1,730**		**2,330**		**562**		**842**		<11.6		**13,600**		**849**		**28,500**		**2,569**	**2,570**
GP-502	GP-502-GW	3/14/2013	<0.729		<1.01		<1.26		<1.39		<1.24		**48.7**		**1,110**		<0.662		<0.661		<0.703		<0.876		<0.853		<0.89		<1.03		**7.17**	J	<0.852		**36.9**	J	**0.90**	**2.3**
GP-503	GP-503-GW	3/13/2013	<0.991		<1.22		<1.01		<1.08		<1.12		**27**		**294**		<0.836		<0.879		<0.857		<0.813		<0.795		<0.883		<0.972		**4.48**	EMPC, J	<0.913		**21.6**	J	**0.41**	**2.0**
GP-504	GP-504-GW	3/13/2013	<0.703		<0.696		**0.758**	EMPC, J	**4.4**	J	**1.4**	EMPC, J	**219**		**2,000**		<0.563		<0.577		<0.575		**0.885**	J	<0.598		<0.685		<0.739		**19.7**	J	**3.07**	J	**156**		**3.8**	**4.7**
GP-505	GP-505-GW	3/13/2013	<2.43		<3.22		<3.11		<3.28		<3.12		**20.8**	J	**219**		<2.07		<1.87		<1.72		<2.07		<2		<2.23		<2.11		<2.63		<2.89		**8.69**	J	**0.28**	**4.4**
GP-508	GP-508-GW	3/13/2013	<4.31		<4.22		<5.73		<6.1		<5.55		**9.14**	J	**119**		<2.74		<2.76		<2.68		<2.83		<2.69		<3.2		<3.58		<3.05		<3.58		<6.17		**0.13**	**6.5**
GP-510	GP-510-GW	3/13/2013	<1.98		<3		<3.08		<3.18		<3.18		**8.83**	EMPC, J	**185**		<1.97		<1.77		<1.85		<1.61		<1.46		<1.56		<1.88		<1.57		<1.93		**7.7**	J	**0.15**	**3.9**
SLR Quarterly Groundwater Monitoring Well Sampling (Highest Measured Value Shown) [B] (2015-2020)																																						
MW-1	MW-1-GW	7/31/2019	<3.68		<3.38		<4.92		<5.22		<5.16		<6.57		*<38.7*	J,B	<2.68		<2.77		<2.82		<4.96		<4.95		<5.08		<5.3		<7.48		<7.72		*<4.38*	J,B	*ND*	**6.0**
MW-4	MW-4-GW	7/30/2019	<5.33		<5.66		<7.56		<7.61		<7.92		<6.33		*<40.9*	J,B	<3.45		<4.1		<4.46		<5.16		<5.4		<5.59		<6.06		<7.75		<6.68		*<10.8*	J,B	*ND*	**8.8**
MW-6	MW-6-GW	1/17/2019	<1.73		<1.91		<1.59		<1.58		<1.48		**2.78**	J, B	<4.15		<1.34		<1.05		<1.02		<1.58		<1.53		<1.48		<1.55		<0.755		<0.964		<2.43		**0.028**	**2.3**
MW-7	MW-7-GW	12/10/2015	<2.17		<2.87		**3.6**	EMPC,J	**20**		**7.7**	EMPC,J	**566**		**4,830**		<2.23		<1.73		<1.9		**3.3**	J	**2.6**	J	**3.9**	J	<2.83		**73**		<3.77		**182**		**12**	**15**
MW-8A	MW-8A-GW	6/28/2017	<1.2		<2.2		<2.2		<1.8		3.82	EMPC,J	**5.7**	J,B	**33**	EMPC,J	<1.8		<2.1		<1.9		<1.3		<1.5		<2.0		<1.5		**2.5**	J	**1.78**	EMPC,J	<2.3		**0.082**	**2.7**
MW-9A	MW9A-1215	12/10/2015	<2.09		<3.31		<2.72		<2.83		<2.62		**5.7**	EMPC,J	**29**		<2.1		<1.44		<1.51		<1.74		<1.85		<1.81		<2.51		**1.6**	EMPC,J	<3.54		<9.78		**0.081**	**4.0**
MW-15	MW-15-GW	7/31/2019	<5.11		<4.51		<6.8		<6.07		<6.73		<7.93		*<30.3*	J,B	<4.2		<2.91		<3.53		<4.06		<3.86		<4.71		<4.71		<4.94		<4.35		<5		*ND*	**7.5**
MW-16	MW-16-GW	7/31/2019	<5.01		<5.31		<4.9		<5.28		<4.88		<7.36		*<28.1*	J,B	<3.63		<3.48		<3.4		<4.24		<4.01		<4.06		<4.43		<4.86		<4.6		<4.6		*ND*	**7.6**
SLR Source Control Evaluation (2018-2019)																																						
NTD Weep Holes	NTD-SW-EAST-0418	4/5/2018	<2.2		<1.35		<2.49		<2.59		<2.51		**6.95**	EMPC,J	**81.4**	B	<1.35		<0.959		<0.953		<1.48		<1.44		<1.49		<1.71		**2.36**	EMPC,J	<1.11		<1.96		**0.17**	**2.6**
	NTD-SW-WEST-0418	4/5/2018	<1.8		<0.96		<1/66		<1.68		<1.72		**13.6**	J	**142**		<1.36		<0.904		<0.867		<1.26		<1.31		<1.35		<1.42		**2.38**	J	<1.27		**5.12**	J	**0.31**	**2.3**
NTD Inlets	NTD-SW-3"-0418	4/4/2018	<2.17		<1.27		<1.6		<1.81		<1.69		**3.1**	J	**19.9**	EMPC,J,B	<1.54		<1.02		<0.914		<1.29		<1.26		<1.26		<1.5		<0.686		<0.765		**<1.89**		**0.051**	**2.3**
	NTD-SW-8"-0418	4/4/2018	<1.6		<0.936		<1.85		<1.74		<1.76		**7.74**	J	**30**	J,B	<1.17		<0.936		<0.904		<1.35		<1.31		<1.23		<1.48		1.61	EMPC,J	<1		4.34	J	**0.13**	**2.0**
SEEP-N-2	SEEP-N-2	5/15/2018	<6.7		<4.17		<3.4		<3.62		<3.35		**12.2**	EMPC,J	**135**		<5.75		<2.88		<2.74		<3.2		<2.9		<2.74		<3.01		**1.35**	EMPC,J	<1.75		**6.8**	EMPC,J	**0.28**	**6.8**
SEEP-N-14	SEEP-N-14	5/15/2018	<6.67		<4.75		<6		<6.06		<5.74		**17.6**	EMPC,J	<5.29		<2.35		<2.25		<3.31		<3.17		<3.12		<3.53		<3.35		4.09	EMPC,J	<2.8		6.24	EMPC,J	**0.47**	**7.4**
SEEP-N-18	SEEP-N-18	5/15/2018	<7.1		<3.04		<4.92		<4.78		<4.85		<4.12		<9.29		<5.56		<3.19		<2.97		<4.14		<3.96		<3.99		<4.57		<1.96		<2.82		<8.38		ND	**7.0**
SEEP-S-1	SEEP-S-1	5/14/2018	<6.47		<3.28		<4.9		<4.7		<4.89		**7.65**	EMPC,J	**77**		<4.47		<2.55		<2.37		<3.19		<2.87		<2.84		<3.21		<1.37		<1.95		<5.77		**0.15**	**6.4**
SEEP-S-14	SEEP-S-14	5/15/2018	<6.55		<5.67		<4.51		<4.57		<4.63		**13.3**	EMPC,J	**45**	EMPC,J	<5.76		<3.43		<3.39		<3.27		<3.14		<2.95		<3.39		6.95	J	<2.38		<8.52		**0.25**	**7.5**
SEEP-S-16	SEEP-S-16	5/14/2018	<7.33		<4.43		<4.99		<4.7		<4.4		<3.19		**14.7**	EMPC,J	<5.74		<3.05		<2.83		<3.54		<3.54		<3.29		<3.63		<1.45		<1.9		<7.06		**0.015**	**7.3**
MW-16	MW-16-0519	5/3/2019	<1.54		<1.14		<1.04		<1.11		<0.943		<1.45		**7.2**	J	<1.49		<1.05		<1.12		<0.737		<0.709		<0.739		<0.767		<0.809		<0.89		<1.2		**0.002**	**1.9**
Intial PCL (per Table 4.1.2.1-2)			-		-		-		-		-		-		-		-		-		-		-		-		-		-		-		-		-		57 (pql)	

Notes

- indicates Not Sampled or Not Analyzed for specific constituent

BOLD = Analytes detected at or above the laboratory practical quantitation limit (PQL)

<1.2 indicates not detected above the laboratory PQL of 1.2 pg/L (picograms per Liter)

Laboratory qualifiers defined on Table 4.1-21

A - Dioxins and Furans per EPA Method 1613 or 8290

B - Only highest detected value shown for quarterly groundwater sampling events. Full analytical results are included in Appendix G

TEQ U=0 indicates Toxic Equivalent Quotient (TEQ) using Toxicity equivalency factors (TEFs) per WHO assuming Non-Detect values as 0

TEQ U=1/2 indicates TEQ using TEFs per WHO assuming Non-Detect values as 1/2 detection limit

Table 4.1-20
Soil Gas Analytical Results

Sample Location	Sample Label	Sample Date	Soil Gas (µg/m^3) [A]																	
			Benzene		Toluene		Ethylbenzene		m,p-Xylenes		o-Xylene		Naphthalene		APH [EC5-8 aliphatics] fraction		APH [EC9-12 aliphatics] fraction		APH [EC9-10 aromatics] fraction	
			Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual
SLR Additional Upland Assessment (2015)																				
GP-708	GP-708-SG	7/7/2015	**12**		**17**		**12**		**50**		**23**		**69**		**770**		**390**		**60**	
GP-709	GP-709-SG	7/6/2015	**8.7**		**23**		**62**		**210**		**93**		**800**	D	**1,100**		**1,500**		**330**	
GP-710	GP-710-SG	7/7/2015	<0.70		**1.6**		**1.1**		**3.1**		**1.5**		**53**		**88**		**160**		**36**	
GP-711	GP-711-SG	7/7/2015	**1.5**		**3.1**		**1.2**		**4.8**		**2.3**		**55**		**160**		**150**		**30**	
GP-712	GP-712-SG	7/7/2015	**17**		**35**		**17**		**40**		**19**		**89**		**1,200**		**870**		**200**	
GP-713	GP-713-SG	7/6/2015	**31**		**100**		**260**		**440**		**190**		**3,100**		**2,500**		**5,900**		**2,200**	
GP-714	GP-714-SG	7/6/2015	**90**		**140**		**320**		**400**		**630**		**81**		**8,900**		**20,000**		**4,900**	
GP-715	GP-715-SG	7/6/2015	**2.2**		**15**		**11**		**20**		**8.4**		**61**		**200**		**200**		**76**	
MW-8A	MW8A-SG	7/7/2015	**58**		**190**	D	**200**	D	**260**		**130**		**2,600**	D	**2,400**		**4,200**		**1,700**	

Notes

- indicates Not Sampled or Not Analyzed for specific constituent

BOLD = Analytes detected at or above the laboratory practical quantitation limit (PQL)

<0.70 indicates not detected above the laboratory PQL of 0.7 micrograms per cubic meter (µg/m3)

Laboratory qualifiers defined on Table 4.1-21

A - APH per Massachusetts Department of Environmental Protection (MassDEP) Air Phase Petroleum Hydrocarbons (APH) and method and Naphthalene + BTEX per TO-15 method

Table 4.1.21
Table Notes

Analytical Laboratory Report Qualifiers (listed per laboratory)

Pace (fka ESC) Laboratory Qualifiers (TPH, cPAH, VOC, SVOC, metals, PCB aroclor analysis:

E - Greater than upper calibration limit: Actual value is known to be greater than the upper calibration range.
J - Estimated value below the lowest calibration point. Confidence correlates with concentration.
J3 - The associated batch QC was outside the established quality control range for precision.
J5 - The sample matrix interfered with the ability to make any accurate determination; spike value is high
J6 - The sample matrix interfered with the ability to make any accurate determination; spike value is low
J8 - The internal standard associated with this data responded abnormally low. The data is likely to show a high bias concerning the result.
O - Sample diluted due to matrix interferences that impaired the ability to make an accurate anlytical determination. The detection limit is elevated in order to reflect the necessary dilution.
Q - Sample held beyond the accepted holding time
T8 - Additional method/sample information: Sample(s) received past/too close to holding time expiration

Maxxim/SGS Laboratory Qualifiers (dioxin/furan and PCB congener analysis):

B - Analyte was detected in the Lab Method Blank at a level above the LOQ
D - Spike or surrogate was diluted out in order to achieve a parameter result within instrument calibration range
E - The reported concentration exceeds the calibration range (upper point of calibration curve)
EMPC - Represents an Estimated Maximum Possible Concentration.
J - Indicates that the analyte has a concentration below the reporting limit (lowest point of calibration curve)
K - Result is estimated due to ion ratio failure in High Resolution PCB Analysis
S - Indicates a split sample. The number that follows the "S" indicates the split factor

ALS Environmental Qualifiers (soil gas analysis):

D - The reporting limit is from a dilution

Analytical Resources, Incorporated (ARI) Qualifiers (low level cPAH analysis):

J - Estimated Concentration value detected below the reporting limit
D - The reported value is from a dilution

Preliminary Cleanup Level (PCL) Definitions

(pot) - Potable Groundwater Screening Level (Method B)
(pql) - Laboratory Practical Quantitation Limit
(hh) - Surface Water Protective of Human Health (CWA)
(vi) - Vapor Intrusion (Method B)
(mA) -Method A Direct Contact
(mB) -Method B Direct Contact
(gwl-s) - Protection of Groundwater - saturated
(back) - Background

Table 4.1.2.1-1
Soil PCLs

ANALYTE (BY GROUP)	CAS No.	CLARC Values - May 2019 [a]							Selected PCLs	
		Soil Protective of Groundwater		Soil, Method A	Soil Protective of Human Direct Contact	Soil Protective of Terrestrial Species [b]	Natural Background Concentration [c]	Laboratory PQLs [j]		
		Unsaturated Soil	Saturated Soil		Soil, Method B					
		(gwl-u)	(gwl-s)	(mA)	(mB)	(TEE)	(back)	(pql)	Value	Source
Total Petroleum Hydrocarbons (TPH) (mg/kg)										
Gasoline Range Hydrocarbon	86290-81-5	-	-	30/100	-		-	0.1	30/100	(mA)
Diesel Range Hydrocarbons	68334-30-5	-	-	2,000	-	12,000	-	4	2,000	(mA)
Oil Range Hydrocarbons	-	-	-	2,000	-	12,000	-	10	2,000	(mA)
Metals (mg/kg)										
Antimony	7440-36-0	5.42	0.272	-	32	-	-	0.2	0.272	(gwl-s)
Arsenic	7440-38-2	2.9	0.15	20	0.67	20	7	0.1	20 [l]	(mA)
Beryllium	7440-41-7	63	3.16	-	160	-	0.6	0.1	3.16	(gwl-s)
Cadmium	7440-43-9	0.69	0.0349	2	80	36	1.0	0.1	1.0	(back)
Chromium (III)	7440-47-3	480,000	24,000	2,000	120,000	135	48	0.1	135	(TEE)
Copper	7440-50-8	280	14	-	3,200	550	36	0.1	36	(back)
Lead	7439-92-1	3,000	150	250	-	220	24	0.1	24	(back)
Mercury	7439-97-6	2.09	0.105	2	-	0.7	0.07	0.0036	0.105	(gwl-s)
Nickel	7440-02-0	130	6.5	-	1,600	1,850	48	0.1	48	(back)
Selenium	7782-49-2	5.2	0.26	-	400	0.8	-	0.5	0.5	(pql)
Silver	7440-22-4	14	0.69	-	400	-	-	0.1	0.69	(gwl-s)
Thallium	7440-28-0	0.23	0.011	-	0.8	-	-	0.1	0.1	(pql)
Zinc	7440-66-6	6,000	300	-	24,000	570	85	1.0	300	(gwl-s)
Volatile Organic Compounds (VOCs) (mg/kg)										
1,2,4-Trimethylbenzene	95-63-6	0.47	0.025	-	800	-	-	0.005	0.025	(gwl-s)
2-Butanone	78-93-3	-	-	-	48,000	-	-	0.025	48,000	(mB)
Acetone	67-64-1	29	2.1	-	72,000	-	-	0.025	2.1	(gwl-s)
Benzene	71-43-2	0.027	0.0017	0.03	18	-	-	0.001	0.0017	(gwl-s)
Carbon disulfide	75-15-0	5	0.27	-	8,000	-	-	-	0.27	(gwl-s)
Ethylbenzene	100-41-4	5.9	0.34	6	8,000	-	-	0.0025	0.34	(gwl-s)
Methylene chloride	75-09-2	0.021	0.0015	0.02	480	-	-	0.002	0.002	(pql)
Tetrachloroethene (PCE)	127-18-4	0.05	0.0028	0.05	480	-	-	0.0025	0.0028	(gwl-s)
Toluene	108-88-3	4.5	0.27	7	6,400	-	-	0.005	0.27	(gwl-s)
Trichloroethene (TCE)	79-01-6	0.025	0.0015	0.03	12	-	-	0.001	0.0015	(gwl-s)
Xylenes (total)	1330-20-7	14	0.83	9	16,000	-	-	0.0065	0.83	(gwl-s)
Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)										
1-Methylnaphthalene	90-12-0	0.08	0.004	-	34			0.02	0.004	(gwl-s)
2-Methylnaphthalene	91-57-6	1.72	0.088	-	320	-	-	0.02	0.088	(gwl-s)
Acenaphthene	83-32-9	98	5	-	4,800	-	-	0.006	5	(gwl-s)
Acenaphthylene [f]	208-96-8	650	33	-	2,400	-	-	0.006	33	(gwl-s)
Anthracene	120-12-7	2,300	110	-	24,000	-	-	0.006	110	(gwl-s)

Table 4.1.2.1-1
Soil PCLs

ANALYTE (BY GROUP)	CAS No.	Soil Protective of Groundwater		Soil, Method A	Soil Protective of Human Direct Contact	Soil Protective of Terrestrial Species [b]	Natural Background Concentration [c]	Laboratory PQLs [j]	Selected PCLs	
		Unsaturated Soil	Saturated Soil		Soil, Method B					
		(gwl-u)	(gwl-s)	(mA)	(mB)	(TEE)	(back)	(pql)	Value	Source
Benzo(g,h,i)perylene [f]	191-24-2	650	33	-	2,400	-	-	0.006	33	(gwl-s)
Fluoranthene	206-44-0	630	32	-	3,200	-	-	0.006	32	(gwl-s)
Fluorene	86-73-7	100	5.1	-	3,200	-	-	0.006	5.1	(gwl-s)
Naphthalene	91-20-3	4.5	0.24	5	1,600	-	-	0.02	0.24	(gwl-s)
Phenanthrene [f]	85-01-8	650	33	-	2,400	-	-	0.006	33	(gwl-s)
Pyrene	129-00-0	650	33	-	2,400	-	-	0.006	33	(gwl-s)
Total cPAHs TEQ [g]	-	3.9	0.19	0.1	0.19	300 [i]	-	0.009	0.19	(gwl-s)
Semi-Volatile Organics (SVOCs) (mg/kg)										
1,1-Biphenyl	92-52-4	0.6	0.03	-	130	-	-	0.333	0.333	(pql)
3,4-Methylphenol (m-cresol)	15831-10-4	-	-	-	4,000	-	-	0.333	4,000	(mB)
Acetophenone	98-86-2	-	-	-	8,000	-	-	0.333	8,000	(mB)
Carbazole	86-74-8	-	-	-	-	-	-	0.333	0.333	(pql)
Dibenzofuran	132-64-9	3.0	0.15	-	80	-	-	0.333	0.333	(pql)
Phenol	108-95-2	11	0.76	-	24,000	-	-	0.333	0.76	(gwl-s)
Polychlorinated Biphenyls (PCBs) (mg/kg)										
Total PCBs	-	-	-	1	0.5	2	-	0.000209 [k]	0.5	(mB)
Dioxins/Furans (mg/kg)										
Total 2,3,7,8 TCDD (TEQ) [h]	-	-	-	-	1.3E-05	3E-06/5E-06 [e]	5.2E-06 [d]	5.70E-06	5.70E-06	(pql)

Notes:

All values in miligrams per kilogram (mg/kg)

a - Values obtained from Ecology's CLARC Table (May 2019)

b - Values obtained from MTCA Table 749-2 (per Simplified TEE)

c - From Ecology's Natural Background Soil Metals Concentrations in Washington State (Ecology, 1994).

d - From Ecology's Natural Background for Dioxins/Furans in WA Soils, Technical Memorandum #8 (August 2010)

e- These values represent TEQ for total furans and total dioxins, respectively

f - Pyrene used as a toxicity surrogate per Alaska Department of Environmental Conservation (ADEC)

g - cPAH TEQ per MTCA Table 708-2

h - Dioxin/Furan TEQ per MTCA Table 708-1

i - Value for Benzo(a)pyrene

j - Laboratory PQLs provided by analytical laboratories, calculated using MTCA TEF equations (see Appendix L), or provided by Ecology

k - Total PCB PQL is sum of PQL for each congener (1 pg/g per congener)

l - Arsenic cleanup level based on direct contact using Equation 740-2 and protection of groundwater for drinking water use using the procedures in WAC 173-340-747(4), adjusted for natural background for soil (see footnote b on MTCA Table 740-1)

Table 4.1.2.1-2
Groundwater PCLs

	CLARC Values - May 2019 [a]											
	Selection of Method B Surface Water Cleanup Levels						Potable Groundwater Screening Level [b]		Groundwater Protective of Vapor Intrusion, Method B	Laboratory PQLs [c]	Selected PCL	
	Surface Water, Human Health, Most-Restrictive, Method B Standard Formula	Surface Water ARAR - Aquatic Life - Marine/Chronic - Ch. 173-201A WAC	Surface Water ARAR - Aquatic Life - Marine/Chronic - Clean Water Act §304	Surface Water ARAR - Human Health – Marine – Ch. 173-201A WAC	Surface Water ARAR - Human Health – Marine – 40 CFR 131.45	Surface Water ARAR - Human Health – Marine – Clean Water Act §304						
ANALYTE (BY GROUP)	(sw-b)	(ma-wac)	(ma-cwa)	(hh-wac)	(hh-cfr)	(hh-cwa)	(pot)	Basis	(vi-b)		Value	Source
Total Petroleum Hydrocarbons (TPH) ug/L												
Gasoline Range Hydrocarbons	-	-	-			-	800/1,000	(gw-b)	-	100	800/1,000	(gw-b)
Diesel Range Hydrocarbons	-	-	-			-	500	(gw-b)	-	100	500	(gw-b)
Oil Range Hydrocarbons	-	-	-			-	500	(gw-b)	-	250	500	(gw-b)
Metals ug/L												
Antimony	1,000	-	-	180	90	640	6	(mcl)	-	0.05	90	(hh-cfr)
Arsenic	0.098	36	36	10	0.14	0.14	5	(gw-a)	-	0.1	5.0 [h]	(gw-a)
Beryllium	270	-	-	-	-	-	4	(mcl)	-	0.02	270	(sw-b)
Cadmium	41	9.3	7.9	-	-	-	5	(mcl)	-	0.02	7.9	(ma-cwa)
Chromium (III)	240,000	-	-	-	-	-	24,000	(gw-b)	-	0.2	240,000	(sw-b)
Copper	2,900	3.1	3.1	-	-	-	640	(gw-b)	-	0.1	3.1	(ma-wac)
Lead	-	8.1	8.1	-	-	-	15	(mcl)	-	0.02	8.1	(ma-wac)
Mercury	-	0.025	0.94	-	-	-	2	(mcl)	0.29	5.00E-07	0.025	(ma-wac)
Nickel	1,100	8.2	8.2	190	100	4,600	100	(mcl)	-	0.2	8.2	(ma-wac)
Selenium	2,700	71	71	480	200	4,200	50	(mcl)	-	1	71	(ma-cwa)
Silver	26,000	-	-	-	-	-	80	(gw-b)	-	0.02	26,000	(sw-b)
Thallium	0.22	-	-	0.27	6.3	0.47	0.16	(gw-b)	-	0.02	0.22	(sw-b)
Zinc	17,000	81	81	290	1,000	26,000	4,800	(gw-b)	-	0.5	81	(ma-cwa)
Volatile Organic Compounds (VOCs) ug/L												
Acetone	-	-	-	-	-	-	7,200	(gw-b)	-	10	7,200	(gw-b)
1,2,4-Trimethylbenzene	-	-	-			-	80	(gw-b)	240	1	240	(vi-b)
Benzene	23	-	-	1.6	-	16	5	(gw-a)	2.4	1	1.6	(hh-wac)
Ethylbenzene	6,900	-	-	270	31	130	700	(gw-b)	2,800	1	31	(hh-cfr)
Isopropylbenzene	-	-	-	-	-	-	800	(gw-b)	720	1	720	(vi-b)
Toluene	19,000	-	-	410	130	520	640	(gw-b)	15,000	1	130	(hh-cfr)
Xylenes (total) [k]	-	-	-	-	-	-	1,000	(gw-b)	330	3	330	(vi-b)
Polycyclic Aromatic Hydrocarbons (PAHs) ug/L												
1-Methylnaphthalene	-	-	-			-	1.5	(gw-b)	-	0.25	1.5	(gw-b)
2-Methylnaphthalene	-	-	-			-	32	(gw-b)	-	0.25	32	(gw-b)
Acenaphthene	640	-	-	110	30	90	960	(gw-b)	-	0.05	30	(hh-cfr)
Acenaphthylene [f]	2,600	-	-	460	8.0	30	480	(gw-b)	-	0.05	8	(hh-cfr)
Anthracene	26,000	-	-	4,600	100	400	4800	(gw-b)	-	0.05	100	(hh-cfr)
Benzo(g,h,i)perylene [f]	2,600	-	-	460	8.0	30	480	(gw-b)	-	0.05	8	(hh-cfr)
Fluoranthene	90	-	-	16	6.0	20	640	(gw-b)	-	0.05	6	(hh-cfr)
Fluorene	3,500	-	-	610	10	70	640	(gw-b)	-	0.05	10	(hh-cfr)
Naphthalene	4,900	-	-	-	-	-	160	(gw-a)	8.9	0.25	8.9	(vi-b)
Phenanthrene [f]	2,600	-	-	460	8.0	30	480	(gw-b)	-	0.05	8	(hh-cfr)
Pyrene	2,600	-	-	460	8.0	30	480	(gw-b)	-	0.05	8	(hh-cfr)
Total cPAHs TEQ [d]	0.035	-	-	0.0021	0.000016	0.00013	-	-	-	0.015	0.015	(pql)
Semi-Volatile Organics (SVOCs) ug/L												
1,1-Biphenyl	-	-	-	-	-	-	5.5	(gw-b)	-	-	5.5	(gw-b)
2,4-Dimethylphenol	550	-	-	97	-	3,000	160	(gw-b)	-	10	97	(hh-wac)
3,4-Methylphenol (m,p-cresol)	-	-	-	-	-	-	400	(gw-b)	-	10	400	(gw-b)
Carbazole	-	-	-	-	-	-	-	-	-	-	-	-
Dibenzofuran	-	-	-	-	-	-	16	(gw-b)	-	-	16	(gw-b)
Phenol	560,000	-	-	200,000	70,000	300,000	2,400	(gw-b)	-	10	70,000	(hh-cfr)
Dioxins/Furans ug/L												
Total 2,3,7,8 TCDD (TEQ) [e]	1.0E-08	-	-	6.40E-08	1.40E-08	5.1E-09	6.7E-07	(gw-b)	-	5.70E-05	5.70E-05	(pql)
Polychlorinated Biphenyls (PCBs) ug/L												
Total PCBs	1.0E-04	0.03	0.03	1.70E-04	7.00E-06	6.4E-05	0.044	(gw-b)		1.21E-03	1.21E-03	(pql)[g]

Notes:

All values in micrograms per liter (ug/L)

a - Values obtained from Ecology's CLARC Table (May 2019)

b - Upland Area groundwater is not be a practicable source of potable groundwater, but, for the purposes of the RI, potable groundwater screening levels are applied for those compounds without either marine water- or vapor intrusion-based screening levels.

c- Laboratory PQLs provided by analytical laboratories, calcuated using MTCA TEF equations (see Appendix L), or provided by Ecology

d - cPAH TEQ per MTCA Table 708-2

e - Dioxin/Furan TEQ per MTCA Table 708-1

f - Pyrene used as a toxicity surrogate per Alaska Department of Environmental Conservation (ADEC)

g - Total PCB PQL calculated by adding individual PQLs (10 pg/L for each congener) for each congener measured in sample from MW-13 (highest congener frequency detection)

h - Arsenic cleanup level based on background concentrations for state of Washington (see footnote b on MTCA Table 720-1)

Table 4.2-2
Maulsby Marsh Surface Sediment Chemistry Results Summary

Task	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012
Location ID	MS001	MS001	MS002	MS003	MS004	MS005	MS006	MS007	MS008	MS009
Sample ID	MS001-SS-120515	MS101-SS-120515	MS002-SS-120515	MS003-SS-120515	MS004-SS-120515	MS005-SS-120515	MS006-SS-120515	MS007-SS-120515	MS008-SS-120515	MS009-SS-120515
Sample Date	05/15/2012	05/15/2012	05/15/2012	05/15/2012	05/15/2012	05/15/2012	05/15/2012	05/15/2012	05/15/2012	05/15/2012
Sample Depth	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm
Sample Type	N	FD	N	N	N	N	N	N	N	N
Matrix	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE
Conventional Parameters (mg/kg)										
Ammonia	132	130	213	170	178	71.1	17.9	33.2	12.6	117
Sulfide	2960	3100	2350	3640	4070	1840	20.5	718	1770	1720
Conventional Parameters (pct)										
Total organic carbon	19.6	18.4	17.1	23.6	17.9	29	31.9	16.7	22.5	12.2
Total solids	10.2	10.2	10.4	9.3	10.3	9.2	9.8	16.8	10.7	10.1
Total solids (preserved)	9.7	9.7	10.5	10.9	10	8.3	6.9	19	8.1	10.6
Grain Size (pct)										
Gravel	0.1 U	11.8	0.4	7.5	4.6	19.1	16.2	1.2	44.1	5.5
Sand, very coarse	24.4	17.1	14.2	11.8	8.2	13.9	19	16.4	11.4	8.3
Sand, coarse	7.1	7.9	6	8.1	7.5	11.2	16.5	9.7	7.2	7
Sand, medium	4.5	4.8	4.4	5.7	6.7	9.5	12.6	8.2	5.4	6.3
Sand, fine	3	3.2	3	4	5.3	6.6	8	9.6	4.2	5.3
Sand, very fine	2.1	2.4	2.3	2.7	3.7	4.1	4.9	10.2	3.1	4.5
Silt, coarse	1.3	1	1.5	5.2	4.2	2.8	3.3	11.2	5.2	10.3
Silt, medium	13.1	11.5	18.8	24.5	25.2	4.1	2.4	9.7	2.6	12.2
Silt, fine	11.3	9.9	12.2	7.7	8.4	6.5	3.5	7.2	4.3	9
Silt, very fine	12.4	11.2	15.2	5.9	7.5	6	2.9	6.9	4.1	10.7
Clay, coarse	3.1	3.4	4.5	1.3	3.2	4.8	3.4	2.2	3	4.2
Clay, medium	3.3	3.4	5.4	2.5	3.7	2.3	2.3	2.2	2	4.1
Clay, fine	14.2	12.5	12.2	12.9	11.8	9.1	5	5.3	3.4	12.7
Metals (mg/kg)										
Antimony	2 UJ	2 UJ	2 UJ	2 UJ	2 UJ	3 J	5 J	1 UJ	2 UJ	2 UJ
Arsenic	33	33	27	19	24	55	80	28	27	8
Cadmium	3.2	3.4	2.9	2.2	3	3	3	3.7	3	2
Chromium	37	38	41	32	34	25	17	40	37	43
Copper	129	125	139	78	99	251	91	111	94	66
Lead	170	170	150	100	110	1180	360	350	160	60
Mercury	0.4	0.4	0.3	0.3	0.2	0.4	0.7	0.2	0.2	0.2
Nickel	50	42	46	30	40	40	33	44	37	38
Silver	2 U	2 U	2 U	2 U	2 U	2 U	2 U	1 U	2 U	2 U
Zinc	400	374	330	210	260	500	217	594	251	162
Semivolatile Organics (µg/kg)										
4-Methylphenol (p-Cresol)	1200	1600	1400	1100	690	3300	270	1800 J	610	470
Benzoic acid	390 J	640 J	420 J	330 J	390 J	3100 J	3100 J	1300 J	740 J	410 J
bis(2-Ethylhexyl)phthalate	140	120	150	120	120	170	120	120	98	90
Butylbenzyl phthalate	60 U	60 U	59 U	60 U	60 U	59 U	60 U	59 U	60 U	60 U
Carbazole	42 J	57 J	56 J	60 U	69	130	95	62	63	60 U
Dibenzofuran	180	280	240	110	300	660	480	210	69	54 J
Dimethyl phthalate	60 U	60 U	59 U	60 U	60 U	59 U	60 U	59 U	60 U	60 U

Table 4.2-2
Maulsby Marsh Surface Sediment Chemistry Results Summary

Task	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012
Location ID	MS001	MS001	MS002	MS003	MS004	MS005	MS006	MS007	MS008	MS009
Sample ID	MS001-SS-120515	MS101-SS-120515	MS002-SS-120515	MS003-SS-120515	MS004-SS-120515	MS005-SS-120515	MS006-SS-120515	MS007-SS-120515	MS008-SS-120515	MS009-SS-120515
Sample Date	05/15/2012	05/15/2012	05/15/2012	05/15/2012	05/15/2012	05/15/2012	05/15/2012	05/15/2012	05/15/2012	05/15/2012
Sample Depth	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm
Sample Type	N	FD	N	N	N	N	N	N	N	N
Matrix	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE
Di-n-butyl phthalate	60 U	60 U	59 U	60 U	60 U	59 U	60 U	59 U	60 U	60 U
Di-n-octyl phthalate	60 UJ	60 UJ	59 UJ	60 UJ	60 UJ	59 UJ	60 UJ	59 UJ	60 UJ	60 UJ
Pentachlorophenol	600 U	**160 J**	590 U	600 U	600 U	590 U	600 U	590 U	600 U	600 U
Phenol	**300**	**400**	**260**	**180**	**200**	**1100**	**380**	**430 J**	**190**	**100**
Retene	**74**	**100**	**80**	**32 J**	**120**	**140**	**270**	**85**	60 U	60 U
Polycyclic Aromatic Hydrocarbons (µg/kg)										
2-Methylnaphthalene	**170**	**270**	**240**	**86**	**270**	**600**	**600**	**290 J**	**66**	**36 J**
Acenaphthene	**110**	**160**	**140**	**72**	**140**	**820**	**110**	**130**	**57 J**	60 U
Acenaphthylene	**74**	**130**	**86**	**60**	**78**	**250**	**220**	**140**	**39 J**	60 U
Anthracene	**140**	**180**	**170**	**120**	**180**	**350**	**220**	**170**	**110**	**51 J**
Benzo(a)anthracene	**160**	**170**	**280**	**130**	**240**	**300**	**230**	**180**	**190**	**57 J**
Benzo(a)pyrene	**260**	**270**	**470**	**250**	**380**	**330**	**250**	**270**	**220**	**80**
Benzo(b,j,k)fluoranthenes	**570**	**640**	**1000**	**580**	**970**	**970**	**650**	**540**	**420**	**180**
Benzo(g,h,i)perylene	**270**	**330**	**430**	**230**	**360**	**320**	**310**	**250**	**170**	**80**
Chrysene	**430**	**400**	**800**	**390**	**680**	**570**	**410**	**290**	**240**	**120**
Dibenzo(a,h)anthracene	**57 J**	**54 J**	**100**	**51 J**	**87**	**95**	**54 J**	**59**	**54 J**	60 U
Fluoranthene	**660**	**970**	**860**	**550**	**870**	**1900**	**1700**	**1100**	**600**	**290**
Fluorene	**120**	**170**	**160**	**74**	**170**	**450**	**130**	**120**	**66**	**42 J**
Indeno(1,2,3-c,d)pyrene	**200**	**230**	**340**	**180**	**280**	**240**	**220**	**190**	**140**	**63**
Naphthalene	**1100**	**1800**	**1300**	**550**	**1400**	**4400**	**6300**	**2200**	**460**	**290**
Phenanthrene	**690**	**1200**	**830**	**500**	**890**	**1800**	**2200**	**1100**	**480**	**250**
Pyrene	**580**	**910**	**860**	**510**	**790**	**1600**	**1400**	**960**	**460**	**240**
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 1/2)	**363 J**	**383.4 J**	**650**	**348 J**	**544.5**	**496.2**	**369.5 J**	**369.8**	**302.8 J**	**114.2 J**
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	**363 J**	**383.4 J**	**650**	**348 J**	**544.5**	**496.2**	**369.5 J**	**369.8**	**302.8 J**	**111.2 J**
Total PAH (SMS Freshwater 2013) (U = 0)	**5591 J**	**7884 J**	**8066**	**4333 J**	**7785**	**14995**	**15004 J**	**7989 J**	**3772 J**	**1779 J**
Pesticides (µg/kg)										
4,4'-DDD (p,p'-DDD)	99 U	99 U	99 U	99 U	100 U	99 U	**40 J**	99 U	99 U	100 U
4,4'-DDE (p,p'-DDE)	99 U	99 U	99 U	99 U	100 U	99 U	9.9 UJ	99 UJ	99 UJ	100 UJ
4,4'-DDT (p,p'-DDT)	99 U	99 U	99 U	99 U	100 U	99 U	**19 J**	99 UJ	99 UJ	100 UJ
Dieldrin	99 U	99 U	99 U	99 U	100 U	99 U	9.9 U	99 U	99 U	100 U
Endrin ketone	99 U	99 U	99 U	99 U	100 U	99 U	28 U	99 U	99 U	100 U
Hexachlorocyclohexane, beta- (BHC)	50 U	50 U	50 U	50 U	50 U	49 U	12 U	50 U	50 U	50 U
Sum DDD (U = 0)	99 U	99 U	99 U	99 U	100 U	99 U	**40 J**	99 U	99 U	100 U
Sum DDE (U = 0)	99 U	99 U	99 U	99 U	100 U	99 U	9.9 UJ	99 UJ	99 UJ	100 UJ
Sum DDT (U = 0)	99 U	99 U	99 U	99 U	100 U	99 U	**19 J**	99 UJ	99 UJ	100 UJ
PCB Aroclors (µg/kg)										
Aroclor 1016	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Aroclor 1221	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Aroclor 1232	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Aroclor 1242	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U

Table 4.2-2
Maulsby Marsh Surface Sediment Chemistry Results Summary

Task	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012
Location ID	**MS001**	**MS001**	**MS002**	**MS003**	**MS004**	**MS005**	**MS006**	**MS007**	**MS008**	**MS009**
Sample ID	**MS001-SS-120515**	**MS101-SS-120515**	**MS002-SS-120515**	**MS003-SS-120515**	**MS004-SS-120515**	**MS005-SS-120515**	**MS006-SS-120515**	**MS007-SS-120515**	**MS008-SS-120515**	**MS009-SS-120515**
Sample Date	**05/15/2012**	**05/15/2012**	**05/15/2012**	**05/15/2012**	**05/15/2012**	**05/15/2012**	**05/15/2012**	**05/15/2012**	**05/15/2012**	**05/15/2012**
Sample Depth	**0 - 10 cm**	**0 - 10 cm**	**0 - 10 cm**	**0 - 10 cm**	**0 - 10 cm**	**0 - 10 cm**	**0 - 10 cm**	**0 - 10 cm**	**0 - 10 cm**	**0 - 10 cm**
Sample Type	**N**	**FD**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**
Matrix	**SE**	**SE**	**SE**	**SE**	**SE**	**SE**	**SE**	**SE**	**SE**	**SE**
Aroclor 1248	**22**	**17**	**17 J**	20 U	16 U	**12**	**16**	**15**	9.9 U	10 U
Aroclor 1254	**44**	**37**	**39**	**28**	**28 J**	**25**	**27**	**31**	**23**	**20**
Aroclor 1260	20 U	16 U	20 U	14 U	20 U	12 U	20 U	14 U	9.9 U	10 U
Aroclor 1262	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Aroclor 1268	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Total PCB aroclors (SMS Freshwater 2013) (U = 0)	**66**	**54**	**56 J**	**28**	**28 J**	**37**	**43**	**46**	**23**	**20**
Extractable Petroleum Hydrocarbons (µg/kg)										
C8-C10 Aliphatics	20000 U	--	**19000**	21000 U	--	--	**21000**	--	--	--
C10-C12 Aliphatics	20000 U	--	19000 U	21000 U	--	--	21000 U	--	--	--
C12-C16 Aliphatics	20000 U	--	19000 U	21000 U	--	--	21000 U	--	--	--
C16-C21 Aliphatics	20000 U	--	**29000**	**38000**	--	--	21000 U	--	--	--
C21-C34 Aliphatics	**180000**	--	**190000**	**160000**	--	--	**120000**	--	--	--
C8-C10 Aromatics	20000 U	--	19000 U	21000 U	--	--	21000 U	--	--	--
C10-C12 Aromatics	20000 U	--	19000 U	21000 U	--	--	21000 U	--	--	--
C12-C16 Aromatics	20000 U	--	19000 U	21000 U	--	--	21000 U	--	--	--
C16-C21 Aromatics	20000 U	--	19000 U	21000 U	--	--	21000 U	--	--	--
C21-C34 Aromatics	**31000**	--	**48000**	**53000**	--	--	**30000**	--	--	--
Total Petroleum Hydrocarbons (mg/kg)										
Diesel range hydrocarbons	**53**	**54**	**69**	**71**	52 U	54 U	**64**	**37**	45 U	50 U
Motor oil range	**150**	**140**	**180**	**170**	**110**	**160**	**190**	**120**	**120**	100 U

Table 4.2-2
Maulsby Marsh Surface Sediment Chemistry Results Summary

Task	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012
Location ID	MS010	MS010	MS011	MS012	MS013	MS014	MS015	MS016	MS017	MS018
Sample ID	MS010-SS-120515	MS110-SS-120515	MS011-SS-120515	MS012-SS-120515	MS013-SS-120515	MS014-SS-120515	MS015-SS-120515	MS016-SS-120515	MS017-SS-120515	MS018-SS-120515
Sample Date	05/15/2012	05/15/2012	05/15/2012	05/15/2012	05/15/2012	05/15/2012	05/15/2012	05/15/2012	05/15/2012	05/15/2012
Sample Depth	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm
Sample Type	N	FD	N	N	N	N	N	N	N	N
Matrix	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE
Conventional Parameters (mg/kg)										
Ammonia	100	95.6	20.8	155	107	204	121	129	117	130
Sulfide	2030	1750	8.88 U	2180	1520	4450	2130	702	2450	2960
Conventional Parameters (pct)										
Total organic carbon	11.8	15.7	31.5	22.6	18.8	16.9	14.3	19.6	21.8	18
Total solids	10.6	10.4	9.8	9.7	9.3	9.8	10.3	12.4	8.4	11.7
Total solids (preserved)	10.5	10.7	11	10.5	9.6	10.8	11	11	7.4	11.1
Grain Size (pct)										
Gravel	11.4	2.6	23.6	21.3	23.6	6.9	16.2	17.3	19.6	16.8
Sand, very coarse	9.5	14.2	17.8	11	11.6	13.4	11.3	14	14.3	8.7
Sand, coarse	7.1	9.4	14.5	5.9	7.1	10.3	7.5	10.4	11.5	4.6
Sand, medium	5.8	6.5	11.7	4.1	3.7	7	4.8	7.2	8.2	3.3
Sand, fine	4.7	5	7.4	2.8	4.2	4.9	2.7	4.5	5.3	2.8
Sand, very fine	3.8	3.8	4.6	1.9	1.8	3.2	1.5	2.8	3.4	2.1
Silt, coarse	8.1	2.4	0.2	4.9	4.2	1.9	2.1	0.2	0.7	1.8
Silt, medium	14.5	9.5	1.6	18.9	12.9	7.7	11.8	8.5	3.4	17.7
Silt, fine	8.1	9.5	3.7	6.5	11.6	11.9	11.9	12.9	9	12.9
Silt, very fine	8.7	15.4	4.2	4.1	6.9	12.8	12.8	9.3	8.3	7.1
Clay, coarse	2.9	5.5	3.2	1.2	2.2	4.7	4	2.1	2.4	4.6
Clay, medium	3.9	4.1	2.6	2.2	0.8	3.4	2.9	2.5	2.5	4.7
Clay, fine	11.6	12	5.1	15.2	9.3	11.8	10.5	8.2	11.4	12.9
Metals (mg/kg)										
Antimony	--	--	--	--	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--	--	--	--	--
Chromium	--	--	--	--	--	--	--	--	--	--
Copper	--	--	--	--	--	--	--	--	--	--
Lead	--	--	--	--	--	--	--	--	--	--
Mercury	--	--	--	--	--	--	--	--	--	--
Nickel	--	--	--	--	--	--	--	--	--	--
Silver	--	--	--	--	--	--	--	--	--	--
Zinc	--	--	--	--	--	--	--	--	--	--
Semivolatile Organics (µg/kg)										
4-Methylphenol (p-Cresol)	--	--	--	--	--	--	--	--	--	--
Benzoic acid	--	--	--	--	--	--	--	--	--	--
bis(2-Ethylhexyl)phthalate	--	--	--	--	--	--	--	--	--	--
Butylbenzyl phthalate	--	--	--	--	--	--	--	--	--	--
Carbazole	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--
Dimethyl phthalate	--	--	--	--	--	--	--	--	--	--

Table 4.2-2
Maulsby Marsh Surface Sediment Chemistry Results Summary

Task	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012
Location ID	**MS010**	**MS010**	**MS011**	**MS012**	**MS013**	**MS014**	**MS015**	**MS016**	**MS017**	**MS018**
Sample ID	**MS010-SS-120515**	**MS110-SS-120515**	**MS011-SS-120515**	**MS012-SS-120515**	**MS013-SS-120515**	**MS014-SS-120515**	**MS015-SS-120515**	**MS016-SS-120515**	**MS017-SS-120515**	**MS018-SS-120515**
Sample Date	**05/15/2012**	**05/15/2012**	**05/15/2012**	**05/15/2012**	**05/15/2012**	**05/15/2012**	**05/15/2012**	**05/15/2012**	**05/15/2012**	**05/15/2012**
Sample Depth	**0 - 10 cm**	**0 - 10 cm**	**0 - 10 cm**	**0 - 10 cm**	**0 - 10 cm**	**0 - 10 cm**	**0 - 10 cm**	**0 - 10 cm**	**0 - 10 cm**	**0 - 10 cm**
Sample Type	**N**	**FD**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**
Matrix	**SE**	**SE**	**SE**	**SE**	**SE**	**SE**	**SE**	**SE**	**SE**	**SE**
Di-n-butyl phthalate	--	--	--	--	--	--	--	--	--	--
Di-n-octyl phthalate	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--
Phenol	--	--	--	--	--	--	--	--	--	--
Retene	--	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)										
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--	--	--
Benzo(a)anthracene	--	--	--	--	--	--	--	--	--	--
Benzo(a)pyrene	--	--	--	--	--	--	--	--	--	--
Benzo(b,j,k)fluoranthenes	--	--	--	--	--	--	--	--	--	--
Benzo(g,h,i)perylene	--	--	--	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--	--	--
Dibenzo(a,h)anthracene	--	--	--	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-c,d)pyrene	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--	--	--	--
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 1/2)	--	--	--	--	--	--	--	--	--	--
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	--	--	--	--	--	--	--	--	--	--
Total PAH (SMS Freshwater 2013) (U = 0)	--	--	--	--	--	--	--	--	--	--
Pesticides (µg/kg)										
4,4'-DDD (p,p'-DDD)	--	--	--	--	--	--	--	--	--	--
4,4'-DDE (p,p'-DDE)	--	--	--	--	--	--	--	--	--	--
4,4'-DDT (p,p'-DDT)	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--	--	--	--
Endrin ketone	--	--	--	--	--	--	--	--	--	--
Hexachlorocyclohexane, beta- (BHC)	--	--	--	--	--	--	--	--	--	--
Sum DDD (U = 0)	--	--	--	--	--	--	--	--	--	--
Sum DDE (U = 0)	--	--	--	--	--	--	--	--	--	--
Sum DDT (U = 0)	--	--	--	--	--	--	--	--	--	--
PCB Aroclors (µg/kg)										
Aroclor 1016	--	--	--	--	--	--	--	--	--	--
Aroclor 1221	--	--	--	--	--	--	--	--	--	--
Aroclor 1232	--	--	--	--	--	--	--	--	--	--
Aroclor 1242	--	--	--	--	--	--	--	--	--	--

Table 4.2-2
Maulsby Marsh Surface Sediment Chemistry Results Summary

Task	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012	Maulsby Marsh 2012
Location ID	MS010	MS010	MS011	MS012	MS013	MS014	MS015	MS016	MS017	MS018
Sample ID	MS010-SS-120515	MS110-SS-120515	MS011-SS-120515	MS012-SS-120515	MS013-SS-120515	MS014-SS-120515	MS015-SS-120515	MS016-SS-120515	MS017-SS-120515	MS018-SS-120515
Sample Date	05/15/2012	05/15/2012	05/15/2012	05/15/2012	05/15/2012	05/15/2012	05/15/2012	05/15/2012	05/15/2012	05/15/2012
Sample Depth	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm
Sample Type	N	FD	N	N	N	N	N	N	N	N
Matrix	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE
Aroclor 1248	--	--	--	--	--	--	--	--	--	--
Aroclor 1254	--	--	--	--	--	--	--	--	--	--
Aroclor 1260	--	--	--	--	--	--	--	--	--	--
Aroclor 1262	--	--	--	--	--	--	--	--	--	--
Aroclor 1268	--	--	--	--	--	--	--	--	--	--
Total PCB aroclors (SMS Freshwater 2013) (U = 0)	--	--	--	--	--	--	--	--	--	--
Extractable Petroleum Hydrocarbons (µg/kg)										
C8-C10 Aliphatics	--	--	--	--	--	--	--	--	--	--
C10-C12 Aliphatics	--	--	--	--	--	--	--	--	--	--
C12-C16 Aliphatics	--	--	--	--	--	--	--	--	--	--
C16-C21 Aliphatics	--	--	--	--	--	--	--	--	--	--
C21-C34 Aliphatics	--	--	--	--	--	--	--	--	--	--
C8-C10 Aromatics	--	--	--	--	--	--	--	--	--	--
C10-C12 Aromatics	--	--	--	--	--	--	--	--	--	--
C12-C16 Aromatics	--	--	--	--	--	--	--	--	--	--
C16-C21 Aromatics	--	--	--	--	--	--	--	--	--	--
C21-C34 Aromatics	--	--	--	--	--	--	--	--	--	--
Total Petroleum Hydrocarbons (mg/kg)										
Diesel range hydrocarbons	--	--	--	--	--	--	--	--	--	--
Motor oil range	--	--	--	--	--	--	--	--	--	--

Table 4.2-2
Maulsby Marsh Surface Sediment Chemistry Results Summary

Notes:
Bold = Detected result
J = Estimated value
U = Compound analyzed, but not detected above detection limit
UJ = Compound analyzed, but not detected above estimated detection limit
µg = microgram
CPAH = carcinogenic polycyclic aromatic hydrocarbon
HPAH = high-molecular-weight polycyclic aromatic hydrocarbon
kg = kilogram
LPAH = low-molecular-weight polycyclic aromatic hydrocarbon
mg = milligram
ng = nanogram
OC = organic carbon
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
pct = percent
TEQ = toxic equivalency quotient

Table 4.3-1
Marine RI Investigation Sample Summary

Matrix/Sample ID	Study	Sample Type	Sample Date	Sample Depth	Conventionals	Grain Size	Metals	PCB Aroclors	PCB Congeners	PAHs	SVOCs	Dioxin Furans	Radionuclides
Surface Sediment Locations													
A2-18B-S_8/14/2008[a]	SAIC 2008	N	8/14/2008	0 – 10 cm	X			X					
A2-18B-S_9/4/2008[a]	SAIC 2008	N	9/4/2008	0 – 10 cm								X	
BW-03-SS-090602[b]	Bay Wood Products 2009	N	6/2/2009	0 – 10 cm	X							X	
BW-11-SS-090602[b]	Bay Wood Products 2009	N	6/2/2009	0 – 10 cm	X							X	
BW-53-SS-090602[b]	Bay Wood Products 2009	FD	6/2/2009	0 – 10 cm	X							X	
3SED10-A	SLR 2009	N	6/5/2009	0 – 10 cm	X	X	X	X		X	X		
3SED10-B	SLR 2009	N	6/5/2009	0 – 10 cm	X	X	X	X		X	X		
3SED10-C	SLR 2009	N	6/5/2009	0 – 10 cm	X	X	X	X		X	X		
3SED11-A	SLR 2009	N	6/3/2009	0 – 10 cm	X	X	X	X		X	X		
3SED11-B	SLR 2009	N	6/3/2009	0 – 10 cm	X	X	X	X		X	X		
3SED12-A	SLR 2009	N	6/3/2009	0 – 10 cm	X	X	X	X		X	X		
3SED12-B	SLR 2009	N	6/3/2009	0 – 10 cm	X	X	X	X		X	X		
3SED1-A	SLR 2009	N	6/3/2009	0 – 10 cm	X	X	X	X		X	X	X	
3SED1-B	SLR 2009	N	6/3/2009	0 – 10 cm	X	X	X	X		X	X	X	
3SED1-C	SLR 2009	N	6/3/2009	0 – 10 cm	X	X	X	X		X	X	X	
3SED2-A	SLR 2009	N	6/3/2009	0 – 10 cm	X	X	X	X		X	X		
3SED2-B	SLR 2009	N	6/3/2009	0 – 10 cm	X	X	X	X		X	X		
3SED2-C	SLR 2009	N	6/3/2009	0 – 10 cm	X	X	X	X		X	X		
3SED3-A	SLR 2009	N	6/4/2009	0 – 10 cm	X	X	X	X		X	X		
3SED3-B	SLR 2009	N	6/4/2009	0 – 10 cm	X	X	X	X		X	X		
3SED3-C	SLR 2009	N	6/4/2009	0 – 10 cm	X	X	X	X		X	X		
3SED4-A	SLR 2009	N	6/4/2009	0 – 10 cm	X	X	X	X		X	X		
3SED4-B	SLR 2009	N	6/4/2009	0 – 10 cm	X	X	X	X		X	X		
3SED4-C	SLR 2009	N	6/4/2009	0 – 10 cm	X	X	X	X		X	X		
3SED5-A	SLR 2009	N	6/5/2009	0 – 10 cm	X	X	X	X		X	X		

Table 4.3-1
Marine RI Investigation Sample Summary

Matrix/Sample ID	Study	Sample Type	Sample Date	Sample Depth	Conventionals	Grain Size	Metals	PCB Aroclors	PCB Congeners	PAHs	SVOCs	Dioxin Furans	Radionuclides
3SED5-B	SLR 2009	N	6/5/2009	0 – 10 cm	X	X	X	X		X	X		
3SED5-C	SLR 2009	N	6/5/2009	0 – 10 cm	X	X	X	X		X	X		
3SED6-A	SLR 2009	N	6/4/2009	0 – 10 cm	X	X	X	X		X	X		
3SED6-B	SLR 2009	N	6/4/2009	0 – 10 cm	X	X	X	X		X	X		
3SED6-C	SLR 2009	N	6/4/2009	0 – 10 cm	X	X	X	X		X	X		
3SED7-A	SLR 2009	N	6/4/2009	0 – 10 cm	X	X	X	X		X	X	X	
3SED7-B	SLR 2009	N	6/4/2009	0 – 10 cm	X	X	X	X		X	X	X	
3SED7-C	SLR 2009	N	6/4/2009	0 – 10 cm	X	X	X	X		X	X	X	
3SED8-A	SLR 2009	N	6/5/2009	0 – 10 cm	X	X	X	X		X	X	X	
3SED8-B	SLR 2009	N	6/5/2009	0 – 10 cm	X	X	X	X		X	X	X	
3SED8-C	SLR 2009	N	6/5/2009	0 – 10 cm	X	X	X	X		X	X	X	
3SED9-A	SLR 2009	N	6/4/2009	0 – 10 cm	X	X	X	X		X	X	X	
3SED9-B	SLR 2009	N	6/4/2009	0 – 10 cm	X	X	X	X		X	X	X	
3SED9-C	SLR 2009	N	6/4/2009	0 – 10 cm	X	X	X	X		X	X	X	
JW-EA01-COMP-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X	X			X	X			
JW-EA01-SS01-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X	X						X	
JW-EA01-SS02-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X	X						X	
JW-EA01-SS03-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X	X						X	
JW-EA01-SS04-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X	X						X	
JW-EA01-SS51-120507	Anchor QEA 2012 – 2014	FD	5/7/2012	0 – 10 cm	X							X	
JW-EA02-COMP-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X	X			X			X	
JW-EA02-SS05-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X							X	
JW-EA02-SS06-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X							X	
JW-EA02-SS07-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X							X	
JW-EA03-COMP-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X	X			X			X	
JW-EA03-SS11-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X							X	

Table 4.3-1
Marine RI Investigation Sample Summary

Matrix/Sample ID	Study	Sample Type	Sample Date	Sample Depth	Conventionals	Grain Size	Metals	PCB Aroclors	PCB Congeners	PAHs	SVOCs	Dioxin Furans	Radionuclides
JW-EA03-SS12-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X							X	
JW-EA04-COMP-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X	X			X			X	
JW-EA04-SS13-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X							X	
JW-EA04-SS14-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X							X	
JW-EA04-SS15-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X							X	
JW-EA04-SS16-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X							X	
JW-EA05-COMP-120509	Anchor QEA 2012 – 2014	N	5/9/2012	0 – 10 cm	X	X			X			X	
JW-EA06-COMP-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X	X			X			X	
JW-EA06-SS21-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X							X	
JW-EA06-SS22-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X							X	
JW-EA06-SS23-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X							X	
JW-EA06-SS24-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X							X	
JW-EA07-COMP-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X	X			X			X	
JW-EA07-SS25-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X							X	
JW-EA07-SS26-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X							X	
JW-EA07-SS27-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X							X	
JW-EA07-SS28-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X							X	
JW-EA08-COMP-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X	X			X	X		X	
JW-EA08-SS131-120507	Anchor QEA 2012 – 2014	FD	5/7/2012	0 – 10 cm								X	
JW-EA08-SS29-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X							X	
JW-EA08-SS30-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X							X	
JW-EA08-SS31-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X							X	
JW-EA08-SS32-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X							X	
JW-EA09-COMP-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X	X			X	X		X	
JW-EA09-SS33-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X				X			X	
JW-EA09-SS34-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X				X			X	

Table 4.3-1
Marine RI Investigation Sample Summary

Matrix/Sample ID	Study	Sample Type	Sample Date	Sample Depth	Conventionals	Grain Size	Metals	PCB Aroclors	PCB Congeners	PAHs	SVOCs	Dioxin Furans	Radionuclides
JW-EA09-SS35-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X				X			X	
JW-EA09-SS36-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X				X			X	
JW-EA09-SS37-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X				X			X	
JW-EA09-SS38-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X				X			X	
JW-EA10-COMP-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X	X				X		X	
JW-EA10-SS39-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X	X			X			X	
JW-EA10-SS40-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X	X			X			X	
JW-EA10-SS41-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X	X			X			X	
JW-EA10-SS42-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X	X			X			X	
JW-EA10-SS43-120507	Anchor QEA 2012 – 2014	N	5/7/2012	0 – 10 cm	X	X			X			X	
JW-EA10-SS90-120507	Anchor QEA 2012 – 2014	FD	5/7/2012	0 – 10 cm	X				X				
JW-EA58-COMP-120507	Anchor QEA 2012 – 2014	FD	5/7/2012	0 – 10 cm	X	X			X	X		X	
JW-SS-101-130429	Anchor QEA 2012 – 2014	N	4/29/2013	0 – 10 cm	X							X	
JW-SS-102-130429	Anchor QEA 2012 – 2014	N	4/29/2013	0 – 10 cm	X							X	
JW-SS-103-130429	Anchor QEA 2012 – 2014	N	4/29/2013	0 – 10 cm	X							X	
JW-SS-104-130429	Anchor QEA 2012 – 2014	N	4/29/2013	0 – 10 cm	X							X	
JW-SS-105-130429	Anchor QEA 2012 – 2014	N	4/29/2013	0 – 10 cm	X							X	
JW-SS-106-130429	Anchor QEA 2012 – 2014	N	4/29/2013	0 – 10 cm	X				X				
JW-SS-107-130429	Anchor QEA 2012 – 2014	N	4/29/2013	0 – 10 cm	X				X				
JW-SS-108-130429	Anchor QEA 2012 – 2014	N	4/29/2013	0 – 10 cm	X				X			X	
JW-SS-109-130429	Anchor QEA 2012 – 2014	N	4/29/2013	0 – 10 cm	X				X			X	
JW-SS-110-130429	Anchor QEA 2012 – 2014	N	4/29/2013	0 – 10 cm	X				X			X	
JW-SS-207-130429	Anchor QEA 2012 – 2014	N	4/29/2013	0 – 10 cm	X				X				
JW-SS-208-130429	Anchor QEA 2012 – 2014	N	4/29/2013	0 – 10 cm	X				X				
JW-SS-209-130429	Anchor QEA 2012 – 2014	N	4/29/2013	0 – 10 cm	X				X				
JW-SS-211-130429	Anchor QEA 2012 – 2014	N	4/29/2013	0 – 10 cm	X				X			X	

Table 4.3-1
Marine RI Investigation Sample Summary

Matrix/Sample ID	Study	Sample Type	Sample Date	Sample Depth	Conventionals	Grain Size	Metals	PCB Aroclors	PCB Congeners	PAHs	SVOCs	Dioxin Furans	Radionuclides
JW-SS-214-130429	Anchor QEA 2012 – 2014	N	4/29/2013	0 – 10 cm	X				X			X	
JW-SS-215-130429	Anchor QEA 2012 – 2014	N	4/29/2013	0 – 10 cm	X				X			X	
JW-SS-216-130429	Anchor QEA 2012 – 2014	N	4/29/2013	0 – 10 cm	X				X			X	
JW-SS-310-130429	Anchor QEA 2012 – 2014	FD	4/29/2013	0 – 10 cm	X				X			X	
JW-301-130919	Anchor QEA 2012 – 2014	N	9/19/2013	0 – 10 cm	X				X				
JW-302-130919	Anchor QEA 2012 – 2014	N	9/19/2013	1 – 10 cm	X				X				
Sediment Core Locations (Chemistry)													
JW-EA02-SC05-A-130423	Anchor QEA 2012 – 2014	N	4/23/2013	0 – 2 ft	X	X						X	
JW-EA02-SC05-B-130423	Anchor QEA 2012 – 2014	N	4/23/2013	2 – 4 ft	X	X						X	
JW-EA02-SC05-C-130423	Anchor QEA 2012 – 2014	N	4/23/2013	4 – 6 ft	X	X						X	
JW-EA02-SC05-D-130423	Anchor QEA 2012 – 2014	N	4/23/2013	6 – 7 ft	X					X	X	X	
JW-EA02-SC05-E-130423	Anchor QEA 2012 – 2014	N	4/23/2013	7 – 7.3 ft	X			X		X	X		
JW-EA02-SC105-B-130423	Anchor QEA 2012 – 2014	FD	4/23/2013	2 – 4 ft	X	X						X	
JW-EA04-SC13-A-130423	Anchor QEA 2012 – 2014	N	4/23/2013	0 – 2 ft	X	X						X	
JW-EA04-SC13-B-130423	Anchor QEA 2012 – 2014	N	4/23/2013	2 – 4 ft	X	X						X	
JW-EA04-SC13-C-130423	Anchor QEA 2012 – 2014	N	4/23/2013	4 – 6 ft	X	X						X	
JW-EA04-SC13-D-130423	Anchor QEA 2012 – 2014	N	4/23/2013	6 – 7 ft	X					X	X	X	
JW-EA04-SC13-EF-130423	Anchor QEA 2012 – 2014	N	4/23/2013	7 – 9 ft	X							X	
JW-EA06-SC21-A-130423	Anchor QEA 2012 – 2014	N	4/23/2013	0 – 2 ft	X							X	
JW-EA06-SC21-B-130423	Anchor QEA 2012 – 2014	N	4/23/2013	2 – 4 ft	X							X	
JW-EA06-SC23-A-130423	Anchor QEA 2012 – 2014	N	4/23/2013	0 – 2 ft	X	X						X	
JW-EA06-SC23-A-130426	Anchor QEA 2012 – 2014	N	4/26/2013	0 – 2 ft	X								
JW-EA06-SC23-B-130423	Anchor QEA 2012 – 2014	N	4/23/2013	2 – 4 ft	X	X						X	
JW-EA06-SC23-C-130423	Anchor QEA 2012 – 2014	N	4/23/2013	4 – 6 ft	X	X						X	
JW-EA07-SC27-A-130429	Anchor QEA 2012 – 2014	N	4/29/2013	0 – 1 ft	X	X						X	
JW-EA07-SC27-B-130429	Anchor QEA 2012 – 2014	N	4/29/2013	1 – 2 ft	X	X						X	

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Marine RI Investigation Sample Summary

Matrix/Sample ID	Study	Sample Type	Sample Date	Sample Depth	Conventionals	Grain Size	Metals	PCB Aroclors	PCB Congeners	PAHs	SVOCs	Dioxin Furans	Radionuclides
JW-EA07-SC27-C-130429	Anchor QEA 2012 – 2014	N	4/29/2013	2 – 2.6 ft	X	X						X	
JW-EA07-SC28-A-130426	Anchor QEA 2012 – 2014	N	4/26/2013	0 – 2 ft								X	
JW-EA07-SC28-B-130426	Anchor QEA 2012 – 2014	N	4/26/2013	2 – 4 ft	X							X	
JW-EA07-SC28-C-130426	Anchor QEA 2012 – 2014	N	4/26/2013	4 – 6 ft	X							X	
JW-EA09-SC138-C-130426	Anchor QEA 2012 – 2014	FD	4/26/2013	4 – 6 ft	X	X			X			X	
JW-EA09-SC36-A-130426	Anchor QEA 2012 – 2014	N	4/26/2013	0 – 2 ft	X				X			X	
JW-EA09-SC36-B-130426	Anchor QEA 2012 – 2014	N	4/26/2013	2 – 4 ft	X				X				
JW-EA09-SC36-C-130426	Anchor QEA 2012 – 2014	N	4/26/2013	4 – 6 ft	X				X				
JW-EA09-SC38-A-130426	Anchor QEA 2012 – 2014	N	4/26/2013	0 – 2 ft	X	X			X			X	
JW-EA09-SC38-B-130426	Anchor QEA 2012 – 2014	N	4/26/2013	2 – 4 ft	X	X			X			X	
JW-EA09-SC38-C-130426	Anchor QEA 2012 – 2014	N	4/26/2013	4 – 6 ft	X	X			X			X	
JW-EA10-SC42-A-130426	Anchor QEA 2012 – 2014	N	4/26/2013	0 – 2 ft	X	X			X			X	
JW-EA10-SC42-B-130426	Anchor QEA 2012 – 2014	N	4/26/2013	2 – 4 ft	X	X			X			X	
JW-EA10-SC42-C-130426	Anchor QEA 2012 – 2014	N	4/26/2013	4 – 6 ft	X	X			X			X	
JW-SC401-A-130928	Anchor QEA 2012 – 2014	N	9/28/2013	0 – 2 ft	X							X	
JW-SC401-B-130928	Anchor QEA 2012 – 2014	N	9/28/2013	2 – 4 ft	X							X	
JW-SC401-C-130928	Anchor QEA 2012 – 2014	N	9/28/2013	4 – 6 ft	X							X	
JW-SC402-A-130928	Anchor QEA 2012 – 2014	N	9/28/2013	0 – 2 ft	X							X	
JW-SC402-B-130928	Anchor QEA 2012 – 2014	N	9/28/2013	2 – 4 ft	X							X	
JW-SC402-C-130928	Anchor QEA 2012 – 2014	N	9/28/2013	4 – 6 ft	X							X	
JW-SC402-D-130928	Anchor QEA 2012 – 2014	N	9/28/2013	6 – 8 ft	X							X	
Sediment Core Location (Geochronology and Sieving)													
JW-GC1-02-04-130919	Anchor QEA 2012 – 2014	N	9/19/2013	2 – 4 cm	X								X
JW-GC1-06-08-130919	Anchor QEA 2012 – 2014	N	9/19/2013	6 – 8 cm	X								X
JW-GC1-08-10-130919	Anchor QEA 2012 – 2014	N	9/19/2013	8 – 10 cm	X								X
JW-GC1-10-12-130919	Anchor QEA 2012 – 2014	N	9/19/2013	10 – 12 cm	X								X

Table 4.3-1
Marine RI Investigation Sample Summary

Matrix/Sample ID	Study	Sample Type	Sample Date	Sample Depth	Conventionals	Grain Size	Metals	PCB Aroclors	PCB Congeners	PAHs	SVOCs	Dioxin Furans	Radionuclides
JW-GC1-14-16-130919	Anchor QEA 2012 – 2014	N	9/19/2013	14 – 16 cm	X								X
JW-GC1-18-20-130919	Anchor QEA 2012 – 2014	N	9/19/2013	18 – 20 cm	X								X
JW-GC1-20-22-130919	Anchor QEA 2012 – 2014	N	9/19/2013	20 – 22 cm	X								X
JW-GC1-22-24-130919	Anchor QEA 2012 – 2014	N	9/19/2013	22 – 24 cm	X								X
JW-GC1-26-28-130919	Anchor QEA 2012 – 2014	N	9/19/2013	26 – 28 cm	X								X
JW-GC1-30-32-130919	Anchor QEA 2012 – 2014	N	9/19/2013	30 – 32 cm	X								X
JW-GC1-32-34-130919	Anchor QEA 2012 – 2014	N	9/19/2013	32 – 34 cm	X								X
JW-GC1-34-36-130919	Anchor QEA 2012 – 2014	N	9/19/2013	34 – 36 cm	X								X
JW-GC1-38-40-130919	Anchor QEA 2012 – 2014	N	9/19/2013	38 – 40 cm	X								X
JW-GC1-42-44-130919	Anchor QEA 2012 – 2014	N	9/19/2013	42 – 44 cm	X								X
JW-GC1-44-46-130919	Anchor QEA 2012 – 2014	N	9/19/2013	44 – 46 cm	X								X
JW-GC1-46-48-130919	Anchor QEA 2012 – 2014	N	9/19/2013	46 – 48 cm	X								X
JW-GC1-50-52-130919	Anchor QEA 2012 – 2014	N	9/19/2013	50 – 52 cm	X								X
JW-GC1-54-56-130919	Anchor QEA 2012 – 2014	N	9/19/2013	54 – 56 cm	X								X
JW-GC1-56-58-130919	Anchor QEA 2012 – 2014	N	9/19/2013	56 – 58 cm	X								X
JW-GC1-58-60-130919	Anchor QEA 2012 – 2014	N	9/19/2013	58 – 60 cm	X								X
JW-GC1-62-64-130919	Anchor QEA 2012 – 2014	N	9/19/2013	62 – 64 cm	X								X
JW-GC1-68-70-130919	Anchor QEA 2012 – 2014	N	9/19/2013	68 – 70 cm	X								X
JW-GC1-74-76-130919	Anchor QEA 2012 – 2014	N	9/19/2013	74 – 76 cm	X								X
JW-GC1-80-82-130919	Anchor QEA 2012 – 2014	N	9/19/2013	80 – 82 cm	X								X
JW-GC1-84-86-130919	Anchor QEA 2012 – 2014	N	9/19/2013	84 – 86 cm	X								X
JW-GC2-02-04-130919	Anchor QEA 2012 – 2014	N	9/19/2013	2 – 4 cm	X								X
JW-GC2-06-08-130919	Anchor QEA 2012 – 2014	N	9/19/2013	6 – 8 cm	X								X
JW-GC2-08-10-130919	Anchor QEA 2012 – 2014	N	9/19/2013	8 – 10 cm	X								X
JW-GC2-10-12-130919	Anchor QEA 2012 – 2014	N	9/19/2013	10 – 12 cm	X								X

Table 4.3-1
Marine RI Investigation Sample Summary

Matrix/Sample ID	Study	Sample Type	Sample Date	Sample Depth	Conventionals	Grain Size	Metals	PCB Aroclors	PCB Congeners	PAHs	SVOCs	Dioxin Furans	Radionuclides
JW-GC2-14-16-130919	Anchor QEA 2012 – 2014	N	9/19/2013	14 – 16 cm	X								X
JW-GC2-18-20-130919	Anchor QEA 2012 – 2014	N	9/19/2013	18 – 20 cm	X								X
JW-GC2-20-22-130919	Anchor QEA 2012 – 2014	N	9/19/2013	20 – 22 cm	X								X
JW-GC2-22-24-130919	Anchor QEA 2012 – 2014	N	9/19/2013	22 – 24 cm	X								X
JW-GC2-26-28-130919	Anchor QEA 2012 – 2014	N	9/19/2013	26 – 28 cm	X								X
JW-GC2-30-32-130919	Anchor QEA 2012 – 2014	N	9/19/2013	30 – 32 cm	X								X
JW-GC2-32-34-130919	Anchor QEA 2012 – 2014	N	9/19/2013	32 – 34 cm	X								X
JW-GC2-34-36-130919	Anchor QEA 2012 – 2014	N	9/19/2013	34 – 36 cm	X								X
JW-GC2-38-40-130919	Anchor QEA 2012 – 2014	N	9/19/2013	38 – 40 cm	X								X
JW-GC2-42-44-130919	Anchor QEA 2012 – 2014	N	9/19/2013	42 – 44 cm	X								X
JW-GC2-44-46-130919	Anchor QEA 2012 – 2014	N	9/19/2013	44 – 46 cm	X								X
JW-GC2-46-48-130919	Anchor QEA 2012 – 2014	N	9/19/2013	46 – 48 cm	X								X
JW-GC2-50-52-130919	Anchor QEA 2012 – 2014	N	9/19/2013	50 – 52 cm	X								X
JW-GC2-54-56-130919	Anchor QEA 2012 – 2014	N	9/19/2013	54 – 56 cm	X								X
JW-GC2-56-58-130919	Anchor QEA 2012 – 2014	N	9/19/2013	56 – 58 cm	X								X
JW-GC2-58-60-130919	Anchor QEA 2012 – 2014	N	9/19/2013	58 – 60 cm	X								X
JW-GC2-62-64-130919	Anchor QEA 2012 – 2014	N	9/19/2013	62 – 64 cm	X								X
JW-GC2-68-70-130919	Anchor QEA 2012 – 2014	N	9/19/2013	68 – 70 cm	X								X
JW-GC2-74-76-130919	Anchor QEA 2012 – 2014	N	9/19/2013	74 – 76 cm	X								X
JW-GC2-80-82-130919	Anchor QEA 2012 – 2014	N	9/19/2013	80 – 82 cm	X								X

Table 4.3-1
Marine RI Investigation Sample Summary

Matrix/Sample ID	Study	Sample Type	Sample Date	Sample Depth	Conventionals	Grain Size	Metals	PCB Aroclors	PCB Congeners	PAHs	SVOCs	Dioxin Furans	Radionuclides
Tissue Sample Locations													
JW-DR-TISSUE-120508	Anchor QEA 2012 – 2014	N	5/8/2012	NA	X				X	X		X	
JW-EA01-TISSUE-120516	Anchor QEA 2012 – 2014	N	5/16/2012	NA	X				X	X		X	
JW-EA10-TISSUE-120516	Anchor QEA 2012 – 2014	N	5/16/2012	NA	X				X	X		X	
JW-RG-TISSUE-120508	Anchor QEA 2012 – 2014	N	5/8/2012	NA	X				X	X		X	
JW-UR-TISSUE-120508	Anchor QEA 2012 – 2014	N	5/8/2012	NA	X				X	X		X	
P-25	Anchor QEA 2012 – 2014	N	4/28/2014	NA	X				X	X		X	
P-50	Anchor QEA 2012 – 2014	N	4/28/2014	NA	X				X	X		X	
P-100	Anchor QEA 2012 – 2014	N	4/28/2014	NA	X				X	X		X	

Notes:

cm = centimeter

FD = field duplicate

ft = feet

N = normal sample

NA = not applicable

PAH = polycyclic aromatic hydrocarbon

PCB = polychlorinated biphenyl

RI = Remedial Investigation

SAIC = Science Applications International Corporation

SLR = SLR Consulting Ltd.

SVOC = semivolatile organic compound

a Only these sample locations' PCB Aroclor and dioxin furans results were evaluated.

b Only these sample locations' dioxin furans results were evaluated.

Table 4.3-2
Summary of Conventional Surface Sediment Results

	Count Results	Count Detects	Percent Detected	Min Detected Result	Max Detected Result	Average Detected Result	Average Nondetected Result
Conventional Parameters (mg/kg)							
Black carbon	20	20	100	1200	2100	1580	--
Ammonia as nitrogen	34	34	100	0.11	20.9	5.69	--
Sulfide	34	27	79.41	3.39	492	126	1.29
Conventional Parameters (pct)							
Moisture, percent	22	22	100	33.7	59.3	45.8	--
Total organic carbon	101	101	100	0.289	6.65	2.28	--
Total solids	77	77	100	37.05	87.8	59.5	--
Total solids (preserved)	34	34	100	38.4	85.4	62.9	--
Total volatile solids	34	34	100	1.69	10.53	5.23	--

Notes:
kg = kilogram
mg = milligram
pct = percent
-- = not applicable

Table 4.3-3
Summary of Grain Size Surface Sediment Results

	Count Results	Count Detects	Percent Detected	Min Detected Result	Max Detected Result	Average Detected Result	Nondetected Result
Grain Size (pct)							
Total Sand	54	54	100%	1.6	77	31.9	--
Total Silt	54	53	98%	2.5	85	43.7	NA
Total Clay	54	53	98%	0.9	20.9	9.9	NA
Total Gravel	54	54	100%	0.1	69.9	14.7	--

Notes:
pct = percent
-- = not applicable

Table 4.3-4

Summary of Metals Surface Sediment Results

	Count Results	Count Detects	Percent Detected	Min Detected Result	Max Detected Result	Average Detected Result	Average Nondetected Result
Metals (mg/kg)							
Arsenic	34	32	94.12	8	40	16.9	30
Cadmium	34	0	0	--	--	--	0.397
Chromium	34	34	100	13.3	88	45	--
Copper	34	34	100	18.4	155	50.7	--
Lead	34	30	88.24	5	31	11.8	8.5
Mercury	34	26	76.47	0.04	0.11	0.0777	0.0238
Silver	34	1	2.94	1	1	1	0.6
Zinc	34	34	100	23	214	82.2	--

Notes:

kg = kilogram

mg = milligram

-- = not applicable

Table 4.3-5
Summary of Dry Weight SVOC Surface Sediment Results

	Count Results	Count Detects	Percent Detected	Min Detected Result	Max Detected Result	Average Detected Result	Average Nondetected Result
Semivolatile Organics (µg/kg)							
1,2,4-Trichlorobenzene	34	0	0	--	--	--	8.18
1,2-Dichlorobenzene	34	0	0	--	--	--	8.18
1,3-Dichlorobenzene	34	0	0	--	--	--	8.18
1,4-Dichlorobenzene	34	0	0	--	--	--	8.18
2,4-Dimethylphenol	34	0	0	--	--	--	8.18
2-Methylphenol (o-Cresol)	34	0	0	--	--	--	8.18
4-Methylphenol (p-Cresol)	34	5	14.71	14	34	20	38.7
Benzoic acid	34	1	2.94	820	820	820	363
Benzyl alcohol	34	0	0	--	--	--	29.8
bis(2-Ethylhexyl)phthalate	34	31	91.18	12	620	101	19.3
Butylbenzyl phthalate	34	5	14.71	17	86	49.6	21
Di-n-butyl phthalate	34	3	8.82	13	35	20.7	37.4
Di-n-octyl phthalate	34	0	0	--	--	--	35.9
Dibenzofuran	34	4	11.76	12	200	62.3	38
Diethyl phthalate	34	2	5.88	19	42	30.5	36.9
Dimethyl phthalate	34	0	0	--	--	--	35.9
Hexachlorobenzene	34	1	2.94	47	47	47	7.88
Hexachlorobutadiene (Hexachloro-1,3-butadiene)	34	0	0	--	--	--	8.18
Hexachloroethane	34	0	0	--	--	--	35.9
n-Nitrosodiphenylamine	34	0	0	--	--	--	9.06
Pentachlorophenol	34	4	11.76	42	100	67.3	42.5
Phenol	34	4	11.76	14	61	36.5	38

Notes:

µg = microgram

kg = kilogram

SVOC = semivolatile organic compound

-- = not applicable

Table 4.3-6

Summary of Organic Carbon Normalized SVOC Surface Sediment Results

	Count Results	Count Detects	Percent Detected	Min Detected Result	Max Detected Result	Average Detected Result	Average Nondetected Result
Semivolatile Organics (mg/kg-OC)							
1,2,4-Trichlorobenzene	34	0	0	--	--	--	0.511
1,2-Dichlorobenzene	34	0	0	--	--	--	0.511
1,3-Dichlorobenzene	34	0	0	--	--	--	0.511
1,4-Dichlorobenzene	34	0	0	--	--	--	0.511
bis(2-Ethylhexyl)phthalate	34	31	91.18	0.752	11.789	3.88	3.92
Butylbenzyl phthalate	34	5	14.71	0.773	3.871	2.23	1.36
Di-n-butyl phthalate	34	3	8.82	0.489	1.386	0.864	2.12
Di-n-octyl phthalate	34	0	0	--	--	--	2.02
Dibenzofuran	34	4	11.76	0.302	28.05	7.49	2.12
Diethyl phthalate	34	2	5.88	1.996	4.158	3.08	2.02
Dimethyl phthalate	34	0	0	--	--	--	2.02
Hexachlorobenzene	34	1	2.94	6.851	6.851	6.85	0.494
Hexachlorobutadiene (Hexachloro-1,3-butadiene)	34	0	0	--	--	--	0.512
Hexachloroethane	34	0	0	--	--	--	2.02
n-Nitrosodiphenylamine	34	0	0	--	--	--	0.539

Notes:

µg = microgram

kg = kilogram

mg = milligram

OC = organic carbon

SVOC = semivolatile organic compound

-- = not applicable

Table 4.3-7
Summary of Dry Weight PAH Surface Sediment Results

	Count Results	Count Detects	Percent Detected	Min Detected Result	Max Detected Result	Average Detected Result	Average Nondetected Result
Polycyclic Aromatic Hydrocarbons (µg/kg)							
1-Methylnaphthalene	39	5	12.8	0.26	30	6.25	35.3
2-Methylnaphthalene	39	5	12.8	0.4	32	11.8	34.2
Acenaphthene	39	9	23.1	0.96	130	22.4	37.4
Acenaphthylene	39	10	25.6	0.62	31	9.03	38.6
Anthracene	39	21	53.9	0.59	200	48.9	41.5
Benzo(a)anthracene	39	26	66.7	1.5	260	77.8	46.2
Benzo(a)pyrene	39	27	69.2	1.6	320	59.6	48.5
Benzo(b)fluoranthene	39	28	71.8	2.1	310	84.3	47.3
Benzo(g,h,i)perylene	39	28	71.8	0.88	140	33.1	42.7
Benzo(k)fluoranthene	39	28	71.8	0.89	310	83.3	47.3
Chrysene	39	35	89.7	2.5	460	127	47.8
Dibenzo(a,h)anthracene	39	15	38.5	0.87	53	12.9	16
Fluoranthene	39	34	87.2	2.8	1300	222	50
Fluorene	39	13	33.3	0.3	230	28.4	40.8
Indeno(1,2,3-c,d)pyrene	39	21	53.9	1	130	31.4	43.6
Naphthalene	39	7	18.0	0.67	26	8.85	36.3
Phenanthrene	39	26	66.7	0.91	1800	137	46.6
Pyrene	39	34	87.2	2.4	1100	159	37.4
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	39	36	92.3	0.11	429	67	40.3
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 1/2)	39	36	92.3	2.22	429	76.5	40.3
Total cPAH TEQ (7 minimum CAEPA 2005) (U = limit)	39	36	92.3	2.26	429	86	40.3
Total HPAH (9 of 15) (U = 0)	39	37	94.9	15.7	3369	743	19.5
Total HPAH (9 of 15) (U = 1/2)	39	37	94.9	16.1	3372	799	19.5
Total HPAH (9 of 15) (U = limit)	39	37	94.9	16.5	3375	854	19.5
Total LPAH (6 of 15) (U = 0)	39	27	69.2	3.13	2273	196	45.7
Total LPAH (6 of 15) (U = 1/2)	39	27	69.2	3.56	2273	243	45.7
Total LPAH (6 of 15) (U = limit)	39	27	69.2	3.99	2273	290	45.7
Total LPAH (7 of 16) (U = 0)	39	27	69.2	3.13	2305	199	45.7

Table 4.3-7
Summary of Dry Weight PAH Surface Sediment Results

	Count Results	Count Detects	Percent Detected	Min Detected Result	Max Detected Result	Average Detected Result	Average Nondetected Result
Polycyclic Aromatic Hydrocarbons (µg/kg)							
Total LPAH (7 of 16) (U = 1/2)	39	27	69.2	3.99	2305	257	45.7
Total LPAH (7 of 16) (U = limit)	39	27	69.2	4.85	2305	315	45.7
Total PAH (15) (U = 0)	39	37	94.9	18.8	5642	886	19.5
Total PAH (15) (U = 1/2)	39	37	94.9	19.7	5645	1020	19.5
Total PAH (15) (U = limit)	39	37	94.9	20.5	5648	1150	19.5

Notes:

µg = microgram

cPAH = carcinogenic polycyclic aromatic hydrocarbon

HPAH = high-molecular-weight polycyclic aromatic hydrocarbon

kg = kilogram

LPAH = low-molecular-weight polycyclic aromatic hydrocarbon

PAH = polycyclic aromatic hydrocarbon

U = Compound analyzed, but not detected above detection limit

Total LPAH represents the sum of: naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, and anthracene.

Total HPAH represents the sum of: fluoranthene, pyrene, benz(a)anthracene, chrysene, benzo(b,j,k)fluoranthenes, benzo(a)pyrene, indeno(1,2,3,-c,d)pyrene, dibenzo(a,h)anthracene, and benzo(g,h,i)perylene.

Table 4.3-8
Summary of Organic Carbon Normalized PAH Surface Sediment Results

	Count Results	Count Detects	Percent Detected	Min Detected Result	Max Detected Result	Average Detected Result	Average Nondetected Result
Polycyclic Aromatic Hydrocarbons (mg/kg-OC)							
1-Methylnaphthalene	39	5	12.8	0.010	4.21	0.853	1.95
2-Methylnaphthalene	39	5	12.8	0.019	4.49	1.09	1.9
Acenaphthene	39	9	23.1	0.034	18.23	2.32	2.11
Acenaphthylene	39	10	25.6	0.034	4.35	0.774	2.12
Anthracene	39	21	53.9	0.033	8.56	2.27	2.37
Benzo(a)anthracene	39	26	66.7	0.083	20.97	4.33	2.66
Benzo(a)pyrene	39	27	69.2	0.089	10.80	2.91	2.78
Benzo(b)fluoranthene	39	28	71.8	0.117	29.45	4.84	2.77
Benzo(g,h,i)perylene	39	28	71.8	0.049	5.40	1.49	2.8
Benzo(k)fluoranthene	39	28	71.8	0.049	29.45	4.8	2.77
Chrysene	39	35	89.7	0.139	42.08	7.16	2.93
Dibenzo(a,h)anthracene	39	15	38.5	0.031	1.31	0.413	0.917
Fluoranthene	39	34	87.2	0.156	182.3	15.8	2.88
Fluorene	39	13	33.3	0.017	32.26	2.99	2.24
Indeno(1,2,3-c,d)pyrene	39	21	53.9	0.056	4.68	1.45	2.45
Naphthalene	39	7	18.0	0.024	2.95	0.557	2.04
Phenanthrene	39	26	66.7	0.051	252.5	13.2	2.67
Pyrene	39	34	87.2	0.133	154.3	11.4	3.1
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	39	36	92.3	0.014	19.23	3.42	3.55
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 1/2)	39	36	92.3	0.123	19.27	3.89	3.55
Total cPAH TEQ (7 minimum CAEPA 2005) (U = limit)	39	36	92.3	0.126	19.31	4.37	3.55
Total HPAH (9 of 15) (U = 0)	39	37	94.9	0.854	472.5	46.3	4.49
Total HPAH (9 of 15) (U = 1/2)	39	37	94.9	0.894	472.9	48.8	4.49
Total HPAH (9 of 15) (U = limit)	39	37	94.9	0.918	473.4	51.3	4.49
Total LPAH (6 of 15) (U = 0)	39	27	69.2	0.174	318.8	17.1	2.67
Total LPAH (6 of 15) (U = 1/2)	39	27	69.2	0.198	318.8	19.6	2.67
Total LPAH (6 of 15) (U = limit)	39	27	69.2	0.222	318.8	22.1	2.67

Table 4.3-8
Summary of Organic Carbon Normalized PAH Surface Sediment Results

	Count Results	Count Detects	Percent Detected	Min Detected Result	Max Detected Result	Average Detected Result	Average Nondetected Result
Polycyclic Aromatic Hydrocarbons (mg/kg-OC)							
Total PAH (15) (U = 0)	39	37	94.9	0.854	791.3	58.8	4.49
Total PAH (15) (U = 1/2)	39	37	94.9	1.092	791.7	65	4.49
Total PAH (15) (U = limit)	39	37	94.9	1.140	792.2	71.2	4.49

Notes:

cPAH = carcinogenic polycyclic aromatic hydrocarbon

HPAH = high-molecular-weight polycyclic aromatic hydrocarbon

kg = kilogram

LPAH = low-molecular-weight polycyclic aromatic hydrocarbon

mg = milligram

OC = organic carbon

PAH = polycyclic aromatic hydrocarbon

TEQ = toxic equivalency quotient

U = Compound analyzed, but not detected above detection limit

Total LPAH represents the sum of: naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, and anthracene.

Total HPAH represents the sum of: fluoranthene, pyrene, benz(a)anthracene, chrysene, benzo(b,j,k)fluoranthenes, benzo(a)pyrene, indeno(1,2,3,-c,d)pyrene, dibenzo(a,h)anthracene, and benzo(g,h,i)perylene.

Table 4.3-9

Summary of Dry Weight PCB Aroclor Surface Sediment Results

	Count Results	Count Detects	Percent Detected	Min Detected Result	Max Detected Result	Average Detected Result	Average Nondetected Result
PCB Aroclors (µg/kg)							
Aroclor 1016	35	0	0	--	--	--	7.44
Aroclor 1221	35	0	0	--	--	--	7.44
Aroclor 1232	35	0	0	--	--	--	7.44
Aroclor 1242	35	7	20	4.5	38	18.8	8.32
Aroclor 1248	35	2	5.71	12	15	13.5	7.65
Aroclor 1254	35	16	45.71	4.2	990	83.7	4.7
Aroclor 1260	35	10	28.57	4.1	390	48.1	6.28
Aroclor 1262	1	0	0	--	--	--	19
Aroclor 1268	1	0	0	--	--	--	19
Total PCB Aroclors (U = 0)	35	23	65.71	4.1	1380	86	5.16
Total PCB Aroclors (U = 1/2)	35	23	65.71	15.8	1530	109	5.16
Total PCB Aroclors (U = limit)	35	23	65.71	27.5	1680	133	5.16

Notes:

µg = microgram

kg = kilogram

PCB = polychlorinated biphenyl

-- = not applicable

U = Compound analyzed, but not detected above detection limit

Table 4.3-10
Summary of Organic Carbon Normalized PCB Aroclor Surface Sediment Results

	Count Results	Count Detects	Percent Detected	Min Detected Result	Max Detected Result	Average Detected Result	Average Nondetected Result
PCB Aroclors (mg/kg-OC)							
Aroclor 1016	35	0	0	--	--	--	0.617
Aroclor 1221	35	0	0	--	--	--	0.617
Aroclor 1232	35	0	0	--	--	--	0.617
Aroclor 1242	35	7	20	0.1793	3.065	1.05	0.728
Aroclor 1248	35	2	5.71	0.222	0.307	0.265	0.649
Aroclor 1254	35	16	45.71	0.1201	121.622	9.15	0.372
Aroclor 1260	35	10	28.57	0.0833	47.912	5.35	0.474
Aroclor 1262	1	0	0	--	--	--	0.772
Aroclor 1268	1	0	0	--	--	--	0.772
Total PCB Aroclors (U = 0)	35	23	65.71	0.0833	169.533	9.03	0.498
Total PCB Aroclors (U = 1/2)	35	23	65.71	0.2902	187.961	10.9	0.498
Total PCB Aroclors (U = limit)	35	23	65.71	0.4707	206.388	12.7	0.498

Notes:

kg = kilogram

mg = milligram

OC = organic carbon

PCB = polychlorinated biphenyl

-- = not applicable

U = Compound analyzed, but not detected above detection limit

Table 4.3-11
Summary of Dry Weight PCB Congener Surface Sediment Results

	Count Results	Count Detects	Percent Detected	Min Detected Result	Max Detected Result	Average Detected Result	Average Nondetected Result
PCB Congeners (ng/kg)							
PCB-001	37	36	97.3	2.63	761	67.9	2.08
PCB-002	37	37	100	0.63	126	33.9	
PCB-003	37	37	100	2.02	501	59.6	--
PCB-004	37	37	100	3.33	163	34.8	--
PCB-005	37	27	72.97	0.878	350	22.8	1.95
PCB-006	37	37	100	1.24	113	23.7	--
PCB-007	37	31	83.78	1	18.9	5.77	2.2
PCB-008	37	35	94.59	5.26	617	112	0.227
PCB-009	37	34	91.89	1.31	30.2	7.71	2.11
PCB-010	37	26	70.27	0.579	8.85	2.62	2.04
PCB-011	37	26	70.27	51.3	2640	407	54.3
PCB-012/013	37	35	94.59	2.03	83.1	20.3	2.63
PCB-014	37	20	54.05	0.373	5.28	1.82	1.36
PCB-015	37	37	100	5.44	421	105	--
PCB-016	37	37	100	4.11	452	92.9	--
PCB-017	37	37	100	4.65	434	94.9	--
PCB-018/030	37	37	100	7.71	1080	202	--
PCB-019	37	36	97.3	1.94	79.2	15.6	1.16
PCB-020/028	37	37	100	16.3	3420	554	--
PCB-021/033	37	37	100	5.95	1270	203	--
PCB-022	37	37	100	5.09	961	162	--
PCB-023	37	8	21.62	0.215	1.73	0.831	0.733
PCB-024	37	29	78.38	0.721	7.39	2.49	0.718
PCB-025	37	37	100	1.52	199	35.4	--
PCB-026/029	37	37	100	2.49	487	74.5	--
PCB-027	37	37	100	0.753	83.7	17.4	--
PCB-031	37	37	100	11.4	2870	435	--
PCB-032	37	37	100	3.7	389	75.9	--
PCB-034	37	27	72.97	0.757	19.7	3.49	0.89

Table 4.3-11
Summary of Dry Weight PCB Congener Surface Sediment Results

	Count Results	Count Detects	Percent Detected	Min Detected Result	Max Detected Result	Average Detected Result	Average Nondetected Result
PCB Congeners (ng/kg)							
PCB-035	37	33	89.19	1.94	97.8	17.4	0.9
PCB-036	37	28	75.68	1.33	33.5	5.44	0.969
PCB-037	37	37	100	7.11	821	169	--
PCB-038	37	13	35.14	0.438	2.87	1.29	0.871
PCB-039	37	25	67.57	0.922	15.4	3.8	0.789
PCB-040/071	37	37	100	6.92	1760	279	--
PCB-041	37	37	100	1.32	252	38.4	--
PCB-042	37	37	100	4.19	836	142	--
PCB-043	37	35	94.59	0.8	113	17.7	0.61
PCB-044/047/065	37	37	100	15	3710	674	--
PCB-045	37	37	100	1.81	412	57.4	--
PCB-046	37	37	100	0.663	146	21.5	--
PCB-048	37	37	100	2.53	575	91.8	--
PCB-049/069	37	37	100	10.1	2130	402	--
PCB-050/053	37	37	100	2.23	398	59.4	--
PCB-051	37	37	100	0.776	70.7	12.7	--
PCB-052	37	37	100	18.1	5760	1190	--
PCB-054	37	19	51.35	0.182	2.78	0.837	0.417
PCB-055	37	25	67.57	1.46	27.8	8.85	1.54
PCB-056	37	37	100	7.12	2060	314	--
PCB-057	37	21	56.76	0.336	6.28	2.3	1.49
PCB-058	37	30	81.08	0.374	118	13.2	0.992
PCB-059/062/075	37	37	100	1.24	236	40.7	--
PCB-060	37	37	100	3.06	1120	154	--
PCB-061/070/074/076	37	37	100	26.9	8490	1510	--
PCB-063	37	32	86.49	1	159	24.9	1.97
PCB-064	37	37	100	6.27	1440	249	--
PCB-066	37	37	100	16.2	4560	765	--
PCB-067	37	32	86.49	1.42	99.8	17.3	2.1

Table 4.3-11
Summary of Dry Weight PCB Congener Surface Sediment Results

	Count Results	Count Detects	Percent Detected	Min Detected Result	Max Detected Result	Average Detected Result	Average Nondetected Result
PCB Congeners (ng/kg)							
PCB-068	37	34	91.89	0.82	28.5	5.15	0.804
PCB-072	37	35	94.59	1.33	64.6	9.63	0.527
PCB-073	37	18	48.65	0.122	2.8	1.09	0.38
PCB-077	37	37	100	1.62	407	72.8	--
PCB-078	37	0	0	--	--	--	1.17
PCB-079	37	34	91.89	1.17	85.2	15.8	0.645
PCB-080	37	5	13.51	1.49	13.3	7.23	0.963
PCB-081	37	26	70.27	0.311	14.5	3.17	1.45
PCB-082	37	37	100	2.83	1260	230	--
PCB-083	37	36	97.3	1.48	571	107	1.1
PCB-084	37	37	100	6.19	2700	463	--
PCB-085/116	37	36	97.3	4.71	1920	299	2.22
PCB-086/087/097/108/119/125	21	21	100	173	4640	1100	--
PCB-086/087/097/109/119/125	16	16	100	15.9	7770	1680	--
PCB-088	37	4	10.81	1.08	69.2	26.4	0.967
PCB-089	37	35	94.59	1.24	76	15.7	0.434
PCB-090/101/113	37	37	100	24.5	11300	1970	--
PCB-091	37	35	94.59	3.06	1150	210	0.538
PCB-092	37	37	100	4.82	2050	374	--
PCB-093/100	37	25	67.57	1.11	30.8	7.71	0.939
PCB-094	37	32	86.49	0.464	21.8	5.81	0.574
PCB-095	37	36	97.3	11.8	4300	1030	0.725
PCB-096	37	34	91.89	0.795	34.4	8.83	0.231
PCB-098	37	18	48.65	0.598	487	63.7	0.894
PCB-099	37	37	100	14.4	5200	958	--
PCB-102	37	36	97.3	0.286	163	26.9	0.927
PCB-103	37	36	97.3	0.616	45.1	9.15	0.392
PCB-104	37	2	5.41	0.19	0.266	0.228	0.222
PCB-105	37	37	100	9.2	4180	804	--

Table 4.3-11
Summary of Dry Weight PCB Congener Surface Sediment Results

	Count Results	Count Detects	Percent Detected	Min Detected Result	Max Detected Result	Average Detected Result	Average Nondetected Result
PCB Congeners (ng/kg)							
PCB-106	37	0	0	--	--	--	0.678
PCB-107	16	16	100	2.16	675	159	--
PCB-107/124	21	21	100	11.1	230	58.9	--
PCB-108/124	16	16	100	1.08	467	101	--
PCB-109	21	21	100	24.6	579	122	--
PCB-110	37	37	100	30.9	13800	2400	--
PCB-111	37	9	24.32	0.541	2.54	1.46	0.639
PCB-112	37	10	27.03	0.128	11.3	2.65	0.63
PCB-114	37	35	94.59	1.02	207	36.8	0.499
PCB-115	37	23	62.16	1.09	74	25.5	0.841
PCB-117	37	31	83.78	2.69	1540	81.3	0.961
PCB-118	37	37	100	23.7	10200	1910	--
PCB-120	37	19	51.35	0.745	31.3	7.4	0.704
PCB-121	37	0	0	--	--	--	0.594
PCB-122	37	34	91.89	1.67	74	19.7	0.691
PCB-123	37	36	97.3	0.423	169	27.5	1.9
PCB-126	37	33	89.19	0.575	14	4.47	0.546
PCB-127	37	4	10.81	1.34	4.18	2.82	0.759
PCB-128/166	37	37	100	4.62	2200	365	--
PCB-129/138/163	37	37	100	32.2	12700	2100	--
PCB-130	37	37	100	2.42	846	141	--
PCB-131	37	36	97.3	1.32	195	29.7	0.342
PCB-132	37	37	100	10.6	3980	633	--
PCB-133	37	36	97.3	0.811	120	26	0.289
PCB-134	37	37	100	1.52	662	110	--
PCB-135/151	37	37	100	10.7	2240	459	--
PCB-136	37	37	100	3.36	1110	195	--
PCB-137	37	37	100	1.8	908	116	--
PCB-139/140	37	36	97.3	1.83	246	39.4	0.301

Table 4.3-11
Summary of Dry Weight PCB Congener Surface Sediment Results

	Count Results	Count Detects	Percent Detected	Min Detected Result	Max Detected Result	Average Detected Result	Average Nondetected Result
PCB Congeners (ng/kg)							
PCB-141	37	37	100	5.37	1650	284	--
PCB-142	37	5	13.51	0.466	0.857	0.611	0.322
PCB-143	37	19	51.35	0.391	16.5	5.57	0.338
PCB-144	37	37	100	1.51	401	71.6	--
PCB-145	37	13	35.14	0.647	2.75	1.29	0.214
PCB-146	37	37	100	7.04	1220	239	--
PCB-147/149	37	37	100	25.2	6670	1220	--
PCB-148	37	29	78.38	0.456	8.18	2.04	0.365
PCB-150	37	26	70.27	0.484	8.71	2.25	0.205
PCB-152	37	24	64.86	0.278	10.1	2.17	0.236
PCB-153/168	37	37	100	30.8	7520	1400	--
PCB-154	37	32	86.49	1.16	57.4	14.6	0.269
PCB-155	37	0	0	--	--	--	0.179
PCB-156/157	37	37	100	2.72	1820	278	--
PCB-158	37	37	100	3.46	1350	219	--
PCB-159	37	21	56.76	1.66	32.3	9.44	0.484
PCB-160	37	7	18.92	4.59	45.8	13.9	0.198
PCB-161	37	2	5.41	1.09	1.19	1.14	0.198
PCB-162	37	34	91.89	0.482	42	8.19	0.548
PCB-164	37	37	100	2.27	682	122	--
PCB-165	37	6	16.22	0.238	1.36	0.764	0.256
PCB-167	37	37	100	1.03	468	76.1	--
PCB-169	37	1	2.7	4.02	4.02	4.02	0.853
PCB-170	37	36	97.3	5.27	1220	267	60.4
PCB-171/173	37	37	100	1.65	364	83.3	--
PCB-172	37	37	100	1.03	193	40.8	--
PCB-174	37	37	100	6.66	1020	233	--
PCB-175	37	34	91.89	1.33	43.3	11.2	0.526
PCB-176	37	37	100	0.867	123	26.5	--

Table 4.3-11
Summary of Dry Weight PCB Congener Surface Sediment Results

	Count Results	Count Detects	Percent Detected	Min Detected Result	Max Detected Result	Average Detected Result	Average Nondetected Result
PCB Congeners (ng/kg)							
PCB-177	37	37	100	4.47	609	149	--
PCB-178	37	37	100	1.78	222	45.6	--
PCB-179	37	37	100	3.27	457	92.3	--
PCB-180/193	37	37	100	14.1	2500	500	--
PCB-181	37	27	72.97	0.484	28.4	5.24	0.626
PCB-182	37	22	59.46	0.574	8.03	2.54	0.523
PCB-183	37	37	100	3.92	616	141	--
PCB-184	37	10	27.03	0.176	0.968	0.498	0.239
PCB-185	37	32	86.49	0.558	85.7	16.5	0.359
PCB-186	37	2	5.41	0.247	0.713	0.48	0.206
PCB-187	37	37	100	8.18	1210	266	--
PCB-188	37	20	54.05	0.156	1.19	0.597	0.245
PCB-189	37	37	100	0.221	54.2	11.3	--
PCB-190	37	37	100	1.02	198	44.5	--
PCB-191	37	35	94.59	1	46.5	10.9	0.342
PCB-192	37	0	0	--	--	--	0.456
PCB-194	37	36	97.3	4.11	548	125	35.3
PCB-195	37	35	94.59	1.4	215	41.7	12.8
PCB-196	37	37	100	1.64	254	54.6	--
PCB-197	37	31	83.78	0.429	15.2	2.84	0.315
PCB-198/199	37	37	100	5.34	616	145	--
PCB-200	37	35	94.59	1.65	51	14.3	0.275
PCB-201	37	37	100	0.441	71.5	15.8	--
PCB-202	37	37	100	1.31	137	35.4	--
PCB-203	37	37	100	3.11	368	89.7	--
PCB-204	37	0	0	--	--	--	0.353
PCB-205	37	34	91.89	0.669	20.7	4.84	0.715
PCB-206	37	37	100	3.98	829	96	--
PCB-207	37	36	97.3	1.34	76.8	11.6	0.755

Table 4.3-11
Summary of Dry Weight PCB Congener Surface Sediment Results

	Count Results	Count Detects	Percent Detected	Min Detected Result	Max Detected Result	Average Detected Result	Average Nondetected Result
PCB Congeners (ng/kg)							
PCB-208	37	37	100	1.17	280	30.2	--
PCB-209	37	37	100	2.31	217	39.3	--
Total PCB Congener (U = 0)	37	37	100	600.887	141209	32400	--
Total PCB Congener (U = 1/2)	37	37	100	623.191	141242	32500	--
Total PCB Congener (U = limit)	37	37	100	645.495	141276	32500	--
Total PCB Congener TEQ 2005 (Mammal) (U = 0)	37	37	100	0.001	1.751	0.504	--
Total PCB Congener TEQ 2005 (Mammal) (U = 1/2)	37	37	100	0.017	1.764	0.52	--
Total PCB Congener TEQ 2005 (Mammal) (U = limit)	37	37	100	0.033	1.776	0.535	--

Notes:
kg = kilogram
ng = nanogram
OC = organic carbon
PCB = polychlorinated biphenyl
TEQ = toxic equivalency quotient
-- = not applicable
U = Compound analyzed, but not detected above detection limit

Table 4.3-12
Summary of Organic Carbon Normalized PCB Surface Sediment Results

	Count Results	Count Detects	Percent Detected	Min Detected Result	Max Detected Result	Average Detected Result	Average Nondetected Result
PCB Congeners (µg/kg-OC)							
PCB-001	36	35	97.22	0.225	43.486	3.410	0.083
PCB-002	36	36	100	0.064	7.200	1.600	--
PCB-003	36	36	100	0.100	28.629	2.900	--
PCB-004	36	36	100	0.210	6.037	1.570	--
PCB-005	36	26	72.22	0.030	14.957	1.020	0.098
PCB-006	36	36	100	0.085	4.185	1.070	--
PCB-007	36	30	83.33	0.053	0.834	0.263	0.131
PCB-008	36	34	94.44	0.452	22.852	5.060	0.010
PCB-009	36	33	91.67	0.061	1.119	0.354	0.129
PCB-010	36	25	69.44	0.021	0.364	0.121	0.103
PCB-011	36	25	69.44	1.655	97.778	17.900	2.320
PCB-012/013	36	34	94.44	0.081	3.078	0.916	0.173
PCB-014	36	20	55.56	0.013	0.196	0.083	0.066
PCB-015	36	36	100	0.500	15.593	4.670	--
PCB-016	36	36	100	0.496	16.741	4.100	--
PCB-017	36	36	100	0.488	16.074	4.210	--
PCB-018/030	36	36	100	0.812	40.000	8.930	--
PCB-019	36	35	97.22	0.078	2.933	0.679	0.157
PCB-020/028	36	36	100	1.700	126.667	24.200	--
PCB-021/033	36	36	100	0.580	47.037	8.920	--
PCB-022	36	36	100	0.580	35.593	7.070	--
PCB-023	36	7	19.44	0.025	0.064	0.038	0.034
PCB-024	36	28	77.78	0.028	0.270	0.110	0.039
PCB-025	36	36	100	0.113	7.370	1.550	--
PCB-026/029	36	36	100	0.238	18.037	3.250	--
PCB-027	36	36	100	0.084	3.100	0.768	--
PCB-031	36	36	100	1.268	106.296	19.000	--
PCB-032	36	36	100	0.330	14.407	3.360	--
PCB-034	36	26	72.22	0.033	0.730	0.153	0.044
PCB-035	36	32	88.89	0.102	3.622	0.767	0.053
PCB-036	36	27	75	0.048	1.241	0.241	0.047
PCB-037	36	36	100	0.572	30.407	7.390	--

Table 4.3-12
Summary of Organic Carbon Normalized PCB Surface Sediment Results

	Count Results	Count Detects	Percent Detected	Min Detected Result	Max Detected Result	Average Detected Result	Average Nondetected Result
PCB Congeners (µg/kg-OC)							
PCB-038	36	12	33.33	0.024	0.106	0.061	0.040
PCB-039	36	24	66.67	0.051	0.570	0.165	0.039
PCB-040/071	36	36	100	0.472	65.185	12.000	--
PCB-041	36	36	100	0.117	9.333	1.650	--
PCB-042	36	36	100	0.295	30.963	6.110	--
PCB-043	36	35	97.22	0.032	4.185	0.768	0.084
PCB-044/047/065	36	36	100	1.080	137.407	29.200	--
PCB-045	36	36	100	0.148	15.259	2.460	--
PCB-046	36	36	100	0.064	5.407	0.921	--
PCB-048	36	36	100	0.218	21.296	3.960	--
PCB-049/069	36	36	100	0.624	78.889	17.400	--
PCB-050/053	36	36	100	0.121	14.741	2.560	--
PCB-051	36	36	100	0.040	2.619	0.550	--
PCB-052	36	36	100	1.224	213.333	51.800	--
PCB-054	36	18	50	0.010	0.103	0.036	0.021
PCB-055	36	24	66.67	0.064	1.188	0.393	0.073
PCB-056	36	36	100	0.316	76.296	13.800	--
PCB-057	36	21	58.33	0.018	0.268	0.102	0.068
PCB-058	36	29	80.56	0.020	4.917	0.577	0.048
PCB-059/062/075	36	36	100	0.101	8.741	1.750	--
PCB-060	36	36	100	0.136	41.481	6.750	--
PCB-061/070/074/076	36	36	100	1.812	314.444	66.800	--
PCB-063	36	32	88.89	0.040	5.889	1.100	0.100
PCB-064	36	36	100	0.448	53.333	10.800	--
PCB-066	36	36	100	0.904	168.889	32.900	--
PCB-067	36	31	86.11	0.057	3.696	0.778	0.111
PCB-068	36	33	91.67	0.029	1.056	0.224	0.045
PCB-072	36	34	94.44	0.054	2.393	0.417	0.048
PCB-073	36	18	50	0.006	0.126	0.051	0.018
PCB-077	36	36	100	0.076	15.074	3.180	--
PCB-078	36	0	0	--	--	--	0.053
PCB-079	36	33	91.67	0.053	3.550	0.698	0.044

Table 4.3-12
Summary of Organic Carbon Normalized PCB Surface Sediment Results

	Count Results	Count Detects	Percent Detected	Min Detected Result	Max Detected Result	Average Detected Result	Average Nondetected Result
PCB Congeners (µg/kg-OC)							
PCB-080	36	5	13.89	0.068	0.568	0.305	0.044
PCB-081	36	25	69.44	0.016	0.537	0.142	0.064
PCB-082	36	36	100	0.227	52.500	10.100	--
PCB-083	36	35	97.22	0.132	23.792	4.730	0.066
PCB-084	36	36	100	0.492	112.500	20.500	--
PCB-085/116	36	35	97.22	0.284	80.000	13.500	0.082
PCB-086/087/097/108/119/125	21	21	100	7.936	171.852	47.500	--
PCB-086/087/097/109/119/125	15	15	100	1.344	323.750	76.900	--
PCB-088	36	4	11.11	0.060	3.954	1.420	0.043
PCB-089	36	34	94.44	0.056	2.815	0.691	0.040
PCB-090/101/113	36	36	100	2.100	470.833	87.500	--
PCB-091	36	34	94.44	0.236	47.917	9.290	0.027
PCB-092	36	36	100	0.420	85.417	16.500	--
PCB-093/100	36	25	69.44	0.058	1.141	0.344	0.043
PCB-094	36	31	86.11	0.024	0.807	0.259	0.032
PCB-095	36	35	97.22	1.492	179.167	45.800	0.023
PCB-096	36	33	91.67	0.042	1.433	0.389	0.016
PCB-098	36	17	47.22	0.031	15.710	2.540	0.040
PCB-099	36	36	100	1.124	216.667	42.400	--
PCB-102	36	35	97.22	0.039	6.037	1.220	0.040
PCB-103	36	35	97.22	0.025	1.804	0.406	0.053
PCB-104	36	2	5.56	0.008	0.010	0.009	0.010
PCB-105	36	36	100	0.820	174.167	35.600	--
PCB-106	36	0	0	--	--	--	0.031
PCB-107	15	15	100	0.166	28.875	7.27	--
PCB-107/124	21	21	100	0.509	8.519	2.54	--
PCB-108/124	15	15	100	0.082	19.458	4.64	--
PCB-109	21	21	100	1.128	21.444	5.27	--
PCB-110	36	36	100	2.488	575	106	--
PCB-111	36	8	22.22	0.031	0.10855	0.0699	0.028
PCB-112	36	10	27.78	0.007	0.4829	0.122	0.028
PCB-114	36	34	94.44	0.041	8.625	1.56	0.042

Table 4.3-12
Summary of Organic Carbon Normalized PCB Surface Sediment Results

	Count Results	Count Detects	Percent Detected	Min Detected Result	Max Detected Result	Average Detected Result	Average Nondetected Result
PCB Congeners (µg/kg-OC)							
PCB-115	36	23	63.89	0.044	3.162	1.11	0.040
PCB-117	36	30	83.33	0.108	57.037	3.32	0.049
PCB-118	36	36	100	2.060	431.25	84.7	--
PCB-120	36	19	52.78	0.039	1.1593	0.336	0.030
PCB-121	36	0	0	--	--	--	0.027
PCB-122	36	33	91.67	0.088	4.625	0.887	0.039
PCB-123	36	35	97.22	0.036	7.042	1.23	0.070
PCB-126	36	32	88.89	0.023	0.5385	0.197	0.028
PCB-127	36	4	11.11	0.057	0.17863	0.117	0.034
PCB-128/166	36	36	100	0.500	91.875	16.2	--
PCB-129/138/163	36	36	100	4.240	529.167	92.8	--
PCB-130	36	36	100	0.314	35.25	6.2	--
PCB-131	36	35	97.22	0.053	8.125	1.31	0.046
PCB-132	36	36	100	1.232	165.833	28.1	--
PCB-133	36	35	97.22	0.074	5	1.15	0.014
PCB-134	36	36	100	0.205	27.583	4.88	--
PCB-135/151	36	36	100	1.040	93.333	20.3	--
PCB-136	36	36	100	0.378	46.25	8.63	--
PCB-137	36	36	100	0.213	37.833	5.14	--
PCB-139/140	36	35	97.22	0.073	10.25	1.75	0.041
PCB-141	36	36	100	0.616	68.75	12.6	--
PCB-142	36	5	13.89	0.021	3.14E-02	0.0266	0.015
PCB-143	36	18	50	0.023	0.6667	0.243	0.016
PCB-144	36	36	100	0.150	16.708	3.17	--
PCB-145	36	12	33.33	0.029	0.17188	0.0605	0.010
PCB-146	36	36	100	0.696	50.833	10.5	--
PCB-147/149	36	36	100	2.576	277.917	54	--
PCB-148	36	28	77.78	0.024	0.3272	0.0928	0.017
PCB-150	36	25	69.44	0.029	0.36292	0.102	0.010
PCB-152	36	23	63.89	0.016	0.4208	0.0985	0.011
PCB-153/168	36	36	100	2.964	313.333	61.7	--
PCB-154	36	31	86.11	0.046	2.296	0.626	0.017

Table 4.3-12
Summary of Organic Carbon Normalized PCB Surface Sediment Results

	Count Results	Count Detects	Percent Detected	Min Detected Result	Max Detected Result	Average Detected Result	Average Nondetected Result
PCB Congeners (µg/kg-OC)							
PCB-155	36	0	0	--	--	--	0.008
PCB-156/157	36	36	100	0.368	75.833	12.4	--
PCB-158	36	36	100	0.412	56.25	9.66	--
PCB-159	36	21	58.33	0.100	1.3458	0.414	0.023
PCB-160	36	7	19.44	0.209	1.5739	0.562	0.009
PCB-161	36	2	5.56	0.041	4.89E-02	0.0449	0.009
PCB-162	36	33	91.67	0.025	1.8188	0.361	0.032
PCB-164	36	36	100	0.258	28.417	5.42	--
PCB-165	36	6	16.67	0.015	5.44E-02	0.0334	0.012
PCB-167	36	36	100	0.119	19.5	3.38	--
PCB-169	36	1	2.78	0.175	0.17478	0.175	0.038
PCB-170	36	35	97.22	0.416	47.917	11.8	2.770
PCB-171/173	36	36	100	0.193	15.167	3.67	--
PCB-172	36	36	100	0.069	7.148	1.79	--
PCB-174	36	36	100	0.680	37.778	10.2	--
PCB-175	36	33	91.67	0.057	1.6037	0.491	0.035
PCB-176	36	36	100	0.076	4.556	1.17	--
PCB-177	36	36	100	0.400	22.556	6.57	--
PCB-178	36	36	100	0.185	8.222	2	--
PCB-179	36	36	100	0.331	16.926	4.04	--
PCB-180/193	36	36	100	1.064	92.593	21.9	--
PCB-181	36	26	72.22	0.030	1.1833	0.235	0.030
PCB-182	36	22	61.11	0.032	0.33458	0.108	0.026
PCB-183	36	36	100	0.364	22.815	6.16	--
PCB-184	36	10	27.78	0.009	4.03E-02	0.0225	0.011
PCB-185	36	31	86.11	0.049	3.6624	0.733	0.015
PCB-186	36	2	5.56	0.009	2.97E-02	0.0194	0.009
PCB-187	36	36	100	0.976	44.815	11.7	--
PCB-188	36	19	52.78	0.014	4.63E-02	0.0267	0.011
PCB-189	36	36	100	0.020	2.2583	0.498	--
PCB-190	36	36	100	0.103	7.667	1.96	--
PCB-191	36	34	94.44	0.044	1.7222	0.48	0.028

Table 4.3-12
Summary of Organic Carbon Normalized PCB Surface Sediment Results

	Count Results	Count Detects	Percent Detected	Min Detected Result	Max Detected Result	Average Detected Result	Average Nondetected Result
PCB Congeners (µg/kg-OC)							
PCB-192	36	0	0	--	--	--	0.021
PCB-194	36	35	97.22	0.555	20.296	5.31	1.600
PCB-195	36	34	94.44	0.184	7.963	1.8	0.582
PCB-196	36	36	100	0.222	9.407	2.35	--
PCB-197	36	30	83.33	0.023	0.563	0.126	0.017
PCB-198/199	36	36	100	0.722	24.478	6.18	--
PCB-200	36	34	94.44	0.066	1.9145	0.614	0.029
PCB-201	36	36	100	0.060	2.6481	0.679	--
PCB-202	36	36	100	0.177	5.522	1.51	--
PCB-203	36	36	100	0.420	14.348	3.81	--
PCB-204	36	0	0	--	--	--	0.016
PCB-205	36	33	91.67	0.035	0.7667	0.211	0.046
PCB-206	36	36	100	0.538	36.043	4	--
PCB-207	36	35	97.22	0.065	3.3391	0.488	0.102
PCB-208	36	36	100	0.139	12.174	1.28	--
PCB-209	36	36	100	0.312	9.274	1.71	--
Total PCB Congener (U = limit)	36	36	100	60.187	5886.485875	1430	--
Total PCB Congener TEQ 2005 (Mammal) (U = limit)	36	36	100	0.002	6.58E-02	0.0235	--
Total PCB Congener (U = 0)	36	36	100	57.865	5883.711292	1430	--
Total PCB Congener (U = 1/2)	36	36	100	59.026	5885.098583	1430	--
Total PCB Congener TEQ 2005 (Mammal) (U = 0)	36	36	100	0.000	6.49E-02	0.0221	--
Total PCB Congener TEQ 2005 (Mammal) (U = 1/2)	36	36	100	0.001	6.53E-02	0.0228	--

Notes:

µg = microgram

kg = kilogram

OC = organic carbon

PCB = polychlorinated biphenyl

TEQ = toxic equivalency quotient

-- = not applicable

U = Compound analyzed, but not detected above detection limit

Table 4.3-13
Summary of Dry Weight Dioxin/Furan Surface Sediment Results

	Count Results	Count Detects	Percent Detected	Min Detected Result	Max Detected Result	Average Detected Result	Average Nondetected Result
Dioxin Furans (ng/kg)							
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	77	61	79.22	0.101	1.8	0.456	0.243
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	77	68	88.31	0.245	6.33	1.57	0.903
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	77	69	89.61	0.541	24.3	3.01	0.915
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	77	76	98.7	1.59	401	28.9	0.569
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	77	75	97.4	1.31	124	11.4	0.691
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	77	77	100	12	7750	455	--
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	77	77	100	122	125000	4050	--
Total Tetrachlorodibenzo-p-dioxin (TCDD)	65	65	100	1.18	211	32	--
Total Pentachlorodibenzo-p-dioxin (PeCDD)	65	63	96.92	4.23	111	27.1	0.116
Total Hexachlorodibenzo-p-dioxin (HxCDD)	65	64	98.46	11.5	2760	166	4.77
Total Heptachlorodibenzo-p-dioxin (HpCDD)	65	65	100	26	5760	421	--
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	77	76	98.7	0.177	9.89	2.46	0.0773
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	77	67	87.01	0.176	6.17	1.13	0.532
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	77	68	88.31	0.455	8.1	2.04	1.13
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	77	70	90.91	0.287	34.1	3.93	1.33
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	77	68	88.31	0.3	29.9	2.88	1.33
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	77	16	20.78	0.251	1.31	0.529	0.246
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	77	73	94.81	0.5	21.5	3.28	1.16
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	77	75	97.4	2.22	1500	85.6	168
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	77	69	89.61	0.228	66.2	4.76	1.52
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	77	77	100	8.57	6230	236	--
Total Tetrachlorodibenzofuran (TCDF)	65	64	98.46	0.654	140	29.6	0.0773
Total Pentachlorodibenzofuran (PeCDF)	65	64	98.46	3.04	69.3	22.6	0.788
Total Hexachlorodibenzofuran (HxCDF)	65	64	98.46	9.06	347	54.9	3.14
Total Heptachlorodibenzofuran (HpCDF)	65	65	100	7.01	996	108	--
Total Dioxin/Furan TEQ 2005 (Mammal) (U = limit)	77	77	100	0.5793	172.497	14.7	--
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)	77	77	100	0.182	172.026	14.4	--
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	77	77	100	0.3807	172.261	14.6	--

Notes:

kg = kilogram

ng = nanogram

TEQ = toxic equivalency quotient

-- = not applicable

U = Compound analyzed, but not detected above detection limit

Table 4.3-14
Summary of Organic Carbon Normalized Dioxin/Furan Surface Sediment Results

	Count Results	Count Detects	Percent Detected	Min Detected Result	Max Detected Result	Average Detected Result	Average Nondetected Result
Dioxin Furans (µg/kg-OC)							
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	74	58	78.38	0.0070	0.067	0.020	0.010
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	74	66	89.19	0.0160	0.243	0.066	0.034
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	74	66	89.19	0.0321	0.587	0.121	0.038
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	74	73	98.65	0.0636	15.423	1.130	0.077
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	74	72	97.3	0.0618	4.769	0.445	0.050
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	74	74	100	0.9040	187.198	16.800	--
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	74	74	100	6.4000	3019.324	138.000	--
Total Tetrachlorodibenzo-p-dioxin (TCDD)	62	62	100	0.0472	8.792	1.400	--
Total Pentachlorodibenzo-p-dioxin (PeCDD)	62	60	96.77	0.1459	4.417	1.180	0.008
Total Hexachlorodibenzo-p-dioxin (HxCDD)	62	61	98.39	0.4600	106.154	6.690	0.645
Total Heptachlorodibenzo-p-dioxin (HpCDD)	62	62	100	2.4818	221.538	17.300	--
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	74	73	98.65	0.0071	0.366	0.108	0.010
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	74	65	87.84	0.0113	0.141	0.046	0.023
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	74	66	89.19	0.0268	0.264	0.086	0.044
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	74	67	90.54	0.0130	0.911	0.155	0.054
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	74	65	87.84	0.0141	0.722	0.114	0.052
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	74	16	21.62	0.0088	0.059	0.022	0.010
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	74	70	94.59	0.0235	0.519	0.132	0.055
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	74	72	97.3	0.2036	36.232	3.240	4.560
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	74	66	89.19	0.0104	1.599	0.180	0.063
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	74	74	100	0.3896	150.483	8.350	--
Total Tetrachlorodibenzofuran (TCDF)	62	61	98.39	0.0262	5.185	1.300	0.010
Total Pentachlorodibenzofuran (PeCDF)	62	61	98.39	0.1216	3.490	0.974	0.106
Total Hexachlorodibenzofuran (HxCDF)	62	61	98.39	0.4118	13.346	2.290	0.424
Total Heptachlorodibenzofuran (HpCDF)	62	62	100	0.5450	38.308	4.500	--
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)	74	74	100	0.0212	4.155	0.557	--
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	74	74	100	0.0388	4.161	0.562	--
Total Dioxin/Furan TEQ 2005 (Mammal) (U = limit)	74	74	100	0.0564	4.167	0.568	--

Notes:

µg = microgram

kg = kilogram

OC = organic carbon

TEQ = toxic equivalency quotient

-- = not applicable

U = Compound analyzed, but not detected above detection limit

Table 4.3-15
Summary of Grain Size Subsurface Sediment Results

	Count Results	Count Detects	Percent Detected	Min Detected Result	Max Detected Result	Average Detected Result	Average Nondetected Result
Grain Size (pct)							
Total Gravel	20	20	100	0.2	3.7	1.39	--
Total Sand	20	20	100	13.8	93.1	49.9	--
Total Silt	20	20	100	4.4	65.1	37.8	--
Total Clay	20	20	100	1.2	23.6	11	--

Notes:

pct = percent

-- = not applicable

Table 4.3-16
Summary of Conventional Subsurface Sediment Results

	Count Results	Count Detects	Percent Detected	Min Detected Result	Max Detected Result	Average Detected Result	Average Nondetected Result
Conventional Parameters (pct)							
Total organic carbon	39	39	100	0.305	8.78	2.23	--
Total solids	39	39	100	42.97	87.1	69.2	--

Notes:

pct = percent

-- = not applicable

Table 4.3-17

Summary of Semivolatile Organics Subsurface Sediment Results

	Count Results	Count Detects	Percent Detected	Min Detected Result	Max Detected Result	Average Detected Result	Average Nondetected Result
Semivolatile Organics (µg/kg)							
1,2,4-Trichlorobenzene	3	0	0	--	--	--	4.83
1,2-Dichlorobenzene	3	1	33.33	2.4	2.4	2.4	4.8
1,4-Dichlorobenzene	3	2	66.67	3.4	5.4	4.4	4.8
2,4-Dimethylphenol	3	2	66.67	7.3	14	10.7	19
2-Methylphenol (o-Cresol)	3	2	66.67	13	16	14.5	4.9
4-Methylphenol (p-Cresol)	3	3	100	260	1600	873	--
Benzoic acid	3	3	100	430	690	567	--
Benzyl alcohol	3	2	66.67	160	190	175	20
bis(2-Ethylhexyl)phthalate	3	3	100	25	150	98.3	--
Butylbenzyl phthalate	3	0	0	--	--	--	4.83
Di-n-butyl phthalate	3	0	0	--	--	--	19.3
Di-n-octyl phthalate	3	1	33.33	12	12	12	19.5
Dibenzofuran	3	3	100	83	290	153	--
Diethyl phthalate	3	0	0	--	--	--	48
Dimethyl phthalate	3	1	33.33	85	85	85	4.8
Hexachlorobenzene	3	0	0	--	--	--	4.83
Hexachlorobutadiene (Hexachloro-1,3-butadiene)	2	0	0	--	--	--	4.85
Hexachloroethane	3	0	0	--	--	--	19.3
n-Nitrosodiphenylamine	3	0	0	--	--	--	19.3
Pentachlorophenol	3	3	100	15	31	22.3	--
Phenol	3	3	100	160	280	210	--

Notes:

µg = microgram

kg = kilogram

-- = not applicable

Table 4.3-18

Summary of Polycyclic Aromatic Hydrocarbon Subsurface Sediment Results

	Count Results	Count Detects	Percent Detected	Min Detected Result	Max Detected Result	Average Detected Result	Average Nondetected Result
Polycyclic Aromatic Hydrocarbons (µg/kg)							
2-Methylnaphthalene	3	3	100	58	360	167	--
Acenaphthene	3	3	100	48	410	176	--
Acenaphthylene	3	2	66.67	30	140	85	20
Anthracene	3	3	100	88	160	126	--
Benzo(a)anthracene	3	3	100	110	140	123	--
Benzo(a)pyrene	3	3	100	72	89	77.7	--
Benzo(b,j,k)fluoranthenes	3	3	100	160	200	183	--
Benzo(g,h,i)perylene	3	3	100	39	60	50.3	--
Chrysene	3	3	100	200	210	203	--
Dibenzo(a,h)anthracene	3	3	100	6.8	17	11.9	--
Fluoranthene	3	3	100	430	880	620	--
Fluorene	3	3	100	83	370	188	--
Indeno(1,2,3-c,d)pyrene	3	3	100	33	37	34.7	--
Naphthalene	3	3	100	140	960	440	--
Phenanthrene	3	3	100	240	1200	590	--
Pyrene	3	3	100	400	750	553	--
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	3	3	100	108.1	128.1	115	--
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 1/2)	3	3	100	108.1	128.1	115	--
Total cPAH TEQ (7 minimum CAEPA 2005) (U = limit)	3	3	100	108.1	128.1	115	--
Total HPAH (9 of 15) (U = 0)	3	3	100	1503	2302.8	1860	--
Total HPAH (9 of 15) (U = 1/2)	3	3	100	1503	2302.8	1860	--
Total HPAH (9 of 15) (U = limit)	3	3	100	1503	2302.8	1860	--
Total LPAH (6 of 15) (U = 0)	3	3	100	709	3240	1580	--
Total LPAH (6 of 15) (U = 1/2)	3	3	100	709	3240	1580	--
Total LPAH (6 of 15) (U = limit)	3	3	100	709	3240	1580	--
Total PAH (15) (U = 0)	3	3	100	2212	5542.8	3430	--
Total PAH (15) (U = 1/2)	3	3	100	2212	5542.8	3440	--
Total PAH (15) (U = limit)	3	3	100	2212	5542.8	3440	--
PCB-205	10	3	30	1.49	8.4	5.39	0.265

Table 4.3-18
Summary of Polycyclic Aromatic Hydrocarbon Subsurface Sediment Results

	Count Results	Count Detects	Percent Detected	Min Detected Result	Max Detected Result	Average Detected Result	Average Nondetected Result
Polycyclic Aromatic Hydrocarbons (µg/kg)							
PCB-206	10	3	30	51.4	146	88.5	0.727
PCB-207	10	3	30	6.29	18.6	11.1	0.471
PCB-208	10	3	30	19.7	56.9	33.9	0.478
PCB-209	10	5	50	0.099	114	46.8	0.311
Total PCB Congener (U = limit)	10	10	100	49.1439	68802.913	11400	--
Total PCB Congener (U = 0)	10	10	100	2.52	68783.73	11300	--
Total PCB Congener (U = 1/2)	10	10	100	30.4658	68793.322	11400	--
Total PCB Congener TEQ 2005 (Mammal) (U = 0)	10	7	70	0.00000966	1	0.244	0.0193
Total PCB Congener TEQ 2005 (Mammal) (U = 1/2)	10	7	70	0.0048	1.011	0.258	0.0193
Total PCB Congener TEQ 2005 (Mammal) (U = limit)	10	7	70	0.0096	1.021	0.271	0.0193

Notes:

µg = microgram

cPAH = carcinogenic polycyclic aromatic hydrocarbon

HPAH = high-molecular-weight polycyclic aromatic hydrocarbon

kg = kilogram

LPAH = low-molecular-weight polycyclic aromatic hydrocarbon

PAH = polycyclic aromatic hydrocarbon

PCB = polychlorinated biphenyl

TEQ = toxic equivalency quotient

-- = not applicable

U = Compound analyzed, but not detected above detection limit

Total LPAH represents the sum of: naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, and anthracene.

Total HPAH represents the sum of: fluoranthene, pyrene, benz(a)anthracene, chrysene, benzo(b,j,k)fluoranthenes, benzo(a)pyrene, indeno(1,2,3,-c,d)pyrene, dibenzo(a,h)anthracene, and benzo(g,h,i)perylene.

Table 4.3-19
Summary of PCB Aroclors Subsurface Sediment Results

	Count Results	Count Detects	Percent Detected	Min Detected Result	Max Detected Result	Average Detected Result	Average Nondetected Result
PCB Aroclors (µg/kg)							
Aroclor 1016	1	0	0	--	--	--	9.8
Aroclor 1221	1	0	0	--	--	--	9.8
Aroclor 1232	1	0	0	--	--	--	9.8
Aroclor 1242	1	0	0	--	--	--	9.8
Aroclor 1248	1	1	100	28	28	28	--
Aroclor 1254	1	1	100	19	19	19	--
Aroclor 1260	1	0	0	--	--	--	24
Total PCB Aroclors (U = 0)	1	1	100	47	47	47	--
Total PCB Aroclors (U = 1/2)	1	1	100	78.6	78.6	78.6	--
Total PCB Aroclors (U = limit)	1	1	100	110.2	110.2	110	--

Notes:

µg = microgram

kg = kilogram

PCB = polychlorinated biphenyl

-- = not applicable

U = Compound analyzed, but not detected above detection limit

Table 4.3-20
Summary of PCB Congeners Subsurface Sediment Results

	Count Results	Count Detects	Percent Detected	Min Detected Result	Max Detected Result	Average Detected Result	Average Nondetected Result
PCB Congeners (ng/kg)							
PCB-001	10	4	40	1.28	35.6	15.9	0.416
PCB-002	10	10	100	0.756	41.9	9.25	--
PCB-003	10	7	70	0.483	54.5	14.8	0.643
PCB-004	10	4	40	0.263	29.4	16.7	0.37
PCB-005	10	3	30	1.2	118	40.3	0.315
PCB-006	10	4	40	0.834	22	11.8	0.278
PCB-007	10	3	30	1.46	4.79	3	0.296
PCB-008	10	5	50	0.323	74.3	28.6	0.297
PCB-009	10	3	30	2.66	6.09	4.29	0.339
PCB-010	10	2	20	0.555	1.41	0.983	0.249
PCB-011	10	3	30	214	425	295	3.63
PCB-012/013	10	4	40	3.8	31.5	16.4	0.263
PCB-014	10	3	30	1.57	2.99	2.06	0.264
PCB-015	10	5	50	0.253	126	52.7	0.27
PCB-016	10	4	40	2.29	94.5	57.3	0.549
PCB-017	10	4	40	2.47	94.6	59.3	0.419
PCB-018/030	10	7	70	0.467	229	76.9	0.377
PCB-019	10	3	30	9.32	15.6	12.7	0.531
PCB-020/028	10	4	40	9.44	615	343	0.788
PCB-021/033	10	7	70	0.335	229	73.6	0.434
PCB-022	10	4	40	3.47	177	99.2	0.4
PCB-023	10	0	0	--	--	--	0.471
PCB-024	10	3	30	1.57	2.21	1.89	0.368
PCB-025	10	4	40	0.969	34.2	19.2	0.375
PCB-026/029	10	4	40	2.36	72.2	40.3	0.378
PCB-027	10	3	30	9.45	17.3	13.5	0.352
PCB-031	10	6	60	0.429	506	184	0.675
PCB-032	10	4	40	1.87	93.1	53.7	0.297
PCB-034	10	3	30	1.68	3	2.28	0.448
PCB-035	10	4	40	1.52	25.4	13.4	0.392
PCB-036	10	3	30	3	5.92	4.06	0.414

Table 4.3-20
Summary of PCB Congeners Subsurface Sediment Results

	Count Results	Count Detects	Percent Detected	Min Detected Result	Max Detected Result	Average Detected Result	Average Nondetected Result
PCB Congeners (ng/kg)							
PCB-037	10	4	40	3.53	236	122	0.396
PCB-038	10	2	20	1.17	1.81	1.49	0.47
PCB-039	10	3	30	1.97	4.09	2.99	0.398
PCB-040/071	10	7	70	0.217	499	131	0.247
PCB-041	10	4	40	0.93	48.7	24.9	0.279
PCB-042	10	4	40	2.13	346	165	0.257
PCB-043	10	3	30	11.9	24.9	16.9	0.332
PCB-044/047/065	10	4	40	10.4	1130	672	2.56
PCB-045	10	4	40	1.32	59.2	33.3	0.262
PCB-046	10	3	30	16	32.2	22.1	0.358
PCB-048	10	4	40	1.86	126	63.1	0.234
PCB-049/069	10	4	40	4.84	1130	511	0.405
PCB-050/053	10	4	40	1.03	89.3	49.1	0.238
PCB-051	10	4	40	1.1	34.8	20.6	0.615
PCB-052	10	4	40	8.04	2130	1190	0.95
PCB-054	10	2	20	0.426	0.916	0.671	0.206
PCB-055	10	5	50	0.334	14.6	6.29	0.319
PCB-056	10	6	60	0.297	504	159	0.32
PCB-057	10	3	30	1.41	2.33	1.8	0.36
PCB-058	10	3	30	2.26	8	4.92	0.351
PCB-059/062/075	10	4	40	0.679	55.4	31	0.174
PCB-060	10	4	40	0.153	261	117	0.405
PCB-061/070/074/076	10	3	30	900	2760	1710	1.05
PCB-063	10	3	30	18.1	42.6	29.3	0.323
PCB-064	10	8	80	0.223	421	116	0.187
PCB-066	10	9	90	0.427	1260	297	0.171
PCB-067	10	3	30	9.03	21.7	14.5	0.343
PCB-068	10	3	30	4.54	12.8	8.91	0.504
PCB-072	10	3	30	8.49	23.2	16.6	0.35
PCB-073	10	1	10	2.07	2.07	2.07	0.235
PCB-077	10	3	30	49.7	138	84	0.371

Table 4.3-20
Summary of PCB Congeners Subsurface Sediment Results

	Count Results	Count Detects	Percent Detected	Min Detected Result	Max Detected Result	Average Detected Result	Average Nondetected Result
PCB Congeners (ng/kg)							
PCB-078	10	0	0	--	--	--	0.511
PCB-079	10	3	30	8.76	20.2	13.1	0.311
PCB-080	10	1	10	13.8	13.8	13.8	0.372
PCB-081	10	2	20	1.71	2.71	2.21	0.46
PCB-082	10	4	40	0.146	532	186	0.321
PCB-083	10	3	30	52.7	178	108	0.293
PCB-084	10	5	50	0.207	1100	386	0.278
PCB-085/116	10	7	70	0.142	748	149	0.22
PCB-086/087/097/108/119/125	10	6	60	0.517	3180	765	0.781
PCB-088	10	1	10	128	128	128	0.633
PCB-089	10	3	30	9.05	35.9	18.9	0.277
PCB-090/101/113	10	4	40	6.28	4510	1740	1.21
PCB-091	10	2	20	477	504	491	0.266
PCB-092	10	6	60	0.133	815	220	0.248
PCB-093/100	10	3	30	5.81	258	93.3	0.251
PCB-094	10	3	30	3.4	13.6	7.79	0.27
PCB-095	10	4	40	5.26	2630	1220	0.575
PCB-096	10	3	30	4.89	18.8	12.1	0.164
PCB-098	10	2	20	4.95	114	59.5	0.33
PCB-099	10	6	60	0.332	2210	611	0.569
PCB-102	10	2	20	24.9	29.8	27.4	0.474
PCB-103	10	3	30	5.66	20.8	15.2	0.237
PCB-104	10	1	10	0.264	0.264	0.264	0.149
PCB-105	10	6	60	0.286	2050	459	0.523
PCB-106	10	0	0	--	--	--	0.426
PCB-107/124	10	3	30	21.6	182	80.5	0.186
PCB-109	10	3	30	74.4	287	152	0.173
PCB-110	10	5	50	2.24	4830	1560	1.07
PCB-111	10	1	10	1.09	1.09	1.09	0.39
PCB-112	10	1	10	1.64	1.64	1.64	0.416
PCB-114	10	3	30	11.5	97.2	43	0.172

Table 4.3-20
Summary of PCB Congeners Subsurface Sediment Results

	Count Results	Count Detects	Percent Detected	Min Detected Result	Max Detected Result	Average Detected Result	Average Nondetected Result
PCB Congeners (ng/kg)							
PCB-115	10	3	30	23	388	156	0.192
PCB-117	10	3	30	25.9	115	57.3	0.183
PCB-118	10	4	40	3.83	4850	1740	1.14
PCB-120	10	2	20	9.46	11.9	10.7	0.211
PCB-121	10	0	0	--	--	--	0.413
PCB-122	10	3	30	6.16	49.1	23	0.198
PCB-123	10	3	30	8.32	99.8	42.1	0.175
PCB-126	10	3	30	2.15	7.48	4.48	0.216
PCB-127	10	2	20	0.563	6.02	3.29	0.22
PCB-128/166	10	7	70	0.276	890	169	0.174
PCB-129/138/163	10	4	40	7.78	5250	1800	2.12
PCB-130	10	3	30	38.1	336	152	0.236
PCB-131	10	3	30	6.94	67.9	29.6	0.233
PCB-132	10	9	90	0.525	1540	232	0.278
PCB-133	10	3	30	10.2	56.4	27.7	0.215
PCB-134	10	3	30	49.3	263	125	0.252
PCB-135/151	10	9	90	0.374	1050	177	0.261
PCB-136	10	8	80	0.304	455	87.9	0.169
PCB-137	10	3	30	22.7	261	113	0.186
PCB-139/140	10	3	30	12.1	90.4	40.8	0.2
PCB-141	10	9	90	0.247	694	108	0.253
PCB-142	10	1	10	0.94	0.94	0.94	0.246
PCB-143	10	2	20	1.95	3.52	2.74	0.224
PCB-144	10	5	50	0.113	166	46.7	0.209
PCB-145	10	2	20	0.266	1.92	1.09	0.162
PCB-146	10	7	70	0.217	559	118	0.206
PCB-147/149	10	4	40	7.5	2880	1040	1.5
PCB-148	10	3	30	0.617	3.07	1.56	0.208
PCB-150	10	3	30	0.881	3.77	2.17	0.142
PCB-152	10	3	30	0.714	3.45	1.73	0.144
PCB-153/168	10	4	40	8.8	3260	1180	1.74

Table 4.3-20
Summary of PCB Congeners Subsurface Sediment Results

	Count Results	Count Detects	Percent Detected	Min Detected Result	Max Detected Result	Average Detected Result	Average Nondetected Result
PCB Congeners (ng/kg)							
PCB-154	10	3	30	8.25	32.7	16.9	0.188
PCB-155	10	1	10	0.266	0.266	0.266	0.142
PCB-156/157	10	6	60	0.133	642	142	0.241
PCB-158	10	8	80	0.141	544	91.6	0.158
PCB-159	10	3	30	2.31	15.4	9.5	0.176
PCB-160	10	1	10	19.4	19.4	19.4	0.156
PCB-161	10	1	10	0.403	0.403	0.403	0.155
PCB-162	10	3	30	1.82	16.8	7.41	0.175
PCB-164	10	7	70	0.183	305	60.5	0.142
PCB-165	10	0	0	--	--	--	0.188
PCB-167	10	3	30	17.5	181	80.9	0.163
PCB-169	10	0	0	--	--	--	0.372
PCB-170	10	9	90	0.37	577	102	0.359
PCB-171/173	10	6	60	0.315	194	50.4	0.235
PCB-172	10	3	30	14	91.7	50.1	0.281
PCB-174	10	6	60	1.14	532	145	0.575
PCB-175	10	3	30	3.8	22.5	12.5	0.267
PCB-176	10	6	60	0.0948	59.2	16.3	0.149
PCB-177	10	9	90	0.295	318	57.6	0.379
PCB-178	10	7	70	0.125	93.5	22.7	0.237
PCB-179	10	8	80	0.36	188	40.9	0.186
PCB-180/193	10	5	50	1.99	1050	352	1.28
PCB-181	10	2	20	2.56	9.52	6.04	0.255
PCB-182	10	3	30	0.454	3.12	1.79	0.246
PCB-183	10	9	90	0.273	306	57.3	0.324
PCB-184	10	1	10	0.591	0.591	0.591	0.175
PCB-185	10	4	40	0.107	55.6	20.9	0.274
PCB-186	10	0	0	--	--	--	0.173
PCB-187	10	5	50	1.12	580	193	0.87
PCB-188	10	1	10	0.987	0.987	0.987	0.16
PCB-189	10	3	30	3.11	23.7	12.1	0.186

Table 4.3-20
Summary of PCB Congeners Subsurface Sediment Results

	Count Results	Count Detects	Percent Detected	Min Detected Result	Max Detected Result	Average Detected Result	Average Nondetected Result
PCB Congeners (ng/kg)							
PCB-190	10	6	60	0.195	93.2	26.2	0.184
PCB-191	10	3	30	3.24	22.6	13.3	0.2
PCB-192	10	0	0	--	--	--	0.294
PCB-194	10	7	70	0.303	225	56.8	0.379
PCB-195	10	5	50	0.234	81.1	29.4	0.459
PCB-196	10	6	60	0.271	99.4	30.4	0.238
PCB-197	10	3	30	1.93	7.75	4.69	0.199
PCB-198/199	10	7	70	0.353	235	60.6	0.265
PCB-200	10	3	30	5.51	25.8	15.2	0.225
PCB-201	10	3	30	6.72	30.7	18	0.209
PCB-202	10	3	30	13.9	59.8	34.6	0.231
PCB-203	10	6	60	0.221	142	41.8	0.231
PCB-204	10	0	0	--	--	--	0.232
PCB-205	10	3	30	1.49	8.4	5.39	0.265
PCB-206	10	3	30	51.4	146	88.5	0.727
PCB-207	10	3	30	6.29	18.6	11.1	0.471
PCB-208	10	3	30	19.7	56.9	33.9	0.478
PCB-209	10	5	50	0.099	114	46.8	0.311
Total PCB Congener (U = limit)	10	10	100	49.1439	68802.913	11400	--
Total PCB Congener (U = 0)	10	10	100	2.52	68783.73	11300	--
Total PCB Congener (U = 1/2)	10	10	100	30.4658	68793.322	11400	--
Total PCB Congener TEQ 2005 (Mammal) (U = 0)	10	7	70	0.00000966	1	0.244	0.0193
Total PCB Congener TEQ 2005 (Mammal) (U = 1/2)	10	7	70	0.0048	1.011	0.258	0.0193
Total PCB Congener TEQ 2005 (Mammal) (U = limit)	10	7	70	0.0096	1.021	0.271	0.0193

Notes:

kg = kilogram

ng = nanogram

PCB = polychlorinated biphenyl

TEQ = toxic equivalency quotient

-- = not applicable

U = Compound analyzed, but not detected above detection limit

Table 4.3-21
Summary of Dioxin/Furan Subsurface Sediment Results

	Count Results	Count Detects	Percent Detected	Min Detected Result	Max Detected Result	Average Detected Result	Average Nondetected Result
Dioxin Furans (ng/kg)							
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	36	23	63.89	0.116	2.43	0.811	0.112
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	36	22	61.11	0.22	8.36	2.99	0.135
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	36	24	66.67	0.113	18.5	4.84	0.141
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	36	24	66.67	0.374	327	57.2	0.144
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	36	24	66.67	0.27	82.4	16.9	0.142
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	36	32	88.89	0.26	2940	440	1.18
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	36	33	91.67	2.66	35500	2760	7.44
Total Tetrachlorodibenzo-p-dioxin (TCDD)	36	36	100	0.306	190	41.1	--
Total Pentachlorodibenzo-p-dioxin (PeCDD)	36	27	75	0.622	163	57.6	0.124
Total Hexachlorodibenzo-p-dioxin (HxCDD)	36	31	86.11	0.218	2010	293	0.193
Total Heptachlorodibenzo-p-dioxin (HpCDD)	36	32	88.89	0.754	5700	858	2.59
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	36	30	83.33	0.117	14.8	4.68	0.0993
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	36	25	69.44	0.0635	5.63	1.9	0.0856
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	36	26	72.22	0.108	15.9	4.59	0.0852
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	36	25	69.44	0.0959	26.4	5.51	0.083
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	36	24	66.67	0.103	20.3	5.1	0.0811
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	36	0	0	--	--	--	0.197
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	36	24	66.67	0.139	48.2	9.5	0.086
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	36	26	72.22	0.471	1050	144	0.126
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	36	21	58.33	0.381	31.6	7.52	0.131
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	36	25	69.44	1.56	1250	193	0.29
Total Tetrachlorodibenzofuran (TCDF)	36	30	83.33	0.559	220	53.5	0.0993
Total Pentachlorodibenzofuran (PeCDF)	36	28	77.78	0.302	301	66.8	0.0878
Total Hexachlorodibenzofuran (HxCDF)	36	28	77.78	0.0959	1400	202	0.0933
Total Heptachlorodibenzofuran (HpCDF)	36	24	66.67	1.69	2930	450	0.392
Total Dioxin only TEQ 2005 (Mammal) (U = 1/2)	36	33	91.67	0.126	78.09	13.4	0.121
Total Furan only TEQ 2005 (Mammal) (U = 1/2)	36	31	86.11	0.0397	26.7187	4.55	0.0256
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)	36	35	97.22	0.0034	104.7923	16.6	0.126
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	36	35	97.22	0.1586	104.8107	16.7	0.126
Total Dioxin/Furan TEQ 2005 (Mammal) (U = limit)	36	35	97.22	0.3129	104.8291	16.8	0.126

Notes:

kg = kilogram

ng = nanogram

TEQ = toxic equivalency quotient

-- = not applicable

U = Compound analyzed, but not detected above detection limit

Table 4.3-22
Summary of Radiochemical Subsurface Sediment Results

	Count Results	Count Detects	Percent Detected	Minimum Detected Result	Maximum Detected Result	Average Detected Result	Average Nondetected result
Conventional Parameters (pct)							
Moisture, percent	49	49	100	17.87	40.69	23.5	--
Radionuclides (pCi/g)							
Cesium 137	30	6	20	0.0645	0.258	0.153	0.0397
Lead 210	29	29	100	0.108	0.381	0.245	--

Notes:

-- = not applicable

pCi = picocuries per gram

pct = percent

Table 4.3-23
Summary of Bioaccumulation Data and BSAF Calculations for JELD-WEN Site COPCs, May 2012

	Regional	Upriver	Downriver	EA 01	EA 10	P25	P50	P100 (Mean of Duplicate)
Surface Sediment Results[a]								
Total organic carbon (TOC; percent dry wt)	2.3	2.0	2.0	2.7	1.8	1.7	2.5	1.1
Black carbon (percent dry wt)	0.12	0.13	0.14	0.18	0.14	--	--	--
Black carbon as percent of TOC	5.2%	6.5%	7.0%	6.7%	7.9%	--	--	--
Total cPAH TEQ (µg/kg dry wt; U = 1/2 DL)	3.27	2.84	2.84	3.82 J	2.58	--	--	--
Total cPAH TEQ (mg/kg TOC normalized)	0.142	0.586	0.071	0.355 J	0.77	--	--	--
Total dioxin/furan TEQ (ng/kg dry wt; U = 1/2 DL)	1.2	1.0	2.7	7.4	4.3	--	--	--
Total dioxin/furan TEQ (ng/kg TOC normalized)	52	51	135	276	236	--	--	--
Total PCB congeners (µg/kg dry wt; U = 0 DL)	6.0	2.9	9.2	14.5	69.7	25.0	50.0	100.0
Total PCB congeners (mg/kg TOC normalized)	0.26	0.14	0.46	0.54	3.66	1.44	1.99	9.09
PCB TEQ (µg/kg dry wt; U = 0)	0.00007	0.00001	0.00018	0.00001	0.00093	--	--	--
PCB TEQ (ng/kg TOC normalized)	2.87	0.35	9.10	0.48	50.98	--	--	--
Tissue (*Mya arenaria*)								
Total lipids (percent wet wt)	0.46	0.56	0.32	0.50	0.52	0.60	0.50	0.50
Total cPAH TEQ (µg/kg wet wt; U = 1/2 DL)	7.92 UJ	0.58 J	5.6 J	1.801 J	1.315 J	--	--	--
Total cPAH TEQ (mg/kg lipid normalized)	1.73 UJ	0.10 J	1.76 J	0.36 J	0.25 J	--	--	--
Total dioxin/furan TEQ (ng/kg wet wt; U = 1/2 DL)	0.108	0.098	0.089	0.127	0.230	--	--	--
Total dioxin/furan TEQ (ng/kg lipid normalized)	23	18	28	25	44	--	--	--
Total PCB congeners (µg/kg wet wt; U = 0)	0.9	1.3	1.3	4.2	2.9	2.9	3.2	7.8
Total PCB congeners (mg/kg lipid normalized)	0.20	0.23	0.41	0.85	0.56	0.49	0.64	0.79
Coplanar PCB congeners TEQ (ng/kg wet wt; U = 0)	0.0014	0.0023	0.0021	0.0022	0.0051	0.0560	0.0640	0.1420

Notes:

-- = not applicable
µg/kg = micrograms per kilogram
BSAF = Biota Sediment Accumulation Factor
cPAH = carcinogenic polycyclic aromatic hydrocarbon
DL = detection limit
J = estimated value
mg/kg = milligrams per kilogram
ng/kg = nanograms per kilogram
PCB = polychlorinated biphenyl
TEQ = toxic equivalency quotient
TOC = total organic carbon
U = Compound analyzed but not detected above detection limit
wt = weight

a Values provided by email from Nick Acklam of Washington State Department of Ecology on May 7, 2014

Table 5.2-1
Creosote/Fuel Oil Area CSM
Soil Analytical Results - cPAHs

Sample Location	Sample Label	Sample Depth (feet)	Sample Date	Carcinogenic Polynuclear Aromatic Hydrocarbons [A] (PAHs) (mg/Kg)															
				Benzo(a) anthracene		Benzo(a) pyrene		Benzo(b) fluoranthene		Benzo(k) fluoranthene		Chrysene		Dibenzo(a,h) anthracene		Indeno (1,2,3-cd) pyrene		TEQ U = 0	TEQ U = 1/2
				Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual		
GP-9	GP9-6	6.0	5/1/2006	**137**		<88.8		<88.8		<88.8		**201**		<88.8		<88.8		**16**	**78**
GP-9	GP9-12	12.0	5/1/2006	**40.1**		**26.3**		**30.6**		**17.7**		**30.2**		<6		**10.1**		**36**	**37**
GP-10	GP10-3	3.0	5/1/2006	**18.7**		**48.5**		**53.2**		**40.8**		**59.1**		<15.3		**30.0**		**63**	**64**
GP-10	GP10-11	11.0	5/1/2006	**34.5**		**20.9**		**25.0**		**13.8**		**35.4**		<7		**7.14**		**29**	**30**
GP-11	GP11-12	12.0	5/4/2006	**33.6**		**20.2**		**20.2**		**17.9**		**27.0**		<8		<8		**28**	**28**
GP-12	GP12-8	8.0	5/2/2006	**152**		**104**		**92.8**		**102**		**261**		<84.2		<84.2		**158**	**158**
GP-13	GP13-11.5	11.5	5/1/2006	<0.404		<0.404		<0.404		<0.404		<0.404		<0.404		<0.404		ND	0.31
GP-14	GP14-6	6.0	5/1/2006	**6.77**		<4.25		<4.25		<4.25		**7.83**		<4.25		<4.25		**0.76**	**3.7**
GP-15	GP15-10	10.0	5/1/2006	<0.388		<0.388		<0.388		<0.388		<0.388		<0.388		<0.388		ND	0.29
GP-16	GP16-8	8.0	5/1/2006	<0.823		<0.823		<0.823		<0.823		<0.823		<0.823		<0.823		ND	0.62
GP-17	GP17-5	5.0	5/1/2006	<0.734		<0.734		<0.734		<0.734		<0.734		<0.734		<0.734		ND	0.55
GP-18	GP18-8	8.0	5/1/2006	<0.0162		<0.0162		**0.0250**		<0.0162		**0.0164**		<0.0162		<0.0162		**0.003**	**0.014**
GP-202	GP202-7.5	7.5	9/11/2006	**299**		**177**		**176**		**173**		**661**		**33.4**		**64.7**		**258**	**258**
GP206	GP206-4.5	4.5	9/12/2006	<0.350		<0.350		<0.350		<0.350		<0.350		<0.350		<0.350		ND	0.27
GP206	GP206-8.5	8.5	9/12/2006	**453**		**237**		**229**		**172**		**411**		<47.9		**83.1**		**335**	**337**
GP213	GP213-3	3.0	9/12/2006	**5.24**		**6.96**		**5.07**		**4.3**		**14.8**		**3.34**		**6.0**		**9.5**	**9.5**
GP214	GP214-6	6.0	9/12/2006	**5.57**		**4.27**		**4.13**		**2.70**		**4.74**		**0.689**		**1.71**		**5.8**	**5.8**
MW5	MW5-8.5	8.5	10/2/2006	**0.625**		<0.394		**0.394**		<0.394		**0.603**		<0.394		<0.394		**0.11**	**0.36**
HA-322	HA-322 1 FT 2	1	9/23/2009	**0.13**		**0.2**		**0.18**		**0.059**		**0.13**		**0.039**		**0.15**		**0.26**	**0.26**
HA-322	HA-322-2 1.5 FT	1.5	9/23/2009	**0.024**		**0.023**		**0.051**		**0.0091**	J	**0.027**		**0.011**	J	**0.028**		**0.036**	**0.036**
HA-323	HA-323 1 FT2	1	9/23/2009	**0.094**		**0.12**		**0.16**		**0.036**		**0.087**		**0.031**		**0.087**		**0.16**	**0.16**
HA-326	HA-326 2 FT2	2	9/24/2009	**0.049**		**0.059**		**0.081**		**0.021**		**0.04**		**0.018**		**0.045**		**0.081**	**0.081**
HA-326	HA-326-2 2.5 FT2	2.5	9/24/2009	**0.058**		**0.054**		**0.084**		**0.022**		**0.067**		**0.014**		**0.037**		**0.076**	**0.076**
HA-327	HA-327-1.5 FT 2	1.5	10/12/2009	**0.014**		**0.017**		**0.022**	J, J8	**0.007**		**0.014**		**0.0025**		**0.0058**	J, J8	**0.022**	**0.022**
HA-327	HA-327-2.5 FT 2	2.5	10/12/2009	**0.014**		**0.016**		**0.023**	J, J8	**0.008**		**0.016**		**0.0024**		**0.006**	J, J8	**0.022**	**0.022**
HA-328	HA-328-1 FT 2	1	10/12/2009	**0.034**		**0.03**	J8	**0.049**	J8	**0.02**	J8	**0.044**		**0.0046**	J,J8	**0.013**	J8	**0.043**	**0.043**
HA-328	HA-328-2.5 FT 2	2.5	10/12/2009	**0.023**		**0.025**	J8	**0.045**	J, J8	**0.012**	J,J8	**0.027**		**0.0047**	J,J8	**0.012**	J, J8	**0.035**	**0.035**
HA-329	HA-329-1 FT 2	1	10/12/2009	**66**		**87**		**100**		**42**		**110**		**16**		**34**		**114**	**114**
HA-330	HA-330-1 FT 2	1	10/13/2009	**0.38**		**0.42**		**1.1**	J, J8	**0.36**		**0.46**		**0.08**		**0.2**	J, J8	**0.64**	**0.64**
HA-331	HA-331-2 FT 2	2	10/13/2009	**0.017**		**0.023**		**0.032**	J, J8	**0.013**		**0.015**		**0.0035**		**0.008**	J, J8	**0.031**	**0.031**
HA-332	HA-332-1 FT 2	1	10/13/2009	**0.14**		**0.17**		**0.32**		**0.094**		**0.18**		**0.013**		**0.047**		**0.23**	**0.23**
HA-333	HA-333-3FT	3	10/13/2009	**0.017**		**0.026**		**0.054**		**0.012**		**0.026**		**0.0026**		**0.011**	J	**0.036**	**0.036**
GP-605	GP-605-13.5	13.5	12/18/2013	**5.4**		**2.6**		**3.3**		**0.92**		**6.4**		**0.25**		**0.69**		**3.7**	**3.7**
GP-605	GP-605-34.5	34.5	12/18/2013	**0.0071**	J	**0.0032**	J	**0.0042**	J	**0.0012**	J	**0.013**		<0.0071		**0.00082**	J	**0.005**	**0.005**
GP-607	GP-607-24.5	24.5	12/18/2013	**0.016**		**0.023**		**0.031**		**0.0083**		**0.026**		**0.0038**	J	**0.0097**		**0.030**	**0.030**
GP-701	GP-701-5	5.0	7/9/2015	**0.0017**	J	**0.0029**	J	**0.0034**	J	<0.0064		**0.0031**	J	<0.0064		**0.0008**	J	**0.004**	**0.004**
GP-702	GP-702-4	4.0	7/9/2015	**0.058**	J	**0.085**	J	**0.13**		<0.13		**0.055**	J	**0.025**	J	**0.030**	J	**0.11**	**0.12**
GP-702	GP-702-14.5	14.5	7/9/2015	**34**		**17**		**22**		**7.0**		**26**		**1.9**		**6.2**		**24**	**24**
GP-703	703-P-8.5-9	8.5	7/21/2015	**22**		**12**		**14**		**4.8**		**24**		**1.3**		**3.5**		**17**	**17**
GP-704	704-P-13.5-14	13.5	7/21/2015	**38**		**23**		**27**		**8.6**		**35**		**2.7**		**7.2**		**32**	**32**
GP-705	GP-705-5	5.0	7/9/2015	**0.0020**	J	**0.0013**	J	**0.0016**	J	<0.0070		**0.0014**	J	<0.0070		<0.0070		**0.002**	**0.003**
GP-706	GP-706-4	4	7/8/2015	**0.0055**	J	**0.0077**	J	**0.0084**		**0.0042**	J	**0.018**		<0.0077		**0.0048**	J	**0.010**	**0.011**
GP-707	GP-707-4	4	7/6/2015	<0.0064		<0.0064		<0.0064		<0.0064		<0.0064		<0.0064		<0.0064		ND	**0.005**
GP-708	GP-708-4	4	7/8/2015	**0.017**		**0.066**		**0.081**		**0.021**		**0.027**		**0.0037**	J	**0.050**		**0.084**	**0.084**
GP-708	GP-708-6	6	7/8/2015	**0.73**	E	**5.3**	E	<0.0085		**0.51**		**0.77**	E	**0.066**		**1.8**	E	**5.6**	**5.6**
GP-709	GP-709-5	5.0	7/7/2015	**430**		**230**		**330**		**87**		**980**		**42**		**94**		**338**	**338**
GP-709	GP-709-42	42.0	7/7/2015	**180**		**110**		**140**		**41**		**130**		**15**		**38**		**153**	**153**
GP-710	GP-710-4	4.0	7/8/2015	<0.0073		<0.0073		<0.0073		<0.0073		<0.0073		<0.0073		<0.0073		ND	**0.006**
GP-710	GP-710-35	35.0	7/8/2015	<0.0072		<0.0072		<0.0072		<0.0072		<0.0072		<0.0072		<0.0072		ND	**0.005**
GP-711	GP-711-3	3.0	7/8/2015	**0.025**		**0.034**		<0.0071		<0.0071		**0.020**		<0.0071		**0.0099**		**0.038**	**0.039**
GP-711	GP-711-6	6.0	7/8/2015	**0.014**		**0.021**		**0.020**		<0.0085		**0.014**		<0.0085		**0.0074**	J	**0.043**	**0.044**
GP-712	GP-712-5	5.0	7/7/2015	**9.4**		**5.3**		**6.7**		**2.8**		**5.9**		**0.59**		**2.2**		**7.5**	**7.5**
GP-712	GP-712-8	8.0	7/7/2015	**6.1**		**3.4**		**6.2**		**5.2**		**4.2**		**0.35**		**1.2**		**5.3**	**5.3**
MW-8B	MW8B-54	54.0	8/12/2015	**0.0125**		**0.00609**	J	**0.00737**		**0.00379**	J	**0.0124**		<0.0073		**0.00187**	J	**0.009**	**0.009**
MW-9B	MW9B-35.5	35.5	8/14/2015	<0.0373		<0.0373		<0.0373		<0.0373		**0.00519**	J	<0.0373		<0.0373		**0.0001**	**0.028**
MW-10B	MW10B-35	35.0	8/13/2015	**0.00419**	J	**0.0023**	J	**0.00309**	J	**0.00115**	J	**0.0055**	J	<0.0070		**0.00082**	J	**0.003**	**0.004**
Selected Preliminary Cleanup Level (PCL)				-		-		-		-		-		-		-		0.19 d	

Notes

- indicates data not available

BOLD = Analytes detected at or above the practical quantitation limit (PQL)

<0.40 indicates not detected above the laboratory PQL of 0.40 mg/kg (milligrams per kilogram)

Gray shading indicates measured above the applicable PCL

A - Carcinogenic Polynuclear Aromatic Compounds (cPAHs) per EPA Method 8270-SIM or 8270-C

d - Selected PCL based on direct contact from MTCA table for soils less than 15 feet bgs

Table 5.2-2
Creosote/Fuel Oil Area CSM
Groundwater Analytical Results - Naphthalene

Sample Location	Sample Label	Sample Date	VOCs [A] (µg/L)	
			Naphthalene	
			Value	Qual
GP-9	GP9-GW	5/1/2006	**17,400**	
GP-10	GP10-GW	5/1/2006	**13,800**	
GP-12	GP12-GW	5/2/2006	<2.00	
GP-13	GP13-GW	5/1/2006	<2.00	
GP-14	GP14-GW	5/1/2006	**800**	
GP-201	GP201-GW	9/11/2006	<2.00	
GP-202	GP202-P	9/11/2006	**11,500**	
GP-204	GP204-GW	9/11/2006	<2.00	
GP-205	GP205-GW	9/12/2006	<2.00	
GP-207	GP207-GW	9/12/2006	**12,800**	
GP-208	GP208-GW	9/12/2006	**11,400**	
GP-209	GP209-GW	9/12/2006	<2.00	
GP-211	GP211-GW	9/12/2006	<2.00	
GP-214	GP214-GW	9/12/2006	**7,140**	
GP-215	GP215-GW	9/12/2006	**474**	
MW-5	MW5-1106	11/14/2006	**11.1**	
MW-5	MW5-407	4/19/2007	**7.92**	
HA-328	HA-328-GW	10/12/2009	**0.035**	J
HA-329	HA-329-GW	10/13/2009	**4,200**	
GP-701	GP-701-GW	7/9/2015	**0.35**	J
GP-702	GP-702-GW	7/9/2015	**63**	
GP-703	GP-703-P-W	7/21/2015	**140**	B
GP-704	GP-704-P-W	7/21/2015	**6,900**	B
GP-705	GP-705-GW	7/9/2015	**4.2**	
GP-706	GP-706-GW	7/8/2015	**1.9**	
GP-707	GP-707-GW	7/6/2015	<0.50	
GP-708	GP-708-GW	7/8/2015	**7,000**	
GP-709	GP-709-GW	7/7/2015	**8,400**	J4
GP-710	GP-710-GW	7/8/2015	**6,600**	
GP-711	GP-711-GW	7/8/2015	**7,700**	
GP-712	GP-712-GW	7/7/2015	**2,100**	J4
SLR Quarterly Monitoring Well Sampling (Highest Measured Value Shown) [x]				
MW-5	MW-5-GW	6/29/2017	**1,100**	
MW-8A	MW-8A-GW	10/24/2018	**14,400**	
MW-8B	MW-8B-GW	10/24/2018	**15,900**	
MW-9A	MW-9A-GW	9/10/2015	**4.52**	
MW-9B	MW-9B-GW	9/10/2015	**0.811**	
MW-10A	MW-10A-GW	1/17/2019	**9,900**	
MW-10B	MW-10B-GW	6/18/2017	**1,880**	
Selected Preliminary Cleanup Level (PCL)			8.9	v

Notes

- indicates data not available

BOLD = Analytes detected at or above the practical quantitation limit (PQL)

<0.40 indicates not detected above the laboratory PQL of 0.40 µg/L (micrograms per Lit

Only those analytes measured above laboratory MDL are included

Gray shading indicates measured above the applicable PCL

A - Total Petroleum Hydrocarbons (TPH) per NWTPH-Dx Method

B - Full quarterly groundwater monitoring results included in Appendix G.

v - Selected PCL based on vapor intrusion from MTCA table

Table 5.2-3
Creosote/Fuel Oil Area CSM
Soil Gas Analytical Results

Sample Location	Sample Label	Sample Date	Soil Gas (µg/m^3)			
			Benzene		Naphthalene	
			Value	Qual	Value	Qual
GP-708	GP-708-SG	7/7/2015	**12**		**69**	
GP-709	GP-709-SG	7/6/2015	**8.7**		**800**	D
GP-710	GP-710-SG	7/7/2015	<0.70		**53**	
GP-711	GP-711-SG	7/7/2015	**1.5**		**55**	
GP-712	GP-712-SG	7/7/2015	**17**		**89**	
GP-713	GP-713-SG	7/6/2015	**31**		**3,100**	
GP-714	GP-714-SG	7/6/2015	**90**		**81**	
GP-715	GP-715-SG	7/6/2015	**2.2**		**61**	
MW-8A	MW8A-SG	7/7/2015	**58**		**2,600**	D
Selected Preliminary Cleanup Level (PCL)			11	m	2.5	m

Notes

- indicates Not Sampled or Not Analyzed for specific constituent

BOLD = Analytes detected at or above the practical quantitation limit (PQL)

<0.70 indicates not detected above the laboratory PQL of 0.7 micrograms per cubic meter (µg/m3)

Gray shading indicates measured above the applicable PCL

m - Selected PCL based on Method B Sub-Slab Soil Gas Screening Level from MTCA table

Table 5.3-1
Woodlife CSM
Soil Analytical Results - Dioxins/Furans

Sample Location	Sample Label	Sample Depth (feet)	Sample Date	Dioxins and Furans [A] (pg/g)																																			
				2,3,7,8-Tetra CDD		1,2,3,7,8-Penta CDD		1,2,3,4,7,8-Hexa CDD		1,2,3,6,7,8-Hexa CDD		1,2,3,7,8,9-Hexa CDD		1,2,3,4,6,7,8-Hepta CDD		Octa CDD		2,3,7,8-Tetra CDF		1,2,3,7,8-Penta CDF		2,3,4,7,8-Penta CDF		1,2,3,4,7,8-Hexa CDF		1,2,3,6,7,8-Hexa CDF		2,3,4,6,7,8-Hexa CDF		1,2,3,7,8,9-Hexa CDF		1,2,3,4,6,7,8-Hepta CDF		1,2,3,4,7,8,9-Hepta CDF		Octa CDF		U = 0	U = 0.5
				Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Value
GP-302	GP-302-1	1.0	5/20/2009	**18.4**		**315**		**1,110**		**5,880**		**2,200**		**156,000**	E	**1,080,000**	E	**41.2**		**190**		**208**		**1,570**		**1,610**		**918**		**43.3**		**42,000**		**2,340**		**284,000**	E	**4,151**	**4,151**
401-P	401-P	2.0	5/17/2012	**0.228**	J	**1.15**	J	**2.48**	K	**34.5**		**7.5**		**792**		**7,710**	E	**0.707**	K	**2.57**		**6.2**		**12.2**		**4.66**		**7.4**		**5.71**	K	**154**		**8.88**	K	**435**		**23**	**23**
402-P	402-P	3.0	5/17/2012	**2.82**		**7.36**		**7.96**		**18.8**		**12.8**		**198**		**1,580**		**5.47**		**3.78**		**5.7**		**5.18**	J, G	**4.46**		**3.78**		**1.71**	K	**38.3**		**3.04**	K	**133**		**21**	**21**
403-P	403-P	3.0	5/17/2012	**1.61**		**13.6**		**57.1**		**377**		**87.7**		**9,600**	E	**105,000**	E	**3.37**	K	**10.2**		**21.9**		**74.3**		**55.4**		**75.1**		<2.7		**2,110**		**129**		**7,260**	E	**247**	**247**
GP-501	GP-501-1	1.0	3/14/2013	**8.64**		**111**		**433**		**70,000**	E	**4,220**		**959,000**	S,E	**5,500,000**	E	**1,480**	E	**3,630**		**7,500**	E	**15,500**	E	**3,080**		**6,140**	E	**2,720**		**199,000**	E	**24,700**	E	**1,680,000**	E	**26,817**	**26,817**
GP-501	GP-501-5	5.0	3/14/2013	<0.138		**0.654**	J	**1.48**	J	**174**		**10.6**		**3,890**		**36,700**	E	**7.07**		**24.8**		**61.1**		**112**		**23.5**		**36**		**15.8**		**671**		**36.9**		**1,460**		**115**	**115**
GP-503	GP-503-1	1.0	3/13/2013	**12.2**		**190**		**931**		**20,500**	E	**3,060**		**624,000**	E	**4,550,000**	E	**20.2**		**110**		**933**		**3,380**		**1,220**		**2,020**		<14.2		**98,500**	E	**7,150**	E	**503,000**	E	**12,411**	**12,412**
GP-503	GP-503-3	3.0	3/13/2013	**3.18**		**5.85**		**8.28**		**67.8**		**13.5**		**1,970**		**22,600**	E	**21.9**		**8.71**		**16.5**		**14**		**8.13**		**11.9**		**2.74**	J	**340**		**22.9**		**1,680**		**60**	**60**
GP-503	GP-503-5	5.0	3/13/2013	<0.319		<0.384		<0.485		**5.15**		**0.889**	EMPC, J	**183**		**2,240**		<0.258		<0.267		<0.25		**0.811**	EMPC, J	<0.258		**0.443**	EMPC, J	<0.317		**28.2**		**2.4**	J	**158**		**3.6**	**4.0**
GP-504	GP-504-1	1.0	3/13/2013	**0.611**		**5.19**		**49.5**		**66**		**23.8**		**2,460**		**27,100**	E	**0.546**		**2.33**	J	**3.61**		**10.7**		**10.5**		**13.3**		<1.06		**269**		**18.2**		**602**		**60**	**60**
GP-505	GP-505-1	1.0	3/13/2013	**1.93**		**15.8**		**62.3**		**367**		**116**		**13,400**	E	**199,000**	E	**3.57**		**11.2**		**26.2**		**99.4**		**87.6**		**128**		**12.6**		**2,100**		**186**		**5,890**		**332**	**332**
GP-505	GP-505-3	3.0	3/13/2013	**0.351**	J	**0.664**	J	<0.398		**1.61**	J	<0.415		**46.4**		**542**		**0.652**		<0.326		<0.309		**0.262**	EMPC, J	**0.232**	EMPC, J	<0.249		<0.288		**6.88**		**0.495**	EMPC, J	**38.4**		**2.0**	**2.1**
GP-506	GP-506-1	1.0	3/13/2013	**0.252**	EMPC, J	**1.66**	J	**4.74**		**22.4**		**8.86**		**669**		**8,040**		**0.937**		**1.23**	J	**2.46**		**5.5**		**5.17**		**6.51**		<0.556		**90.9**		**6.44**		**217**		**18**	**18**
GP-507	GP-507-1	1.0	3/13/2013	<1.44		**9.62**		**24.2**		**196**		**93**		**4,960**	E	**51,300**	E	**4.82**		**9.94**		**21.6**		**47.4**		**28.9**		**40.2**		**5.04**		**683**		**42.7**		**1,510**		**133**	**134**
GP-507	GP-507-3	3.0	3/13/2013	<0.279		<0.285		<0.331		<0.307		<0.333		**11.4**		**99.4**		<0.224		<0.274		<0.276		<0.177		<0.168		<0.204		<0.21		**1.71**	J	<0.316		**4.59**	J	**0.16**	**0.59**
GP-508	GP-508-1	1.0	3/13/2013	**3.11**		**5.06**		**4.25**		**7.88**		**5.72**		**76.5**		**296**		**15.8**		**6.29**		**9.84**		**3.36**	EMPC, J, L	**3.67**		**4.17**		<0.476		**17.2**		**1.38**	EMPC, J	**33.1**		**17**	**17**
GP-508	GP-508-3	3.0	3/14/2013	**1.64**		**9.61**		**10**		**19.3**		**12.8**		**74**		**88.6**		**6.11**		**9.66**		**12.1**		**35**	EMPC, J	**24.2**		**12.8**		<0.449		**158**		**9.56**		**52**		**30**	**30**
GP-510	GP-510-1	1.0	3/13/2013	<0.247		<0.31		<0.448		**1.55**	J	<0.452		**46.8**		**467**		<0.239		<0.292		<0.295		<0.28		<0.267		<0.304		<0.333		**9.91**		<0.293		**35.4**		**0.87**	**1.3**
GP-510	GP-510-3	3.0	3/13/2013	**1.09**		**2.2**	J	**1.76**	J	**3.19**	L, EMPC	**2.02**	EMPC, J	**44.8**		**246**		**3.42**		**1.64**	J	**2.65**		**1.15**	EMPC, J	**0.946**	EMPC, J	**1.15**	EMPC, J	<0.333		**8.01**		**0.51**	EMPC, J	**13.9**		**6.1**	**6.1**
GP-511	GP-511-1	1.0	3/13/2013	<0.271		<0.282		<0.363		**0.491**	J	<0.372		**14.4**		**190**		<0.235		<0.218		<0.202		<0.24		<0.236		<0.244		<0.337		**1.68**	J	<0.422		**5.04**		**0.27**	**0.68**
GP-512	GP-512-1	1.0	3/14/2013	**3.51**		**23.8**		**49**		**128**		**96.2**		**3,110**		**27,300**	E	**3.11**		**4.76**		**10.7**		**23.5**		**27.8**		**40**		<1.56		**641**		**43.3**		**1,660**		**114**	**114**
NTD	NTD-SED-0418	--	4/4/2018	**2.44**		**15.2**		**34.3**		**100**		**66.5**		**2,620**		**23,700**	E	**4.45**		**5.14**		**11.60**		**24.5**		**23.3**		**34.1**		<0.566		**554**		**30.8**		**1,210**		**102**	**102**
	NTD-SED-A	0-1	7/9/2018	**1.8**	EMPC	**14.7**		**32.3**		**105**		**62.2**		**2,540**		**25,300**	E	**2.74**		**6.09**		**6.84**		**26.7**		**22.4**	EMPC	**34.1**		<0.979		**479**		**32.4**		**1,180**		**98**	**98**
	NTD-SED-B	0-1	7/9/2018	**2.9**		**23.7**		**54.4**		**177**		**102**		**4,410**		**42,600**	E	**4.47**		**8.53**		**18.5**		**40.2**		**40.8**		**56.2**		<0.54		**876**		**57.5**		**2,090**		**170**	**170**
Selected Preliminary Cleanup Level (PCL)				-		-		-		-		-		-		-		-		-		-		-		-		-		-		-		-		**5.2 (back)**	

NOTES:

- indicates Not Sampled or Not Analyzed for specific constituent

BOLD = Analytes detected at or above the practical quantitation limit (PQL)

<1.2 indicates not detected above the laboratory PQL of 1.2 pg/g (picograms per gram)

A - Dioxins and Furans per EPA Method 1613

TEQ U=0 indicates Toxic Equivalent Quotient (TEQ) using Toxicity equivalency factors (TEFs) per WHO assuming Non-Detect values as 0

TEQ U=1/2 indicates TEQ using TEFs per WHO assuming Non-Detect values as 1/2 detection limit

Table 5.3-2
Woodlife Area CSM
Groundwater Analytical Results - Dioxins/Furans

Sample Location	Sample Label	Sample Date	Dioxins and Furans (pg/L) [A]																																			
			2,3,7,8-Tetra CDD		1,2,3,7,8-Penta CDD		1,2,3,4,7,8-Hexa CDD		1,2,3,6,7,8-Hexa CDD		1,2,3,7,8,9-Hexa CDD		1,2,3,4,6,7,8-Hepta CDD		Octa CDD		2,3,7,8-Tetra CDF D		1,2,3,7,8-Penta CDF		2,3,4,7,8-Penta CDF		1,2,3,4,7,8-Hexa CDF		1,2,3,6,7,8-Hexa CDF		2,3,4,6,7,8-Hexa CDF		1,2,3,7,8,9-Hexa CDF		1,2,3,4,6,7,8-Hepta CDF		1,2,3,4,7,8,9-Hepta CDF		Octa CDF		U = 0	U = 0.5
			Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Value
GP-302	GP-302-GW	5/20/2009	**2.51**	J	**13.2**	J	**25**	J	**147**		**53**		**4,630**		**50,300**	D	**4.05**	J	**12.6**	J	**15.1**	J	**38.2**	J	<58.4	F	**27.7**	J	**11.7**	J	**1,060**		**68**		**3,250**		**125**	**128**
GP-309	GP-309-GW	5/22/2009	<0.519		<0.559		<0.481		**0.888**		<0.545		**15.3**		**139**		<0.528		**0.643**		**0.712**		**0.91**		**0.679**		<0.546		<0.547		<2.2		<0.635		**3.0**		**0.68**	**1.4**
403-P	403-P-GW	5/17/2012	<10.1		<50.7		<50.7		<50.7		<50.7		**7.08**	J	**63.4**	J	<10.1		<50.7		<50.7		<50.7		<50.7		<50.7		<50.7		**2.47**	EMPC, J	<50.7		**7.8**	EMPC, J	**0.12**	**57**
GP-501	GP-501-GW	3/14/2013	**1.66**	J	**11.7**	J	**41.7**		**3,990**		**237**		**82100**	E	**742,000**	E	**213**		**628**		**1,730**		**2,330**		**562**		**842**		<11.6		**13,600**		**849**		**28,500**		**2,569**	**2,570**
GP-502	GP-502-GW	3/14/2013	<0.729		<1.01		<1.26		<1.39		<1.24		**48.7**		**1,110**		<0.662		<0.661		<0.703		<0.876		<0.853		<0.89		<1.03		**7.17**	J	<0.852		**37**	J	**0.90**	**2.3**
GP-503	GP-503-GW	3/13/2013	<0.991		<1.22		<1.01		<1.08		<1.12		**27**		**294**		<0.836		<0.879		<0.857		<0.813		<0.795		<0.883		<0.972		**4.48**	EMPC, J	<0.913		**22**	J	**0.41**	**2.0**
GP-504	GP-504-GW	3/13/2013	<0.703		<0.696		**0.758**	EMPC, J	**4.4**	J	**1.4**	EMPC, J	**219**		**2,000**		<0.563		<0.577		<0.575		**0.885**	J	<0.598		<0.685		<0.739		**19.7**	J	**3.07**	J	**156**		**3.8**	**4.7**
GP-505	GP-505-GW	3/13/2013	<2.43		<3.22		<3.11		<3.28		<3.12		**20.8**	J	**219**		<2.07		<1.87		<1.72		<2.07		<2		<2.23		<2.11		<2.63		<2.89		**8.7**	J	**0.28**	**4.4**
GP-508	GP-508-GW	3/13/2013	<4.31		<4.22		<5.73		<6.1		<5.55		**9.14**	J	**119**		<2.74		<2.76		<2.68		<2.83		<2.69		<3.2		<3.58		<3.05		<3.58		<6.17		**0.13**	**6.5**
GP-510	GP-510-GW	3/13/2013	<1.98		<3		<3.08		<3.18		<3.18		**8.83**	EMPC, J	**185**		<1.97		<1.77		<1.85		<1.61		<1.46		<1.56		<1.88		<1.57		<1.93		**7.7**	J	**0.15**	**3.9**
MW-6	MW-6-GW	5/24/2012	<10.3		<51.4		<51.4		<51.4		<51.4		<51.4		**54.2**	EMPCJ	<10.3		<51.4		<51.4		<51.4		<51.4		<51.4		<51.4		<51.4		<51.4		<103		**0.016**	**2.4**
	MW6-1215	12/10/2015	<1.28		<1.74		<1.51		<1.52		<1.57		<2.52		**22.5**	J	<1.39		<1.03		<1.07		<0.922		<0.958		<1.07		<1.42		<1.34		<2.04		<6.59		**0.007**	**2.2**
	MW6-062316	6/23/2016	<0.80		<0.82		<1.1		<1.1		<1.1		<1.6		<1.7		<0.60		<0.88		<0.86		<0.65		<0.65		<0.66		<0.79		<1.1		<1.5		<1.3		ND	**1.3**
	MW-6-0117	1/31/2017	<1.1		<2.0		<1.3		<1.32		<1.4		<1.49		**8.9**	J	<1.11		<0.88		<0.90		<0.71		<0.72		<0.77		<1.0		<0.60		<0.80		<2.7		**0.003**	**2.1**
	MW-6-0617	6/29/2017	<2.1		<1.9		<2.1		<2.1		<2.0		<1.5		<4.2		<1.4		<1.0		<1.1		<1.3		<1.3		<1.3		<1.5		<0.92		<0.90		<4.3		ND	**2.5**
	MW-6-0118	1/15/2018	<1.6		<0.90		<0.69		<0.74		<0.70		<0.63		<3.9		<1.1		<0.57		<0.55		<0.51		<0.54		<0.57		<0.57		<0.37		<0.41		<1.6		ND	**1.5**
	MW-6-0718	7/10/2018	<2.1		<2.46		<1.99		<2.17		<2.04		<1.16		**9.30**	EMPCJ	<2.16		<1.4		<1.28		<1.5		<1.51		<1.5		<1.69		<1.07		<1.03		<2.88		**0.009**	**2.8**
	MW-6-0119	1/17/2019	<1.73		<1.91		<1.59		<1.58		<1.48		**2.78**	J, B	<4.15		<1.34		<1.05		<1.02		<1.58		<1.53		<1.48		<1.55		<0.755		<0.964		<2.43		**0.028**	**2.3**
MW-7	MW7-1215	12/10/2015	<2.17		<2.87		**3.55**	EMPCJ	**20**		**7.68**	EMPCJ	**566**		**4,830**		<2.23		<1.73		<1.9		**3.28**	J	**2.63**	J	**3.91**	J	<2.83		**73**		<3.77		**182**		**12**	**15**
	MW7-062416	6/24/2016	<1.2		<1.1		<1.4		<1.4		<1.4		**7.6**		**66**		<0.51		<0.98		<0.95		<1.1		<1.1		<1.1		<1.4		<0.81	1	<0.96		<2.0	1	**0.10**	**1.9**
	MW-7-0117	1/31/2017	<4.77		<5.85		<4.0		<4.05		<4.23		**37**		**261**	EMPC	<3.61		<3.95		<3.7		<2.61		<2.41		<2.64		<3.27		<2.7		<3.27		<10.7		**0.45**	**7.7**
	MW-7-0617	6/29/2017	<1.9		<1.6		<1.5		<1.6		<1.5		**13**	J,B	**104**		<1.3		<1.4		<1.5		<0.96		<0.97		<0.96		<1.1		<1.3		<1.2		<3.5		**0.23**	**2.5**
	MW-7-0118	1/15/2018	<1.6		<1.6		<1.4		<1.3		<1.3		**80**		**665**		<1.3		<1.3		<1.3		<0.68		<0.71		<0.75		<0.81		**11**	J	<0.58		**16**	EMPCJ	**1.6**	**3.5**
	MW-7-0718	7/10/2018	<3.17		<2.66		<1.49		<1.68		<1.56		**17.3**	J	**149**		<2.09		<1.33		<1.15		<1.25		<1.38		<1.29		<1.51		**2.88**	J	<1.01		**8.3**	J	**0.36**	**3.6**
	MW-7-0119	1/17/2019	<1.63		<1.64		<1.78		<1.85		<1.62		**43.3**		**353**		<1.18		<0.99		<0.96		<1.46		<1.45		<1.43		<1.39		**6.52**	J	<0.884		**14**	J	**0.87**	**3.0**
NTD Weep Holes	NTD-SW-EAST-0418	4/5/2018	<2.2		<1.35		<2.49		<2.59		<2.51		**6.95**	EMPCJ	**81.4**	B	<1.35		<0.959		<0.953		<1.48		<1.44		<1.49		<1.71		**2.36**	EMPCJ	<1.11		<1.96		**0.17**	**2.6**
	NTD-SW-WEST-0418	4/5/2018	<1.8		<0.96		<1/66		<1.68		<1.72		**13.6**	J	**142**		<1.36		<0.904		<0.867		<1.26		<1.31		<1.35		<1.42		**2.38**	J	<1.27		**5.12**	J	**0.31**	**2.3**
NTD Inlets	NTD-SW-3"-0418	4/4/2018	<2.17		<1.27		<1.6		<1.81		<1.69		**3.1**	J	**19.9**	EMPCJ,B	<1.54		<1.02		<0.914		<1.29		<1.26		<1.26		<1.5		<0.686		<0.765		**<1.89**		**0.051**	**2.3**
	NTD-SW-8"-0418	4/4/2018	<1.6		<0.936		<1.85		<1.74		<1.76		**7.74**	J	**30**	J,B	<1.17		<0.936		<0.904		<1.35		<1.31		<1.23		<1.48		1.61	EMPCJ	<1		4.34	J	**0.13**	**2.0**
SEEP-N-2	SEEP-N-2	5/15/2018	<6.7		<4.17		<3.4		<3.62		<3.35		**12.2**	EMPCJ	**135**		<5.75		<2.88		<2.74		<3.2		<2.9		<2.74		<3.01		**1.35**	EMPCJ	<1.75		**6.8**	EMPCJ	**0.28**	**6.8**
SEEP-N-14	SEEP-N-14	5/15/2018	<6.67		<4.75		<6		<6.06		<5.74		**17.6**	EMPCJ	<5.29		<2.35		<2.25		<3.31		<3.17		<3.12		<3.53		<3.35		4.09	EMPCJ	<2.8		6.24	EMPCJ	**0.47**	**7.4**
SEEP-N-18	SEEP-N-18	5/15/2018	<7.1		<3.04		<4.92		<4.78		<4.85		<4.12		<9.29		<5.56		<3.19		<2.97		<4.14		<3.96		<3.99		<4.57		<1.96		<2.82		<8.38		ND	**7.0**
Selected Preliminary Cleanup Level (PCL)			-		-		-		-		-		-		-		-		-		-		-		-		-		-		-		-		-		**63 (pql)**	

NOTES:

- indicates Not Sampled or Not Analyzed for specific constituent

BOLD = Analytes detected at or above the practical quantitation limit (PQL)

<1.2 indicates not detected above the laboratory PQL of 1.2 pg/L (picograms per liter)

A - Dioxins and Furans per EPA Method 1613

TEQ U=0 indicates Toxic Equivalent Quotient (TEQ) using Toxicity equivalency factors (TEFs) per WHO assuming Non-Detect values as 0

TEQ U=1/2 indicates TEQ using TEFs per WHO assuming Non-Detect values as 1/2 detection limit

Table 5.4-1
Knoll Fill Area CSM
Groundwater Analytical Results - PCB Congeners

Sample Location	Sample Label	Sample Date	Polychlorinated Biphenyls [A] (pg/L)			
			Total PCBs		TEQ: ND=1/2 DL	
			Value	Qual	Value	Qual
MW-12	MW-12-0519	5/3/2019	**8,790**		**0.15**	
	MW-12-0719	7/30/2019	**5,270**		**0.18**	
	MW-12-0220	2/19/2020	**3,350**		**0.16**	
MW-13	MW-13-0519	5/3/2019	**29,800**		**0.13**	
	MW-13-0719	8/1/2019	**5,980**		**0.15**	
	JW-MW13-SPME-20191127	11/27/2019	**4,761**		**0.004**	
	MW-13-0220	2/19/2020	**20,100**		**0.21**	
MW-14	MW-14-0519	5/3/2019	**16,100**		**0.15**	
	MW-14-0719	8/1/2019	**10,200**		**0.16**	
	JW-MW14-SPME-20191127	11/27/2019	**1,857**		**0.005**	
	MW-14-0220	2/19/2020	**10,100**		**0.24**	
MW-15	MW-15-0719	7/31/2019	**222**	J	**0.17**	
MW-18	MW-18-1019	10/25/2019	**3,190**		**0.11**	
	MW-18-0220	2/18/2020	**2,050**		**0.16**	
MW-19	MW-19-1019	10/25/2019	**21,700**		**0.11**	
	MW-19-0220	2/18/2020	**22,400**		**0.21**	
MW-20	MW-20-1019	10/25/2019	**20**		**0.05**	
Seep-S-1	SEEP-S-1	5/14/2018	**460**		**0.57**	
Seep-S-3	SEEP-S-3A-20191025	10/25/2019	**258**		**0.006**	
	SEEP-S-3B-20191025	10/25/2019	**200**		**0.010**	
Seep-S-16	SEEP-S-16-20191025	10/25/2019	**43,388**		**0.016**	
	SEEP-S-16	5/14/2018	**16,200**		**1.1**	
Seep-S-17	SEEP-S-17-20191025	10/25/2019	**283**		**0.013**	
Seep-S-18	SEEP-S-18-20191025	10/25/2019	**56,243**		**0.010**	
Selected Preliminary Cleanup Level (PCL)			1,210	p	-	

Notes

- indicates Not Sampled or Not Analyzed for specific constituent

BOLD = Analytes detected at or above the practical quantitation limit (PQL)

<0.40 indicates not detected above the laboratory PQL of 0.40 pg/L (picograms per liter)

Gray shading indicates measured above the applicable PCL

A - Polychlorinated Biphenyl (PCB) Congeners per EPA Method1668

p - Selected PCL based on laboratory practical quantitation limit per Ecology recommendation to sum PQL for all detected congeners

Table 6.2-1
Preliminary Marine Sediment Cleanup Levels

Parameter	Units	BSAF[a]	Human Health Risk (10^{-6})	Natural Background	Practical Quantitation Limit	Sediment Cleanup Objective	Cleanup Screening Level	Current SWAC
Total Dioxin/Furan TEQ[b]	ng/kg dry wt	0.06	0.24	4	5	**5**	**5**	11
Total PCB Congeners[b]	µg/kg dry wt	0.03	30	3.0	0.001	**30**	**300**	36
PCB TEQ	ng/kg dry wt	0.01	1.5	0.2	0.7	**1.5**	**15**	0.61
cPAH TEQ[c]	µg/kg dry wt	0.67	0.93	21	9	**21**	**21**	na

Notes:

Bold = selected Sediment Cleanup Objective and Cleanup Screening Level

µg/kg = micrograms per kilogram

BSAF = Biota Sediment Accumulation Factor

cPAH = carcinogenic polycyclic aromatic hydrocarbon

na = there is insufficient data to calculate a SWAC

ng/kg = nanograms per kilogram

PCB = polychlorinated biphenyl

SWAC = surface weighted average concentration

TEQ = toxic equivalents quotient

wt = weight

a BSAFs were derived using linear regression (site-specific for total PCB and all study locations for dioxin/furan and PCB TEQs) except cPAH TEQ, which is the mean of the two site results due to negative correlation of regression.

b Site indicator hazardous substance chemicals

c The sediment areas exceeding the sediment cleanup objective for PCB TEQ and cPAH are within areas already defined by dioxin/furan TEQ and total PCBs; thus, this chemical is not an indicator hazardous substance for the site.

Table 8.2
Screening of Potentially Applicable General Response Actions - JELD-WEN Sediment Cleanup

General Response Action	Technology	Description	Physical or Chemical Constraints	Implementability	Effectiveness and Reliability	Cost	Applicability	Technology Retained for Further Evaluation
No action	None	Refraining from using any remedial technology.	None	Not applicable	Does not achieve the sediment cleanup action objective of protecting human health.	No cost	Not applicable	No
Legal or administrative actions	Institutional controls	Imposing legal or administrative actions on the property to protect human health by restricting activities with potential for exposure (e.g., deed restrictions, site security measures, aquatic use restrictions).	None	Few technical or administrative challenges. May require negotiation with third-party property owners.	Effective and proven method commonly used to control potential exposure and protect human health.	Low capital costs; low long-term monitoring costs	May be appropriate in combination with other general response actions for sediments.	Yes (as an additive requirement in combination with other response actions)
Natural recovery	Monitored natural recovery (MNR)	Relies on natural processes (sedimentation and biodegradation) to achieve the site remediation goals. MNR is usually combined with another remedial technique that controls the source of the contamination.	MNR may be limited in some areas of the Site by net sedimentation rates. The potential for recontamination from historical contaminant sources is low.	Site-specific sedimentation rates and recontamination potential from source areas indicate MNR is technically implementable for portions of the site.	Net sedimentation rate may result in longer treatment timeframes. May only be effective and reliable in areas with lower contaminant concentrations.	No capital cost; moderate long-term monitoring costs	May be appropriate for areas with lower contaminant concentrations (where an acceptable level of risk reduction can be achieved within 10 years), in combination with other general response actions.	Yes
	Enhanced monitored natural recovery (EMNR)	Placement of a thin, clean sediment layer over impacted areas to accelerate the natural recovery processes and achieve the site remediation goals.	Bioturbation, physical mixing, and binding of contaminants to organic carbon in EMNR material.	Few technical or administrative challenges.	Highly effective and reliable where natural recovery is occurring but at slower rates than desired due to low net sedimentation.	Low capital cost; moderate long-term monitoring costs	May be particularly applicable to much or all of the tideflat area.	Yes
In-situ treatment	Immobilization amendment	Introducing sorbent amendments into contaminated sediments to alter sediment geochemistry, increasing contaminant binding and therefore decreasing bioavailability.	Bioavailability of contaminants, measured as a biota sediment accumulation factor (BSAF), determines the sequestering capacity.	Few technical or administrative challenges.	More effective at sites with higher bioavailability of contaminants.	Low capital costs	Low site-specific BSAF indicates limited ability to further reduce bioavailability.	No
Physical containment	Engineered capping on-grade	Placement of a suitable cap to isolate contaminated material and protect the biological receptors. Intertidal sediment caps must be thick enough to provide the required isolation of the material contained by the cap.	Cap designs need to account for: bioturbation, habitat compatibility, erosion (currents, waves, wakes, and propeller wash), chemical isolation, consolidation, and constructability tolerances.	Few technical or administrative challenges.	Effective/proven containment option without the risks associated with removal. Must be compatible with future land use, property ownership, and navigation	Moderate capital costs and increased long-term monitoring costs over capping at-grade	May impact the physical environment by increasing mudline elevations and grain size.	Yes
	Engineered capping at-grade					Increased capital costs over capping on-grade and moderate long-term monitoring costs	May be particularly applicable to much or all of the tideflat area.	Yes
Removal with on-site or off-site disposal	Excavation	Removal of impacted sediment using standard upland excavation equipment means and methods. Removal would need to occur during low-tide conditions and would followed by on-site or off-site disposal.	No chemical constraints. Access for land-based equipment is complicated by soft intertidal sediments. Access for standard water-based equipment is severely limited and complicated by tideflat elevations and equipment draft requirements.	Presence of subsurface logs and debris will complicate and slow excavation operations. Uncertainties regarding the risk reduction that can be achieved from removal of bioaccumulating chemicals such as PCBs and dioxin/furans.	Effectiveness and reliability are limited by potential for release of contaminated sediment residuals during excavation.	High capital costs; low long-term monitoring costs	May be particularly applicable to targeted areas of the tideflat with higher near-surface contaminant concentrations or where there are limitations on capping.	Yes

Table 8.2
Screening of Potentially Applicable General Response Actions - JELD-WEN Sediment Cleanup

General Response Action	Technology	Description	Physical or Chemical Constraints	Implementability	Effectiveness and Reliability	Cost	Applicability	Technology Retained for Further Evaluation
Disposal (following removal)	Commercial landfill disposal	Disposal of excavated sediment at a permitted Subtidal D commercial landfill.	Sediment dewatering required for trucking. Transloading/rehandling required for transport by barge.	Few technical or administrative challenges.	Effective/proven disposal option.	Moderate capital costs	Standard disposal method.	Yes
	Confined disposal facility (CDF)	Disposal of excavated sediment in an upland, nearshore, or aquatic CDF, engineered to contain and isolate.	Requires a suitable location and permit approvals.	Not currently implementable due to lack of a suitable location.	Effective/proven disposal option.	Moderate capital costs	Standard disposal method when there is a suitable location.	No
	Open-water aquatic disposal	Barge disposal at a Washington State Dredge Material Management Program (DMMP) in-water disposal site.	Only sediment that meets DMMP suitability criteria could be disposed of at an in-water disposal site. Limitations on use of water-based dredging equipment would likely require additional transloading onto barge. Would also require debris screening.	May be difficult to implement in conjunction with land-based excavation methods.	Effective/proven disposal option.	Low capital costs	Standard disposal method when suitability criteria are met.	Yes
	Upland beneficial reuse	Reuse excavated material as backfill in upland remedial excavations.	Chemical concentrations need to meet suitability criteria (below the final upland soil cleanup standards) for reuse as backfill. Debris screening requirements and geotechnical suitability would also need to be met.	Few technical or administrative challenges for reuse of suitable material.	Effective/proven beneficial reuse option.	Low capital costs	Standard reuse option when suitability criteria are met.	Yes
Ex-situ treatment (following removal)	Bioremediation	Ex-situ bioremediation (aerobic or anaerobic) treatment process whereby contaminants are metabolized into less toxic or non-toxic compounds by enhanced naturally occurring microorganisms.	May not be effective treatment method for dioxin/furans.	Difficult to implement on site due to space and use limitations. No off-site facility has been identified.	Not proven reliable for Site COCs.	High relative to off-site landfill disposal	Not applicable based on effectiveness and cost.	No
	Thermal desorption	Heating sediments to volatilize, recover, and treat contaminants.	May not be effective treatment method for dioxin/furans.	Difficult to implement on site due to space and use limitations. No off-site facility has been identified.	Not proven reliable for Site COCs.	High relative to off-site landfill disposal	Not applicable based on effectiveness and cost.	No
	Incineration	Heating sediments to volatilize and combust contaminants.	Requires dewatering and debris removal.	Difficult to implement on site due to space and use limitations. No off-site facility has been identified.	Effective/proven treatment technology.	Very high relative to off-site landfill disposal	Not applicable based on very high cost.	No
	Sediment washing	Removing contaminants from sediment using water and surfactants.	High volume of process wastewater requiring subsequent treatment.	Difficult to implement on site due to space and use limitations. No off-site facility has been identified.	Not proven reliable for Site COCs.	High relative to off-site landfill disposal	Not applicable based on effectiveness and cost.	No
	Chemical treatment	Ex-situ chemical treatment process whereby contaminants are degraded into less toxic or non-toxic compounds by chemical oxidation.	May not be effective treatment method for dioxin/furans. High organic carbon content in sediment may limit effectiveness of oxidizing chemicals.	Difficult to implement on site due to space and use limitations. No off-site facility has been identified.	Not proven reliable for Site COCs.	High relative to off-site landfill disposal	Not applicable based on effectiveness and cost.	No
	Solidification	Adding reagents to physically bind or chemical stabilize contaminants and reduce mobility.	None	Difficult to implement on site (large-scale) due to space limitations. No off-site facility has been identified. Can increase volume of waste.	Effective/proven treatment technology.	Moderate capital costs	May be appropriate in combination with beneficial reuse of excavated material in upland remedial excavations.	Yes (as an additive requirement in combination with other response actions)

Note:
In-situ treatment is not further evaluated as an independent technology; however, use of a sequestering agent as an amendment to engineered caps may be considered in remedial design.

Table 8.4.1-1 - Creosote Area Remedial Action Alternatives Summary

ALTERNATIVE	Proposed Remedial Technologies per Alternative and Location					
	On Property			Off Property		
	Vadose Zone	Shallow Groundwater	Deeper Groundwater	Vadose Zone	Shallow Groundwater	Deeper Groundwater
ALTERNATIVE 1: ENGINEERING CONTROLS, INSTITUTIONAL CONTROLS, LONG-TERM MONITORING	EC, IC, LTM	EC, IC, LTM	EC, IC, LTM	EC, IC, LTM	EC, IC, LTM	EC, IC, LTM
ALTERNATIVE 2: BIO, MNA, ENGINEERING CONTROLS, INSTITUTIONAL CONTROLS	EC, IC	BIO, EC, IC	BIO, EC, IC	IC	BIO, IC	BIO, IC
ALTERNATIVE 3: ISCO, MNA, ENGINEERING CONTROLS AND INSTITUTIONAL CONTROLS	EC, IC	ISCO, EC, IC	ISCO, EC, IC	IC	IC	IC
ALTERNATIVE 4: SOIL REMOVAL & DISPOSAL/TREATMENT (SS), BIO, INSTITUTIONAL CONTROLS	SS, IC	SS, IC	BIO, IC	IC	BIO, IC	BIO, IC
ALTERNATIVE 5: THERMAL TREATMENT (TT), INSTITUTIONAL CONTROLS	TT, IC	TT, IC	TT, IC	TT, IC	TT, IC	TT, IC
ALTERNATIVE 6: IN-SITU SOIL STABILIZATION/SOLIDIFICATION (ISS), TT, INSTITUTIONAL CONTROLS	ISS, IC	ISS, IC	ISS, IC	TT, IC	TT, IC	TT, IC

Notes:

Bio – Bioremediation (i.e. EAOB with AS)
MNA – Monitored Natural Attenuation (includes Long-Term Monitoring)
EC - Engineering Controls (i.e. surface capping)
IC - Institutional Controls
ISCO - In Situ Chemical Oxidation
SS – Soil Removal & Disposal/Treatment
TT – Thermal Treatment (i.e. steam injection)
ISS – In-Situ Soil Stabilization/Solidification

Table 10.1-1
Creosote/Fuel Oil Area
Disproportional Cost Analysis Matrix

Criterion	Weighting	WAC Language	Scoring Criteria	Alternative 1 Sub-Slab Depressurization (SSD), Engineering Control (EC), Institutional Controls (IC)	Alternative 2 In-Situ Bioremediation (ISB), SSD, MNA, EC, IC	Alternative 3 In-Situ Chemical Oxidation (ISCO), SSD, MNA, IC	Alternative 4 Soil Removal, ISB, MNA, IC	Alternative 5 Thermal Treatment (TT), SSD, EC, IC	Alternative 6 In-Situ Soil Stabilization/Solidification (ISS), TT, IC	Alternative 7 Hotspot Soil Removal, ISB, MNA, IC
Protectiveness	30%	Overall protectiveness of human health and the environment, including the degree to which existing risks are reduced, time required to reduce risk at the facility and attain cleanup standards, on-site and offsite risks resulting from implementing the alternative, and improvement of the overall environmental quality.	Alternative 1 meets the MTCA threshold requirements but does not meet the other requirements (permanent solution to maximum extent practicable and reasonable restoration timeframe); accordingly, the benefit score to Cost Ratio is not presented for Alternative 1. All alternatives protect human health and the environment by reducing the existing risks. Alternative 4 and 7 score highest due to the greater degree of certainty associated with removal and the quicker risk reduction. Alternative 4 scores higher than 7 because of more contaminant mass removal resulting in shorter restoration timeframe. Alternative 6 reduces the mobility of contaminants but leaves them in place and removes contamination through thermal treatment from off property areas. Alternatives 2, 3, and 5 treat the majority of contamination at the Site with different degree of certainty and restoration timeframe with thermal treatment (Alternative 5) scoring relatively higher due to being more effective and with a shorter restoration timeframe. Alternative 2 has a lesser degree of certainty and requires more active treatment time than alternative 5 and therefore scores lower among these. Alternative 3 addresses on property contamination but does not effectively address off property contamination and therefore scores the lowest.							
			Score:	-	4.0	3.0	10.0	6.0	7.0	9.0
Permanence	20%	The degree to which the alternative permanently reduces the toxicity, mobility or volume of hazardous substances, including the adequacy of the alternative in destroying the hazardous substances, the reduction or elimination of hazardous substance releases and sources of releases, the degree of irreversibility of waste treatment process, and the characteristics and quantity of treatment residuals generated.	Alternatives are scored based on permanent removal of contaminants with higher scoring provided for alternatives that permanently reduce toxicity, mobility or volume. Alternative 1 meets the MTCA threshold requirements but does not meet the other requirements (permanent solution to maximum extent practicable and reasonable restoration timeframe); accordingly, Alternative 1 is scored low for permanence and the benefit score to Cost Ratio is not presented for Alternative 1. Alternatives 4, 5 and 7 permanently remove or treat the majority of contamination on the Site. Alternative 4 and 7 removes most on-site contamination permanently and score the highest. Alternative 4 scores slightly higher than 7 because of more soil mass removal resulting in a more permanent solution. Alternative 5 provides more complete treatment of the volatile and semivolatile contaminants and therefore scores the next highest. Alternatives 2 and 6 also provide treatment or immobilize contamination but Alternative 2 has less degree of certainty regarding effectiveness on higher ring PAHs. Alternative 6 scores higher due to the thermal treatment of the off property areas. Alternative 3 scores lowest as it leaves contamination in the off property soils.							
			Score:	-	4.0	3.0	9.0	7.0	6.0	8.0
Long-Term Effectiveness	20%	Long-term effectiveness includes the degree of certainty that the alternative will be successful, the reliability of the alternative during the period of time hazardous substances are expected to remain on-site at concentrations that exceed cleanup levels, the magnitude of residual risk with the alternative in place, and the effectiveness of controls required to manage treatment residues or remaining wastes.	Proven treatment technologies, site-tested treatment technologies, and technologies with a shorter restoration timeframe generally receive a higher ranking. Complex & less reliable treatment technologies and technologies requiring longer durations generally are ranked lower. Scores reflect MTCA's preferences for (in order) recycling, destruction/detoxification, immobilization/solidification, off-site disposal, isolation/containment, and institutional and engineering controls. Alternative 1 meets the MTCA threshold requirements but does not meet the reasonable restoration timeframe requirement in MTCA; accordingly, Alternative 1 is scored low for Long-Term Effectiveness and the benefit score to Cost Ratio is not presented for Alternative 1. Alternative 4, 5, and 7 have similar higher scores for long term effectiveness than other alternatives. Alternative 5 could score very high due to more complete destruction of hazardous substances on Site but some degree of uncertainty exists whether this Alternative will be successful. Alternative 4 and 7 rely on off-site disposal which is a mature and proven technology used at most sites with Alternative 4 scoring slightly higher than 7 because of less magnitude of residual risk remaining on-site. Alternative 6 also scores very high due to immobilization and destruction technology but suffers from complexity. Alternative 2 destroys contamination over a longer period that requires longer monitored natural attenuation. Alternative 3 also destroys contaminants quicker than Alternative 2 but it is not practical for off-property contamination and therefore receives the lowest score.							
			Score:	-	4.0	3.0	9.0	8.0	7.0	8.0
Management of Short-Term Risk	10%	The risk to human health and the environment associated with the alternative during construction and implementation, and the effectiveness of measures that will be taken to manage such risks.	Scoring for management of short term risks uses a relative scale to evaluate construction risks to human health and safety; larger more complex projects are considered to carry greater risk than simpler small projects. Technology-specific risks have been considered (e.g. thermal treatment has temperature related risks; excavation has construction, cave-in, bottom heave, and shoring risks; and ISCO has chemical handling risks). Alternative 1 meets the MTCA threshold requirements but does not meet the other requirements (permanent solution to maximum extent practicable and reasonable restoration timeframe); accordingly, the benefit score to Cost Ratio is not presented for Alternative 1. Alternative 2 includes modest installation risks for the enhanced bioremediation system (pumps and piping) and operates for a longer period of time (cumulative health and safety consideration). This Alternative still receives a higher score compared to alternatives with more construction risk. Alternative 3 (ISCO treatment) poses an elevated risk of worker injury handling and injecting high-ionic strength solution, as well as potential risk to near-surface utilities. Alternatives 4, 5, 6, and 7 can pose some short-term risks that include high risks of worker injury that may include excavation failures, potential burns or damage associated with high pressure steam, injuries associated with building demolition, and/or damage to near surface utilities.							
			Score:	-	8.0	7.0	4.0	6.0	4.0	5.0
Technical and Administrative Implementability	10%	Ability to be implemented including consideration of whether the alternative is technically possible, availability of necessary offsite facilities, services and materials, administrative and regulatory requirements, scheduling, size, complexity, monitoring requirements, access for construction operations and monitoring, and integration with existing facility operations and other current or potential remedial actions.	Scoring evaluates the overall difficulty of implementation for each of the proposed alternatives. Alternative 1 meets the MTCA threshold requirements but does not meet the other requirements (permanent solution to maximum extent practicable and reasonable restoration timeframe); accordingly, the benefit score to Cost Ratio is not presented for Alternative 1. Alternatives 2, 3, & 5 use technologies that have been demonstrated to be effective for conditions observed at the Site and comprise projects of moderate size and complexity. Alternative 2 requires more active services while Alternative 3 requires chemical amendments that have become more difficult to procure and handle at the scale required for treatment. Alternative 5 also uses mature technology that has demonstrated efficacy at the Site, but may require a greater degree of complexity to construct and execute. Alternatives 4 and 7 represent proven technology (frequently occurring) with available off-site facilities suitable for disposal. Alternative 7 is less invasive than Alternative 4 and, therefore, scores slightly higher. Alternative 4 and 6 require extensive, risky construction and therefore score the lowest.							
			Score:	-	8.0	7.0	6.0	7.0	4.0	7.0
Consideration of Public Concerns	10%	Whether the community has concerns regarding the alternative and, if so, the extent to which the alternative addresses those concerns. This process includes concerns from individuals, community groups, local governments, tribes, federal and state agencies, or any other organization that may have an interest in or knowledge of the site.	Alternatives were scored based on public concerns related to cleanup projects in the Port Gardner Bay area. Alternative 1 is the least change to the Site and least disruptive alternative. Alternative 1 meets the MTCA threshold requirements but does not meet the other requirements; accordingly, the benefit score to Cost Ratio is not presented for Alternative 1. Alternative 4 and 7 offer removal of contamination with impacts associated with active construction, hauling to off-site facilities, and additional traffic. Alternatives 2 and 5 offer active cleanup of contamination on Site with the least potential public impact, however, the public may be skeptical about biological treatment. Alternative 6 scores lower than previous alternatives due to greater public impacts including keeping contamination in place, extended construction schedules and prolonged disruption to business activity on the Subject Property. Alternatives 3 scores the lowest based on public concern about injection of chemicals in groundwater and leaves contamination off property.							
			Score:	-	5.0	3.0	9.0	6.0	4.0	8.0
			Total Composite Benefit Score:	-	4.9	3.8	8.5	6.7	5.9	7.9
			Unit Cost (Dollars per Composite Benefit Score Increment):	-	$1,123,000	$2,079,000	$1,906,000	$1,762,000	$3,119,000	$1,140,000
			Cost (Millions of Dollars)*:	-	$5.5	$7.9	$16.2	$11.8	$18.4	$9.0
			Benefit Score to Cost Ratio	-	0.89	0.48	0.52	0.57	0.32	0.88

* Cost estimates presented as Appendix M

Table 10.1-2
Woodlife Area
Disproportional Cost Analysis Matrix

Criterion	Weighting	WAC Language	Scoring Criteria	Alternative 1 LONG-TERM MONITORING, ENGINEERING AND INSTITUTIONAL CONTROLS	Alternative 2 SOIL REMOVAL
Protectiveness	30%	*Overall protectiveness of human health and the environment, including the degree to which existing risks are reduced, time required to reduce risk at the facility and attain cleanup standards, on-site and off-site risks resulting from implementing the alternative, and improvement of the overall environmental quality.*	Protection of human health and the environment is a threshold requirement. Alternative 1 leaves contamination in place with long term engineering and institutional controls and does not provide for a reasonable restoration timeframe and therefore scores the lowest possible score. Alternative 2 removes contamination, reducing mobility, toxicity, and volume to meet Site cleanup levels and therefore scores highest.		
			Score:	1.0	7.0
Permanence	20%	*The degree to which the alternative permanently reduces the toxicity, mobility or volume of hazardous substances, including the adequacy of the alternative in destroying the hazardous substances, the reduction or elimination of hazardous substance releases and sources of releases, the degree of irreversibility of waste treatment process, and the characteristics and quantity of treatment residuals generated.*	Contaminants in the Woodlife Area have low mobility; higher scoring is provided for alternatives that primarily reduce toxicity or volume. Alternative 1 does not reduce toxicity, mobility, or volume, but ensures exposure pathways remain incomplete through engineering and institutional controls and therefore scores the lowest. Alternative 2 permanently removes the majority of contamination in this area.		
			Score:	2.0	8.0
Long-Term Effectiveness	20%	*Long-term effectiveness includes the degree of certainty that the alternative will be successful, the reliability of the alternative during the period of time hazardous substances are expected to remain on-site at concentrations that exceed cleanup levels, the magnitude of residual risk with the alternative in place, and the effectiveness of controls required to manage treatment residues or remaining wastes.*	Proven treatment technologies, site-tested treatment technologies, and technologies with a shorter restoration timeframe generally receive a higher ranking. Complex treatment technologies and technologies requiring longer durations generally are ranked lower. Scores reflect MTCA's preferences for (in order) recycling, destruction/detoxification, immobilization/solidification, off-site disposal, isolation/containment, and institutional and engineering controls. Alternative 1 includes barriers to prevent exposure to hazardous substances, but requires long term monitoring and therefore scores the lowest. Alternative 2 relies on off-site disposal for on-property contamination .		
			Score:	2.0	7.0
Management of Short-Term Risk	10%	*The risk to human health and the environment associated with the alternative during construction and implementation, and the effectiveness of measures that will be taken to manage such risks.*	The scoring uses the relative scale of active construction to evaluate construction risks to human health and safety; larger more complex projects are considered to carry greater risk than simpler smaller projects. Technology-specific risks have been considered (e.g. excavation has cave-in and heave risks etc.). Alternative 1 poses minimal short term risks, and therefore scores the highest. Alternative 2 pose significant short term risks that include high risks of worker injury that may include excavation failures and/or damage to near surface utilities and are therefore ranked the lowest.		
			Score:	9.0	4.0
Technical and Administrative Implementability	10%	*Ability to be implemented including consideration of whether the alternative is technically possible, availability of necessary off-site facilities, services and materials, administrative and regulatory requirements, scheduling, size, complexity, monitoring requirements, access for construction operations and monitoring, and integration with existing facility operations and other current or potential remedial actions.*	Scoring evaluates the overall difficulty of implementation each of the proposed alternatives including the size and complexity of the project, maturity of the remedial technology for the Site conditions and contaminants, and availability of local experienced contractors and materials. Because it can be readily implemented with minimal difficulty Alternative 1 scores the highest. Alternatives 2 uses mature technologies that have been demonstrated to be effective for conditions observed at the Site and comprise projects of moderate size and complexity.		
			Score:	9.0	7.0
Consideration of Public Concerns	10%	*Whether the community has concerns regarding the alternative and, if so, the extent to which the alternative addresses those concerns. This process includes concerns from individuals, community groups, local governments, tribes, federal and state agencies, or any other organization that may have an interest in or knowledge of the site.*	Alternatives were scored based on the balance between public desire for more active clean-up actions and potentially negative impacts to the community that may include economic (prolonged shutdowns or disruption to local business), public safety (e.g. heavy haul traffic on public roads), or other nuisance (e.g. construction noise and duration) considerations. Alternative 1 has minimal public impact, but offers the least active cleanup. Alternatives 2 includes greater public impacts including extended construction schedules, increased haul traffic on public roads, and prolonged disruption to business activity on the Subject Property.		
			Score:	5.0	2.0
			Total Composite Benefit Score:	3.4	6.4
			Unit Cost (Dollars per Composite Benefit Score Increment):	$148,000	$266,000
			Cost (Millions of Dollars):	$0.5	$1.7
			Benefit Score to Cost Ratio:	6.80	3.76

Notes:
WAC = Washington Administrative Code
Weighting Factors Applied From Ecology 2009 Disproportionate Cost Analysis Outline

Table 10.2-1
Jeld-Wen Marine Disproportional Cost Analysis Matrix

Criterion	Weighting	Washington Administrative Code Language	Considerations for Site-Specific Evaluation		M1 Source Control and Natural Recovery	M2 Engineered Cap On-Grade	M3 Targeted Removal and Engineered Cap	M4 Partial Removal and Engineered Cap	M5 Expanded Partial Removal and Engineered Cap	M6 Removal Focus	M7 Full Removal
Protectiveness	30%	*Overall protectiveness of human health and the environment, including the degree to which existing risks are reduced, time required to reduce risk at the facility and attain cleanup standards, on-site and offsite risks resulting from implementing the alternative, and improvement of the overall environmental quality.*	Protection of Human Health	Narrative	Does not achieve human health cleanup standards (cleanup levels not met within top 1 foot of sediment on a SWAC basis) throughout the marine areas of the site in a reasonable timeframe. Does not meet MTCA minimum threshold requirements.	Achieves human health cleanup standards (cleanup levels met within top 1 foot of sediment on a SWAC basis) throughout the marine areas of the site immediately following construction. Scores lower than alternatives that include removal because of future risks from contamination remaining on site above cleanup levels in SMA-1, SMA-2, and SMA-3.	Achieves human health cleanup standards (cleanup levels met within top 1 foot of sediment on a SWAC basis) throughout the marine areas of the site immediately following construction. Scores lower than M4, M5, M6, and M7 because future risks from contamination that remains above cleanup levels, particularly in SMA-3.	Achieves human health cleanup standards (cleanup levels met within top 1 foot of sediment on a SWAC basis) throughout the marine areas of the site immediately following construction. Removal of top 2-feet across SMA-3 reduces future risks. Scores lower than M5, M6, and M7 because future risks from contamination that remains above cleanup levels in SMA-1, SMA-2, and below 2 feet in SMA-3.	Achieves human health cleanup standards (cleanup levels met within top 1 foot of sediment on a SWAC basis) throughout the marine areas of the site immediately following construction. Contaminants fully removed from SMA-3 southern side results in substantial future risk reduction. Scores higher than M4 because of partial removal in SMA-2 knoll. Scores lower than M6 and M7 becuase of future risk from contaminants that remain on site above cleanups levels in SMA-1 and SMA-2.	Achieves human health cleanup standards (cleanup levels met within top 1 foot of sediment on a SWAC basis) throughout the marine areas of the site immediately following construction. Contaminants fully removed from SMA-3 results in substantial future risk reduction. Scores lower than M7 because of future risks from contamination that remains on site above cleanup levels in SMA-1 and SMA-2.	Achieves human health cleanup standards throughout the marine areas of the site immediately following construction. Complete removal results in the lowest future risk because only residual contamination would remain on site.
				Score	n/a	4.0	6.0	7.0	9.0	9.0	10.0
			Protection of the Environment	Narrative	Does not eliminate ecological risks associated with COPC releases to marine areas of the site in a reasonable timeframe. Unacceptable risks to benthic community remain. Does not meet MTCA minimum threshold requirements.	Achieves cleanup standards protective of ecological receptors for COPC throughout the marine areas of the site immediately following construction. However scores lower than M3 through M7 because of future risks from sediment exceeding benthic criteria for PCBs that remain on site in the knoll area; future risks remain from contamination left in place above cleanup levels, particularly in SMA-3.	Achieves cleanup standards protective of ecological receptors for COPC throughout the marine areas of the site immediately following construction. Sediment exceeding benthic criteria for PCBs removed from knoll area. Some future risks remain from contamination left in place, particularly in SMA-3 inlet area and contamination deeper than 2 feet in the southern areas.	Achieves cleanup standards protective of ecological receptors for COPC throughout the marine areas of the site immediately following construction. Removal of top 2-feet across SMA-3 reduces future risks. Sediment exceeding benthic criteria for PCBs is removed from knoll area. Scores lower than M5, M6 and M7 because of future risks from contamination that remains above cleanup levels in SMA-1, SMA-2, and below 2 feet in SMA-3.	Achieves cleanup standards protective of ecological receptors for COPC throughout the marine areas of the site immediately following construction. Contaminants fully removed from SMA-3 southern side results in substantial future risk reduction. Scores higher than M4 because of partial removal in SMA-2 knoll. Scores lower than M7 because of future risks from contaminants that remain on site above cleanups levels in SMA-1 and SMA-2.	Achieves cleanup standards protective of ecological receptors for COPC throughout the marine areas of the site immediately following construction. Contaminants fully removed from SMA-3 results in substantial future risk reduction. Scores lower than M7 because of future risk from contamination that remains on Site above cleanup levels in SMA-1 and SMA-2.	Eliminates ecological risks associated COPC throughout the marine areas of the site immediately following construction. Complete removal results in the lowest future risk because only residual contamination would remain on site.
				Score	n/a	4.0	7.0	7.0	9.0	9.0	10.0
			Total	**Score**	**n/a**	**4.0**	**6.5**	**7.0**	**9.0**	**9.0**	**10.0**
Permanence	20%	*The degree to which the alternative permanently reduces the toxicity, mobility or volume of hazardous substances, including the adequacy of the alternative in destroying the hazardous substances, the reduction or elimination of hazardous substance releases and sources of releases, the degree of irreversibility of waste treatment process, and the characteristics and quantity of treatment residuals generated.*	Certainty and Reliability	Narrative	Lowest certainty and reliability; MNR as the sole remedial action is uncertain and not reliable.	Greater comparative risk of remedy failure (requiring future maintenance) due to use of engineered cap-on-grade across all of SMA-3, and no removal of underlying contaminants exceeding cleanup levels. MNR in SMA-1 and EMNR in SMA-2 rely on an extended timeframe to achieve a permanent reduction in toxicity or volume of hazardous substances.	Some potential risk from cap failure. MNR in SMA-1 and EMNR in SMA-2 have high certainty and reliability. Partial removal in SMA-3 (south shoreline) increases certainty and reliability. Some uncertainty exists regarding the long-term performance of MNR in SMA-1 and EMNR in SMA-2.	Partial removal (top 2 feet) in SMA-3 increases certainty and reliability. Some potential risk from cap failure in SMA-3. MNR in SMA-1 and EMNR in SMA-2 rely on an extended timeframe to achieve a permanent reduction in toxicity or volume of hazardous substances.	Full removal in SMA-3 southern areas increases certainty and reliability. Partial removal (top 2 feet) in SMA-3 inlet and portions of SMA-2 knoll increases certainty and reliability. Some potential risk from cap failure in SMA-3 inlet. MNR in SMA-1 and EMNR in SMA-2 rely on an extended timeframe to achieve a permanent reduction in toxicity or volume of hazardous substances.	Full removal in SMA-3 increases certainty and reliability; no potential risk from cap failure. MNR in SMA-1 and EMNR in SMA-2 have high certainty and reliability. Scores lower than M-8 becuase MNR in SMA-1 and EMNR in SMA-2 rely on an extended timeframe to achieve a permanent reduction in toxicity or volume of hazardous substances.	Complete removal provides lowest potential for future exposure or releases.
				Score	n/a	4.0	7.0	8.0	9.0	9.0	10.0
			Residual Risks (Mass Removal)	Narrative	Cresote pilings would be removed; does not otherwise result in mass removal from any SMA. Unacceptable risks would remain because permanent remedial actions are not incorporated.	Capping on-grade in SMA-3 does not provide mass removal. EMNR in SMA-2 and MNR in SMA-1 do not provide mass removal. Risks are elevated compared to alternatives that remove contaminant mass from the Site.	Capping on-grade in SMA-3 inlet does not provide mass removal. Removal to 2-feet within SMA-3 southern side provides targeted mass removal of "hotspot" areas. EMNR in SMA-2 and MNR in SMA-1 do not provide mass removal. Risks are elevated compared to alternatives that remove greater contaminant mass from the Site.	Removal of top 2 feet of sediment within all of SMA-3 results in targeted mass removal of "hotspot" areas; contamination above cleanup levels remains at depth in some areas of SMA-3. EMNR in SMA-2 and MNR in SMA-1 do not provide mass removal. Risks are elevated compared to alternatives that remove greater contaminant mass from the Site.	Full removal in SMA-3 southern areas and portions of SMA-2 knoll results in additional targeted mass removal of "hotspot" areas. Contamination above cleanup levels remains at depth in some areas of SMA-3 inlet. Risks from contaminant concentrations following MNR in SMA-1 and EMNR in SMA-2 are not reduced by additional mass removal.	Full removal in SMA-3 results in substantial mass removal. Risks from contaminant concentrations following MNR in SMA-1 and EMNR in SMA-2 are not reduced by additional mass removal.	Complete removal provides the highest COPC mass reduction in SMA-1, SMA-2 and SMA-3; however, dredging residuals from removal in all three SMAs result in higher overall residual contamination.
				Score	n/a	2.0	6.0	8.0	9.0	9.0	9.5
			Total	**Score**	**n/a**	**3.0**	**6.5**	**8.0**	**9.0**	**9.0**	**9.8**
Long-Term Effectiveness	20%	*Long-term effectiveness includes the degree of certainty that the alternative will be successful, the reliability of the alternative during the period of time hazardous substances* ***are expected to remain on-site at concentrations that exceed cleanup levels,*** *the magnitude of residual risk with the alternative in place, and the effectiveness of controls required to manage treatment residues or remaining wastes.*	Climate Change Factors, including Erosion; Biological Processes; Seismic Events; Human Disturbance	Narrative	Greatest potential for future exposure or releases from climate change-related risks (sea level rise/increased storm intensities) in SMA-2 and SMA-3.	Potential for future exposure or releases from contaminant migration, climate-related risks and other disturbances, particularly for cap-on-grade areas (SMA-3). Climate change evaluations would be considered during design for engineered cap-on-grade design. Some uncertainty exists regarding the long-term performance of MNR in SMA-1 and EMNR in SMA-2.	Partial removal in the SMA-3 southern area reduces vulnerability to climate change and other disturbances. Some potential for future exposure or releases from climate-related risks, particularly for capped areas in SMA-3. Climate change evaluations would be considered for engineered cap-on-grade design. Some uncertainty exists regarding the long-term performance of MNR in SMA-1 and EMNR in SMA-2.	Partial removal (top 2 feet) in SMA-3 reduces vulnerablity to climate change and other disturbances. Some potential for future exposure or releases from climate-related risks, particularly for capped areas in SMA-3. Climate change evaluations would be considered for engineered cap-on-grade design. Some uncertainty exists regarding the long-term performance of MNR in SMA-1 and EMNR in SMA-2.	Full removal in SMA-3 southern areas and portions of SMA-2 knoll substantially decreases vulnerability to climate change and other disturbances. Some potential for future exposure or releases in SMA-3 inlet. Some uncertainty exists regarding the long-term performance of MNR in SMA-1 and EMNR in SMA-2.	Complete removal in SMA-3 substantially descreases potential for future exposure or releases. Some uncertainty exists regarding the long-term performance of MNR in SMA-1 and EMNR in SMA-2.	Complete removal provides lowest potential for future exposure or releases; climate change does not increase risk of future exposure or releases.
			Total	**Score**	**n/a**	**2.0**	**5.0**	**6.0**	**8.0**	**8.0**	**10.0**
Management of Short-Term Risk	10%	*The risk to human health and the environment associated with the alternative during construction and implementation, and the effectiveness of measures that will be taken to manage such risks.*	Risk to Human Health and Safety During Construction	Narrative	No active construction and no associated risk to human health and safety.	Includes risks from constructing thick caps in SMA-3 and applying a thin-layer cap in SMA-2. Risks are reduced compared to alternatives that incorporate sediment removal.	Includes risks from partial removal and engineered cap construction in SMA-3 and from construction of a thin-layer cap in SMA-2. Risks are reduced compared to alternatives with deeper removal depths and/or greater volumes of sediment removal.	Includes risks from partial removal and capping in SMA-3 and from construction of a thin-layer cap in SMA-2.	Includes risks from full removal in SMA-3 southern side and partial SMA-2 knoll area and from construction of a thin-layer cap in SMA-2. Risks not as great as M6 or M7.	Includes risks from full removal in SMA-3 and from construction of a thin-layer cap in SMA-2. Risks not as great as M7.	Alternative with the most active and intensive construction and highest associated risk.
			Total	**Score**	**n/a**	**8.0**	**7.0**	**7.0**	**6.0**	**5.0**	**3.0**

Table 10.2-1
Jeld-Wen Marine Disproportional Cost Analysis Matrix

Criterion	Weighting	Washington Administrative Code Language	Considerations for Site-Specific Evaluation		M1 Source Control and Natural Recovery	M2 Engineered Cap On-Grade	M3 Targeted Removal and Engineered Cap	M4 Partial Removal and Engineered Cap	M5 Expanded Partial Removal and Engineered Cap	M6 Removal Focus	M7 Full Removal
Technical and Administrative Implementability	10%	*Ability to be implemented including consideration of whether the alternative is technically possible, availability of necessary offsite facilities, services and materials, administrative and regulatory requirements, scheduling, size, complexity, monitoring requirements, access for construction operations and monitoring, and integration with existing facility operations and other current or potential remedial actions.*	Technical Feasibility	Narrative	Few technical challenges, however, does not meet minimum regulatory threshold requirements.	Engineered cap design must function in-perpetuity; may require extensive long-term monitoring and maintanence efforts, which could disprupt future site operations. Technology has been used at other sites in Puget Sound and experienced contractors and materials are locally available. Impacts to public may occur during construction; construction duration expected to be shorter than alternatives that include removal and cap/backfill.	Some technical challenges associated with removal on unstable intertidal subgrades; proven technology and locally available experienced contractors and materials. Engineered cap design must function in-perpetuity; may require extensive long-term monitoring and maintanence efforts, which could disprupt future site operations.	Some technical challenges associated with removal in the inlet; proven technology and locally available experienced contractors and materials. Fewer long-term monitoring and maintanence requirements expected than Alternatives M2 through M3.	Some technical challenges associated with removal in the inlet; proven technology and locally available experienced contractors and materials. Fewer long-term monitoring and maintanence requirements expected than Alternatives M2 through M4.	Technical challenges associated with deepest removal in the inlet; however, uses proven technology and locally experienced contractors and materials are available. Fewer long-term monitoring and maintanence requirements expected than Alternatives M2 through M5.	Technical challenges include large excavation footprints on tidally influenced mudflat, deepest cuts, slope stability shoring requirements. No institutional control or long-term maintanence and monitoring requirements.
				Score	n/a	5.0	6.0	8.0	8.0	7.0	3.0
			Administrative Feasibility	Narrative	No difficult permit requirements, however, does not meet minimum regulatory threshold requirements.	Cap-on-grade may be more difficult to permit; long-term monitoring and maintanence greater with caps, particularly cap-on-grade areas. Caps may require institutional controls (restrictive covenants). Mitigation may be required for impacts to natural resources during construction.	Cap-on-grade may be more difficult to permit; long-term monitoring and maintanence greater with caps, particularly cap-on-grade areas. Caps may require institutional controls (restrictive covenants). Mitigation may be required for impacts to natural resources during construction.	Difficult permit requirements not anticipated. Caps may require institutional controls (restrictive covenants). Mitigation may be required for impacts to natural resources during construction.	Difficult permit requirements not anticipated. Caps may require institutional controls (restrictive covenants). Mitigation may be required for impacts to natural resources during construction.	No difficult institutional controls or long-term maintanance and monitoring requirements. Difficult permit requirements not anticipated. Mitigation may be required for impacts to natural resources during construction.	No institutional controls or long-term maintanance and monitoring requirements. May pose some permitting challenges due to large disturbance area. Mitigation may be required for impacts to natural resources during construction.
				Score	n/a	3.0	6.0	8.0	8.0	9.0	8.0
			Total	**Score**	**n/a**	**4.0**	**6.0**	**8.0**	**8.0**	**8.0**	**5.5**
Consideration of Public Concerns	10%	*Whether the community has concerns regarding the alternative and, if so, the extent to which the alternative addresses those concerns. This process includes concerns from individuals, community groups, local governments, tribes, federal and state agencies, or any other organization that may have an interest in or knowledge of the site.*	Balance the Public Desire for Environmental Cleanup and Sustainable Local Economic Conditions	Narrative	Unlikely to satisfy public desire for active cleanup of the Site.	Leaving contamination in place (no removal) likely to be a concern to the public. Some impacts to public may occur during construction (e.g. traffic restrictions on West Marine View Dr.). Construction duration expected to be shorter than removal and cap alternatives.	Greater balance than M-2 and M-3 between public desire for active cleanup with concerns over economic impacts and disruption to the local community (e.g. noise, traffic). Public may be concerned about risks from contamination left in place.	Greater balance between public desire for active cleanup with concerns over economic impacts and disruption to the local community (e.g. noise, traffic).	Greater balance between public desire for active cleanup with concerns over economic impacts and disruption to the local community (e.g. noise, traffic).	Balances public desire for active cleanup with concerns over economic impacts and disruption to the local community (e.g. noise, traffic).	Would satisfy public desire for complete removal, but high cost, economic impacts, and disruption to the community from construction may be more of a concern for the public.
			Total	**Score**	**n/a**	**3.0**	**5.0**	**8.0**	**9.0**	**8.0**	**3.0**
				Total Weighted Benefits	**n/a**	**3.7**	**6.1**	**7.2**	**8.4**	**8.2**	**8.1**
				Cost	**$2,770,000**	**$5,860,000**	**$8,990,000**	**$10,370,000**	**$12,750,000**	**$13,630,000**	**$38,830,000**

Notes:
Cost estimates presented as Appendix N.
COPC = chemical of potential concern
EMNR = enhanced monitored natural recovery
MNR = monitored natural recovery
SMA = sediment management area
SWAC = surface weighted average concentration