Pre-Remedial Design Investigation Work Plan – Upland Areas of Jeld Wen Site

Jeld Wen Site

Prepared for

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1.0 Introduction

This Pre-Remedial Design Investigation (PRDI) Work Plan (WP) – Upland Areas of the Jeld Wen Site (Upland PRDI WP) has been prepared in accordance with Agreed Order (AO) Number DE 5095 for the former E.A. Nord, Inc, door facility (i.e., Former Nord Door Facility) (through its successor-in-interest, JELD-WEN, Inc. [JELD-WEN]), located at 300 West Marine View Drive, Everett, Washington, 98201 (Jeld Wen Site), executed between JELD-WEN and the Washington State Department of Ecology (Ecology). This WP is specifically described in the Second Amendment to the AO (effective date July 28, 2023), Exhibit G – Scope of Work and Schedule, Task 1: Development of PRDI project plan and implementation and in accordance with the Cleanup Action Plan (CAP)(Ecology, 2023). This Upland PRDI WP has been prepared to support engineering design and implementation of the selected remedial alternatives. This Upland PRDI WP identifies sampling and analysis procedures and schedules to implement PRDI activities of upland soil and groundwater for characterization, and pilot testing of selected remedial alternative components.

This Upland PRDI WP has been prepared to meet the requirements of the Model Toxics Control Cleanup Act (MTCA) administered by Ecology under Chapter 173-340 of the Washington Administrative Code (WAC).

1.1 Background

The Site is in Snohomish County, Washington, and is bound by vacant land and tidal mudflats to the east, northeast, and west; West Marine View Drive and Burlington Northern Santa Fe (BNSF) railroad tracks to the southeast; and Port Gardner Bay to the north and northwest (Figure 1). The Site is further defined by the extent of contamination caused by the release of hazardous substances at the Site, as described in the CAP.

From 2009 to 2021 JELD-WEN performed a Remedial Investigation and Feasibility Study (RI/FS) to assess site conditions and evaluate cleanup alternatives in accordance with MTCA (SLR/Anchor, 2021). The cleanup alternatives were evaluated using a Disproportionate Cost Analysis (DCA) and the cleanup action was selected by Ecology and detailed in the August 2023 CAP. As presented in the CAP, PRDI activities are undertaken to support engineering design and implementation of the selected remedies.

1.2 PRDI Work Plan Objectives

General objectives of this Upland PRDI WP are described below:

- To collect data to refine the understanding of the extent of impacts in soil, groundwater, and soil gas;
- To collect data to assist with full-scale engineering design and implementation of remedial alternatives; and,
- To perform pilot testing of remedial alternative components to assess feasibility of full-scale implementation.

1.3 PRDI Work Plan Organization

This Upland PRDI WP document is organized as follows:

- Section 2 provides Conceptual Site Models (CSMs) for the selected areas (Woodlife Area and Creosote/Fuel Oil Area) and a summary of remedy actions, cleanup goals, and objectives.
- Section 3 presents the scope of work for the upland PRDI activities.
- Section 4 presents the regulatory and permitting requirements.
- Section 5 presents the schedule.
- Section 6 lists references cited in this PRDI WP.
- Appendix A presents the Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP) and that describes detailed sampling methodologies and quality assurance protocols to be used during the PRDI.
- Appendix B presents the Health and Safety Plan (HASP) that describes the health and safety procedures that will be followed during field activities conducted at the Site.
- Appendix C presents the Inadvertent Discovery Plan (IDP) to be followed during field activities at the Site.

2.0 Upland Areas

This section presents a summary of the selected remedies and cleanup/remediation levels, and a description of the proposed PRDI activities for the upland areas of the Site selected for remedial action.

2.1 Woodlife Area

2.1.1 Conceptual Site Model

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

Historical Use

Characterization data and history indicate that the primary source of COPCs in soil and groundwater in the Woodlife Area are attributed to an approximately 10,000-gallon aboveground storage tank (AST) containing Woodlife wood treatment solution (which contained PCP) that was formerly located northeast of the main manufacturing building, associated underground piping from the AST, and the former dip tank located within 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.

Suspected and Confirmed Releases

Soil and groundwater sampling was completed for analysis of pentachlorophenol (PCP), dioxins, and total petroleum hydrocarbons (TPH) based on the location and historical use of the Woodlife solution containing PCP. PCP was not measured above the laboratory reporting limit in any groundwater samples 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. Therefore, there appears to be some crossover with impacts associated with the former National Pole treating operations and fuel oil storage. Polychlorinated dibenzo-p-dioxin and

dibenzofurans (hereafter referred to as “dioxins”) analytical results indicate that the impacts are from underground piping connected to the Woodlife AST and former dip tank, and these impacts are localized. It is likely that residual dioxins 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.

Contaminant Fate and Transport

Soil

Contaminants of potential concern (COPCs) identified for the Woodlife Area (and particularly dioxins) 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. Remedial Investigation (RI) data indicate that the migration pathway from soil to groundwater is complete; however, additional transport associated with groundwater flow through contaminated soil is limited (see below).

Groundwater

Groundwater sampling data has demonstrated that dioxin 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 dioxins impacts in the Woodlife Area. Dioxins have a low solubility and tend to bind to soil particles making it comparatively less mobile.

Surface Water and Stormwater

Dioxin 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 dioxins impacts in the Woodlife Area. Historical stormwater discharges from the North Truck Dock (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.

Volatilization to Air

COPCs in the Woodlife Area, particularly dioxins, have relatively low volatility/vapor pressure under typical environmental conditions and will not readily volatilize from the pure organic state; therefore, direct inhalation is a less significant route of exposure. Henry’s Law Constants indicate that volatilization of dioxins from water to air could be a potential transfer mechanism during warmer temperatures, which could result in seasonal volatilization/deposition and long-range air transport. Air blown transport of dioxins is more likely to be the result of air emissions from historical wood-fired boilers, many of which were located in the Everett, Washington area, including the Former Bay Wood Site immediately to the North of the Site.

Nature and Extent of Contamination

Investigations at the Woodlife Area to further characterize dioxins impacts found that soil and groundwater impacts were generally shallow (less than 5 feet bgs) and appeared to be from a shared sub-slab origin source area (i.e., release from underground piping) that ‘pancaked’ out through the surface soils beneath the asphalt driveway and/or building foundation (see Figure 2). 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 “log way”). Groundwater

data collected during the RI/FS and groundwater seep data collected during the SCE show no groundwater migration of dioxins above PCLs to surface water or sediments in the adjacent "log way". 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 "log way", and removed accumulated solids from within the NTD sump and the truck dock ramp area.

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 of the RI/FS and no groundwater production wells are located at the Site.

Groundwater impacts are currently contained under existing surface caps, buildings, and roadways, further limiting potential exposure. Sampling of shoreline seeps in the "log way" indicate that groundwater COCs are not present in surface water or sediment adjacent to the Woodlife Area. Volatilization of dioxins from groundwater is not considered a pathway based on the low volatility. Therefore, no complete exposure pathways were identified for groundwater impacts in the Woodlife Area.

2.1.2 Summary of Selected Remedy

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 remedial actions retained as FS alternatives for the Woodlife Area included:

- Alternative 1: Engineering Controls, Institutional Controls and Long-Term Monitoring
- Alternative 2: Soil Removal, Engineering Controls, Institutional Controls

Ecology has selected Alternative 2 as the preferred cleanup alternative.

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

The purpose of the onsite soil excavation for the Woodlife Area would be to remove the impacted soil for offsite disposal. Removal of the impacted soil will effectively address the groundwater impacts via source removal due to the hydrophobic nature of dioxins.

Conceptually, 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. The extent of the excavation will be based on existing analytical data supplemented with additional investigation completed during the PRDI activities (see Section 3). The use of dewatering equipment would likely be needed as the excavation would extend into the shallow groundwater table. The water would be profiled prior to discharge (pending a permit) or disposal. Clean backfill would be imported, placed into the excavation, and compacted. The area would be finished with an asphalt surface cap to match the existing surface capping to ensure contiguous surface capping throughout the contaminated area (i.e. engineering control).

Institutional controls will include restrictions on soil disturbance where impacted soil remains or placement of drinking water wells in the property.

2.1.3 Cleanup Standards

This section presents the Cleanup Standards applicable to the affected media of the Woodlife Area and the related contaminants of concern (COCs) from the CAP. Cleanup Standards consist of Cleanup Levels (CULs) defined by a hazardous substance's concentration in soil, water, air and sediment with regards to human health and the environment; Remediation Levels (RELs) which may be used to identify the concentrations (or other methods of identification) of hazardous substances at which different cleanup action components will be implemented; designation of location at the Site where the CULs/RELs must be met based on pathway-specific point of compliance (POC); and, additional regulatory requirements that apply to the cleanup action.

COCs

Assessments performed as part of the RI established the following Indicator Hazardous Substances (IHSs) as COCs for the Woodlife Area:

- Dioxins Toxic Equivalency (TEQ) values for soil and groundwater

Cleanup Levels

Selected CULs for IHSs in the Woodlife Area from the CAP are the following:

- 5.2 picograms per gram (pg/g, or parts per trillion [ppt]) for Dioxins TEQ (based on natural regional background concentration[1]) in soil in the Woodlife Area
- 72 picograms per liter (pg/L, or parts per quadrillion [ppq] for Dioxins TEQ (based on the laboratory practical quantitation limit [PQL]) in groundwater in the Woodlife Area

As presented in the Woodlife Area CSM, dioxins readily adsorb into soil particles and it is expected that source removal of the impacted soils will result in instantaneous reductions in groundwater concentrations. Therefore, there is no significant assessment of current groundwater conditions in the Woodlife Area as part of the PRDI activities, with the exception of on-going annual groundwater monitoring at the downgradient existing monitoring wells MW-6 and MW-7 that is scheduled up to implementation of the final cleanup action.

[1] Natural background concentration source

Remediation Levels

RELs are not proposed for the soil and groundwater cleanup components in the Woodlife Area. The CULs presented above are proposed to be used for the Woodlife Area; however, as presented in the CAP, 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) some contamination will remain in place and capped with clean backfill and asphalt pavement. If soil impacts extend below 5 feet bgs an REL of 13 pg/g (MTCA method B direct contact value) will be used to limit the depth and spatial extent of excavation, in conjunction with observations of site conditions or health & safety concerns which will dictate the use of engineering controls (clean backfill and asphalt surface cap) and institutional controls as primary components of the remedial action.

Points of Compliance

Upland Soil

The standard POC for the soil cleanup levels will be throughout the soil column from the ground surface to 9 feet bgs as presented in the CAP. Due to the shallow groundwater table and sandy soil it is unlikely that construction work could be safely performed down to the standard POC for soil of 15 feet bgs described in WAC 173-340-740(6)(d) and WAC 173-340-7490(4)(b). Ecology believes conditions specified in WAC 173-340-740(6)(f)(i)-(vi) will be met for the alternate POC because engineering and institutional controls are included as part of the remedy.

Groundwater

For groundwater, the POC 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 POC to the outer boundary of the hazardous substance plume per WAC 173-340-720(8)(a). Under MTCA, the standard POC 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 (CPOC) at the point of discharge of groundwater to surface water when it can be demonstrated that it is not practicable to meet the cleanup level at a point within the upland groundwater. The CPOC for the Site is the downgradient edge of the property, at the point of entry of groundwater to Port Gardner Bay.

2.2 Creosote/Fuel Oil Area

2.2.1 Conceptual Site Model

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

Physical Setting

Characterization data and reported history of use indicate that the primary source of COPCs in the Creosote/Fuel Oil Area is the pre-1940 to ca. 1948 former pole treating operation and the 1950's oil-fired boiler on the eastern portion of the Site and adjacent to the current placement of West Marine View Drive.

The current location of West Marine View Drive historically consisted of tidally-influenced 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.

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 within the extent of site investigations (up to 60' bgs); however, strata of finer-grained soils (i.e., silty sands) have been observed in some soil borings. 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 flow primarily to the west from the historical operations area towards Port Gardner Bay with a gradient that averages approximately 0.002 feet per foot (ft/ft). Groundwater below 15 feet bgs is considered "deep" groundwater; however, as noted above there is no continuous confining layer that separates the deep groundwater from the shallow groundwater (<15 feet bgs).

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).

Suspected and Confirmed Releases

Historical operations by National Pole included treating 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 (i.e., heavy chain hydrocarbons). Likely historical releases of COPCs associated with pole treating operations include spills and incidental releases of creosote to the ground surface associated with transporting and drying treated poles which eventually migrated to shallow groundwater, and subsequently to deep groundwater in some areas due to the density of the product.

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. 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.

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) were 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 Vapor

Migration of vapor from the volatilization of vapor intrusion (VI) COPCs (naphthalene and benzene) in contaminated shallow groundwater into soil gas has been assessed from within the footprint of the existing main manufacturing building and VI COPCs have been measured in exceedance of sub-slab soil gas PCLs. As noted above, the vadose zone in this area is at times as little as 2 feet thick, depending on the shallow groundwater elevation. While the shallow groundwater is the primary concern for volatilization of VI COPCs there is a potential that volatilization of VI COPCs present in the deep groundwater (as lighter-end hydrocarbon faction of the NAPL) could impact the shallow groundwater, in turn migrating to soil gas.

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 from permanent groundwater monitoring wells and from groundwater seeps throughout the Site's shoreline shows groundwater migration and/or seepage to surface water does not appear to be a significant mechanism for the transport of Creosote/Fuel Oil Area impacts.

Estimates of the shallow groundwater velocity in the Creosote/Fuel Oil Area 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 80 years since the suspected release(s). However, creosote impacts to soil and groundwater remain localized and analytical results indicate that groundwater transport is not a significant mechanism for Creosote/Fuel Oil Area contaminant migration.

While measurable DNAPL is observed in monitoring well MW-8B, there does not appear to be a contiguous DNAPL plume and the majority of groundwater impacts appear to be as dissolved phase.

Surface Water and Stormwater

Creosote and fuel oil impacts at the Site in soil are primarily located at depth beneath buildings or pavement. 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 potential historical contributor to sediment contamination on the north and south off-shore areas. However, the on-site stormwater conveyance system is located outside of the Creosote/Fuel Oil Area and the primary COPCs in sediment are dioxins and polychlorinated biphenyls (PCBs), which are not considered COPCs for the Creosote/Fuel Oil area and its historical operations. The stormwater system is not considered a significant potential pathway for migration of COPCs at the Site.

Nature and Extent of Contamination

Soil contamination at the Creosote/Fuel Oil Area includes TPH, Polynuclear Aromatic Hydrocarbons (PAHs), and Volatile Organic Compounds (VOCs) under the historical pole treating operations area primarily located between approximately 5 and 15 feet bgs. Deep soil contamination was observed in saturated soils to a maximum depth of approximately 50 feet.

Shallow groundwater contamination in the Creosote/Fuel Oil Area includes TPH, PAHs, VOCs, and Semi-Volatile Organic Compounds (SVOCs). The distribution of COCs in groundwater is spatially consistent with the distribution observed for COPCs in soil (see Figure 2).

Deep monitoring well MW-8B was installed to a depth of 55 feet bgs and DNAPL has accumulated in the sump that was constructed at the bottom of the well. Based on previous observations at the Site from soil borings, DNAPL is present in discontinuous ganglia within the Creosote/Fuel Oil Area and small pockets in the deep subsurface. A continuous DNAPL plume or lens has not been identified.

Affected Media and Potential Exposure Pathways

Results of the RI indicated that affected media at the Creosote/Fuel Oil Area include soil, soil vapor, and groundwater. 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 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 VI COPCs (naphthalene and benzene) in soil gas samples exceeded applicable screening criteria under the existing main manufacturing building foundation. Therefore, the indoor air exposure pathway for workers on-Site is considered complete. Exposure to soil gas outside of existing buildings (i.e., volatilization to outdoor air) is unlikely due to immediate dilution by ambient air and lack of confinement to allow buildup of VI COPCs in the vapor phase. The volatilization of VI COPCs in the deep zone groundwater that are untreated may have the potential to re-contaminate the shallow groundwater, which has a direct pathway to receptors via VI.

Groundwater

Groundwater is not considered a current or likely future source of drinking water. Groundwater impacts are currently contained under existing surface caps, buildings, and roadways, further limiting potential exposure. Impacted groundwater within the shallow or deep zone of the Creosote/Fuel Oil Area has not been shown to migrate to adjacent surface water or sediments despite the duration between the initial release(s) and the site investigation activities (up to 80 years in some cases). Therefore, no complete exposure pathways were identified for shallow or deep groundwater associated with the Creosote/Fuel Oil Area; however, there is a connection and complete pathway between soil gas and shallow/deep zone groundwater that does necessitate risk controls.

2.2.2 Summary of Selected Remedy

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 ("property" defined as the legal boundaries of the former E.A. Nord facility; as opposed to the "Site" which includes the extent of contamination caused by the release of hazardous substances) vadose zone; on-property shallow groundwater (to 15 feet bgs); on-property deep groundwater (>15 feet bgs); off-property vadose zone; off-property shallow groundwater (to 15 feet bgs); and, off-property deep groundwater (>15 feet bgs). Based upon the specifics of the assessment area remedial actions retained as FS alternatives for the Creosote/Fuel Oil Area included combinations of remediation technologies. Those technologies included: monitored natural attenuation (MNA), sub-slab depressurization (SSD), soil vapor extraction (SVE), *in-situ* chemical oxidation (ISCO), enhanced *in-situ* bioremediation (BIO), 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: BIO and SSD
- Alternative 3: ISCO and SSD
- Alternative 4: Soil Removal and BIO
- Alternative 5: Thermal Treatment
- Alternative 6: ISS and Thermal Treatment
- Alternative 7: Hot Spot Soil Removal and BIO (with MNA, IC, EC)

Ecology has selected Alternative 7 as the preferred cleanup alternative.

Alternative 7 includes excavation and offsite disposal of Hot Spot contaminated soil on-property, operation of an enhanced BIO treatment system for deeper on-site groundwater and shallow and deeper off-property groundwater (Figure 3), MNA, and institutional and engineering controls.

The Hot Spot excavation will address a majority of the high concentration soil impacts at depths where direct exposure is most likely (via future construction worker scenario) and will reduce potential exposures from VI due to volatilization of shallow groundwater impacts (to future building/Site occupants), via source removal. Operation of the BIO treatment system (air sparge/SSD component) in the shallow zone groundwater will reduce potential exposures through VI. Operation of the BIO treatment system in deeper groundwater (nitrate-nutrient solution and air injections) will reduce the presence of NAPL and address potential migration of lighter end hydrocarbon contamination that could migrate vertically to the shallow groundwater zone.

Conceptually, excavation of contaminated soil will proceed after completion of the PRDI and engineering design. Site conditions could easily lead to flowing sands that could quickly destabilize a shored excavation and additional data will be collected during the PRDI to support a detailed design of the shoring system necessary for soil removal to the CPOC of 9 beet bgs. Based on the findings of the RI, it is assumed that the top three feet of soil is clean and can be stockpiled and subsequently used as backfill. The extent of the excavation will be based on existing analytical data supplemented with additional investigation completed during the PRDI. Limits of excavation will be guided by field observations (there should not be any visible NAPL or photoionization detector (PID) measurements greater than 100 parts per million [ppm]). Impacted soil will be hauled off-site to an approved waste disposal destination pending waste profiling and approval. The use of engineered shoring and dewatering equipment will be needed as the excavation will extend into the shallow groundwater table. The water would be treated prior to discharge (pending a permit) or disposal. Clean backfill would be imported (or sourced from clean overburden), placed into the excavation, and compacted. The area would be finished with concrete surface cap to match the existing surface capping to ensure contiguous surface capping

throughout the contaminated area (i.e. engineering control). Due to the prolonged disruption and required closures that would be necessary, excavation will not include soil beneath West Marine View Drive or BNSF property; however, the BIO system will be used to address the COCs in off-property areas.

The BIO System will consist of several components: 1) a series of recirculation wells (horizontal for shallow zones and vertical for deeper zones) for injection of the nitrate/nutrient/surfactant (NNS) solution; 2) a series of wells to inject air in the shallow and deep groundwater zones; and 3) an air collection system (SSD) to capture the injected air. The system will initially be operated similarly to an AS/SVE system that will focus on removal of residual volatile hydrocarbons following Hot Spot soil removal. When the concentration of hydrocarbons in the extracted vapor begins to significantly decrease the NNS injection and recirculation will begin operation.

Institutional controls may include restrictions on on-site soil disturbance or placement of drinking water wells, and notices of impacted soil. If the soil restrictions are utilized, a soil management plan would be developed to control potential exposure risks posed by direct exposure to residual subsurface contamination (i.e., off-property areas where sufficient remedial action is not feasible, under public roadway or railroad tracks) and to protect the integrity of the remedy. In addition, a paved surface (engineering control) will be maintained so that the site still qualifies for Terrestrial Ecological Evaluation exclusion.

As presented in the CAP, the BIO cleanup action will continue until there is a diminishing return and approval from Ecology. When REL has been achieved and the BIO System is showing diminishing return, the performing Potentially Liable Persons (PLPs) will initiate a study to determine if MNA is applicable to achieve the CULs in a reasonable restoration timeframe, which is estimated at 10 years in the CAP. At any stage in the cleanup, if Ecology determines that CUL will not be achieved within a reasonable restoration timeframe, the performing PLPs shall conduct a Contingent Remedial Action (CRA) or prepare a Focused Feasibility Study (FFS) under Ecology's direction to address the remaining contamination.

2.2.3 Cleanup Standards

This section defines the Cleanup Standards applicable to the affected media of the Creosote/Fuel Oil Area and the related COCs.

COCs

Assessment performed as part of the RI established the following IHSs as COCs for the Creosote/Fuel Oil Area:

- Carcinogenic PAH (cPAH) TEQ values for soil in the Creosote/Fuel Oil Area
- Naphthalene for groundwater in the Creosote/Fuel Oil Area
- Naphthalene for soil vapor in the Creosote/Fuel Oil Area

Cleanup Levels

Selected CULs for IHSs in the Creosote/Fuel Oil Area from the CAP are the following:

- 0.19 milligram per kilogram (mg/kg or ppm) for cPAHs TEQ (based on MTCA Method B direct contact) in the Creosote/Fuel Oil Area
- 8.9 micrograms per liter (µg/L or parts per billion [ppb]) for naphthalene (based on groundwater protective of vapor intrusion criteria) in shallow on-property groundwater in the Creosote/Fuel Oil Area

Remediation Levels

The CULs presented above are proposed to be used for the Hot Spot soil removal in the Creosote/Fuel Oil Area; however, as presented in the RI/FS, 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), some contamination will remain in place and a qualitative REL will be implemented. Limits of excavation will be guided by the physical appearance of the excavated material. There should not be any visible NAPL or excessive creosote/fuel odor. Field screening (i.e. a handheld PID) will be used to differentiate the relative concentration of VOCs and a threshold of 100 ppm PID measurement has been established to screen sidewall samples post-excavation.

The CULs are based on protection of vapor intrusion for groundwater in the Creosote/Fuel Oil Area. RELs will be dependent upon the potential for current and future VI exposure. The REL for areas covered with buildings without engineered vapor control (i.e., SSD) will be the same as the CUL. The REL for areas covered with buildings with engineered vapor control or areas with no structures (roadway, railroad right-of-way) is the MTCA Method B surface water human health Applicable, Relevant, and Appropriate Requirements (ARAR) of 4,900 µg/L. The REL for areas that exclude migration and vapor intrusion potential will be based on physical observation of mobile NAPL.

Points of Compliance

Upland Soil

The alternate POC for the soil cleanup levels in the Creosote/Fuel Oil Area will be throughout the soil column from the ground surface to 9 feet bgs as presented in the CAP. Due to the shallow groundwater table and sandy soil it is unlikely that construction work could be safely performed down to the standard POC for soil of 15 feet bgs described in WAC 173-340-740(6)(d) and WAC 173-340-7490(4)(b). Ecology believes conditions specified in WAC 173-340-740(6)(f)(i)-(vi) will be met for the alternate POC because engineering and institutional controls are included as part of the remedy.

Groundwater

For groundwater, the POC 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 POC to the outer boundary of the hazardous substance plume per WAC 173-340-720(8)(a). Under MTCA, the standard POC 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 CPOC at the point of discharge of groundwater to surface water when it can be demonstrated that it is not practicable to meet the cleanup level at a point within the upland groundwater. The CPOC for the Site is the downgradient edge of the property, at the point of entry of groundwater to Port Gardner Bay.

For deep groundwater impacts, including the presence of NAPL, there are no applicable receptors or pathways for which risk to the contamination can be assessed. The Ecology-selected remedial action of BIO will be performed in the deep groundwater zone to reduce the presence of and potential for migration of NAPL, and to minimize the potential vertical migration of lighter end hydrocarbons in the deep zone groundwater to shallow zone groundwater and ultimately to indoor air via VI.

Summary of Cleanup Standards

Due to the complexities associated with the various remedial technologies and characteristics of the Creosote/Fuel Oil Area Site, the following table is included in this Upland PRDI WP to summarize the cleanup standards that are described in the above sections.

SOIL	ON PROPERTY	OFF PROPERTY
Remedial Action:	Hot Spot Soil Removal, IC, EC, BIO	IC, EC, BIO (via SVE)
CUL	0.19 mg/kg for cPAHs Toxic Equivalency (TEQ) (based on Method B direct contact)	
REL	Hot Spot: visible NAPL or excessive PID measurements (>100 ppm) IC, EC, and protection of groundwater (mobile NAPL removal)	

GROUNDWATER	ON PROPERTY	OFF PROPERTY
Remedial Action:	Hot Spot Soil Removal, BIO, IC, EC, MNA	BIO, IC, EC
CUL	8.9 µg/L for naphthalene (based on groundwater protective of vapor intrusion)	
REL	8.9 µg/L for naphthalene in shallow groundwater where structures are present without vapor controls 4,900 µg/L for naphthalene in shallow groundwater with IC and EC or no structures Removal of NAPL and protection of shallow groundwater from vertical migration of deep groundwater via volatilization in areas with IC and EC	

3.0 Upland Pre-Remedial Design Investigation

The upland RI utilized IHSs to identify areas of concern that warranted remedial action due to soil, groundwater, and/or soil vapor contamination. The IHSs and corresponding upland areas included dioxins for soil and groundwater in the Woodlife Area and cPAHs for soil and naphthalene for groundwater and soil vapor in the Creosote/Fuel Oil Area.

The existing data summarized in the RI were sufficient to characterize the nature and extent of COC contamination in the upland portions of the Site, for the purpose of the RI/FS. As described in the CAP, soil removal and surface capping are the selected remedy for the Woodlife Area, and Hot Spot soil removal and bioremediation is the selected remedy for the Creosote/Fuel Oil Area.

Further vertical and lateral delineation in removal areas is needed to refine these areas for completion of the remedial design and ensure results of the implementation of the remedies are protective of human health and the environment. Pilot testing of various components of the BIO system is needed to assess the feasibility of the technology for Site-specific conditions, and to

appropriately design the multi-faceted remedial technology selected for the Creosote/Fuel Oil Area.

3.1 General Scope of Work

This section presents the upland PRDI scope of work to address data gaps related to the following components of the Ecology-selected upland remedial actions:

- Assessment of Site features including surface topography, underground utilities, and subsurface infrastructure of the main manufacturing building (i.e., configuration of pilings).
- Lateral and vertical delineation of soil impacts for soil removal in Woodlife Area.
- Lateral and vertical delineation of soil impacts for Hot Spot soil removal in Creosote/Fuel Oil Area.
- Bench testing of bioremediation solution(s) for shallow zone and deep zone groundwater and assessment of existing subsurface bacteriological community.
- Aquifer testing of the shallow and deep groundwater zones to assist with shoring and excavation design, and injection/recirculation parameters.
- Pilot testing components of the BIO system for the Creosote/Fuel Oil Area; including soil air injection (AI) / sub-slab depressurization (SSD) testing to determine effective radius of influence (ROI) to assist with full-scale design. Data from the pilot testing of the various components of the BIO system will be evaluated to assess if sufficient data has been generated to complete design of the full system. If it is determined that significant data gaps remain after completion of the initial pilot tests, a pilot-scale BIO system will be constructed and operated.

Upland PRDI activities will be performed in accordance with the Upland SAP and the analytical methodology and quality assurance protocols to be used during the PRDI are described in the Quality Assurance Project Plan (QAPP), both included as Appendix A. The following sections present a summary of the various Upland PRDI activities. Additional detail and step-by-step procedures to be used by field personnel during implementation of the Upland PRDI activities are provided in the SAP/QAPP.

3.2 Site Features (Survey)

Prior to performance of any subsurface work, a licensed surveyor will be subcontracted to survey the Site and select features including: parcel and property boundaries, current shoreline and edge of asphalt (to support design of sediment remedy), surface topography (particularly for the Woodlife Area due to the presence of stormwater surface flow that enters the property from the adjacent public roadway), subsurface utilities within the proposed soil removal areas, and the location and configuration of the pilings supporting the main manufacturing building within the treatment area (see Figure 4). Identifying the location and configuration of the pilings will be an essential element to the design of the shoring for the Hot Spot soil removal in the Creosote/Fuel Oil Area. Understanding the site topography in this area is essential to properly design the construction activities, as well as to assist in designing post-construction conditions that account for changes in site stormwater conditions due to the proposed soil removal, surface re-paving, and demolition of the main manufacturing building (Note: demolition of the main manufacturing building is not included as part of the Upland PRDI; however, demolition activities may be performed by others prior to the performance of PRDI activities).

In addition, a private utility locating contractor will mark the location of any publicly or privately-owned utilities within the work areas in accordance with the SLR utility contact prevention program described in the HASP (Appendix B).

3.3 Woodlife Area

As described in the RI/FS, the soil removal boundaries for the Woodlife Area are controlled by dioxins TEQ values that exceed the CUL, which is equivalent to the regional natural background concentration. Upland PRDI activities in this area will focus on further delineating and confirming the lateral and vertical extent of dioxins contamination that will require removal to meet cleanup objectives.

3.3.1 Soil Removal Delineation Assessment

The sampling design to delineate the soil removal area includes collection of discrete soil samples from an approximately 40 x 40-foot grid across the preliminary Hot Spot removal area. Sampling in the Woodlife Area will include 26 soil boring locations to up to 10 feet bgs. Up to 3 soil samples at each location will be collected for laboratory analysis of dioxins. A proposed sample location map is shown on Figure 5 and cross-sections showing boring depths and preliminary soil sample intervals are shown on Figure 6a to 6c.

The Upland PRDI analytical data for the Woodlife Area, in conjunction with the surface topographical assessment described above, will be utilized to design the proposed construction activities and provide more certainty as to the potential lateral extents to address site access concerns (as the Woodlife Area is located within the main driveway and vehicle access point for the Site in its entirety) and the potential vertical extents to design the necessary dewatering apparatus and understand the scale of dewatering activities.

3.4 Creosote/Fuel Oil Area

As described in the RI/FS, the removal and treatment boundaries for this area are controlled by cPAH concentrations in soil, naphthalene concentrations in groundwater and soil gas, and the presence of DNAPL in deep zone groundwater. Upland PRDI activities include a multi-faceted approach to focus on further delineating and confirming the lateral and vertical extent of shallow soil contamination that will require removal, the lateral and vertical extent of shallow soil contamination that will require treatment, as well as assessing the feasibility and performance of the components of the BIO System.

3.4.1 Hot Spot Soil Removal Delineation Assessment

Sampling in this area will focus on further delineating and confirming the lateral and vertical extent of Hot Spot cPAH contamination. The sampling design includes collection of discrete soil samples and field screening from an approximately 40 x 40-foot grid across the preliminary Hot Spot removal area (Figure 7). Sampling in the Creosote/Fuel Oil Area will include 36 soil boring locations to up to 10 feet bgs (the proposed alternate POC for soil is 9 feet bgs). A continuous soil core will be collected using a Geoprobe direct push drilling method and the core will be field screened with a PID. PID measurements will be recorded in approximately 1-foot increments throughout the soil column and one soil sample at each location will be collected for potential laboratory analysis of cPAHs based on the location with the highest PID measurement. A proposed sample location map is shown on Figure 7. Some boring locations will be advanced deeper to assist with the other components of the Upland PRDI activities, and/or may be

completed as monitoring wells or pilot test wells with an alternate drilling method (e.g., Hollow-Stem Auger, Sonic).

The upland PRDI analytical results and field data from the delineation assessment (and the topographical survey) will be utilized to design the proposed construction activities, particularly the shoring apparatus, and to account for the presence of subsurface infrastructure (pilings). The objective of the Hot Spot soil removal component of the selected remedy is mass source removal to control potential direct contact exposure risk of the highest impacted soils as well as removal of a potential on-going source of impacts to shallow zone groundwater. Engineering controls (surface cap) and institutional controls (restrictions on soil disturbance) are also elements of the selected remedy due to the acknowledgement that residual soil contamination above CULs will likely remain in-place, particularly prior to full implementation of the BIO system.

3.4.2 Shallow Groundwater Zone Assessment

Five shallow groundwater monitoring wells to 15 feet bgs will be installed outside of the horizontal extents of the Hot Spot excavation area to assess the extent of shallow groundwater impacts (see Figure 7). These locations will be co-located with soil borings completed as part of the Hot Spot delineation assessment and their location will be based on whether they will remain outside of the excavation footprint, but still within the shallow groundwater zone area of impacts. The shallow groundwater monitoring wells will be sampled after installation and development activities are completed and groundwater samples will be submitted for laboratory analysis of naphthalene (all 5 wells) and for the bench scale treatability study parameters (2 wells, see Section 3.4.6.1). Some of the shallow groundwater monitoring wells will be used to assist with other components of the Upland PRDI activities (aquifer test, AI pilot).

The shallow groundwater zone data collected during the Upland PRDI activities will be utilized to determine the extents in the shallow zone that will require treatment, and to determine the suitable BIO injection solution mixture for shallow zone aerobic conditions. These locations are also planned to be utilized as compliance monitoring points following completion of the Hot Spot removal and during implementation of the BIO System.

3.4.3 Deep Groundwater Zone Assessment

Five deep groundwater monitoring wells with a bottom sump to approximately 55’ bgs will be installed to assess deep zone groundwater and for DNAPL presence and migration in the Creosote/Fuel Oil Area (see Figure 7). These locations will be co-located with soil borings completed as part of the Hot Spot delineation assessment to confirm that they would be outside of the excavation footprint but potentially still within the deep zone groundwater area of impacts. The deep groundwater monitoring wells will be sampled after installation and development activities are completed and groundwater samples will be submitted for laboratory analysis of naphthalene (all 5 wells) and for the bench scale treatability study parameters (2 wells, see Section 3.4.6.1). The deep zone monitoring wells will also be monitored on an initial monthly basis for accumulation of DNAPL in the sumps in the interim prior to design and implementation of the full-scale remedial action. The frequency of the DNAPL gauging will be adjusted as necessary and based upon field observations.

The deep groundwater zone data collected during the Upland PRDI activities will be utilized to determine the extents in the deep zone that will require treatment and establish the parameters for monitoring mobile DNAPL, and to determine the suitable BIO injection solution mixture for deep zone anaerobic conditions. These locations are also planned to be utilized as compliance monitoring points during implementation of the BIO System (i.e., when the REL transitions to monitored natural attenuation (MNA)).

3.4.4 Geotechnical Assessment

The scope of work for the Upland PRDI activities needed for full system design of excavation shoring include geotechnical subsurface explorations and field and laboratory testing. A geotechnical boring will be completed to about 15 feet below the bottom of the anticipated shoring system; therefore, to provide a potential benefit for future liquefaction evaluation, a minimum exploration depth of 50 feet is needed. The geotechnical boring will be located outside of the contaminated area; however, as discussed in the CSM the soil lithology is consistent throughout the hydraulically-filled portion of the Site.

One geotechnical boring (see Figure 7) will be advanced using a hollow stem auger rig with SPT and Modified California split spoon samples for recovery of relatively undisturbed ring samples which can then be used for laboratory direct shear testing to obtain soil strength parameters necessary for shoring design. Additional sampling and testing will be done to obtain *in-situ* moisture and density of soils, gradation, and Atterberg Limits of plastic soils. Bulk samples will be obtained from soil cuttings for obtaining representative compaction curves for the site soil types. The geotechnical boring will be completed as the deep zone aquifer pumping well (see Section 3.4.5).

The geotechnical assessment data, in addition to the aquifer pump test data, will be utilized to appropriately design the excavation shoring system to enhance the probability of completing soil excavation activities to the alternate POC of 9 feet bgs in a safe and efficient manner. The geotechnical laboratory parameters results will be utilized to select a backfill material that is similar to the existing fill material to support continuity in Site conditions between the pilot testing of the BIO System components and implementation of the BIO System remedy.

3.4.5 Aquifer Pump Test

Characteristics of the aquifer underlying the Creosote/Fuel Oil Area will be assessed using traditional aquifer testing protocols, including the following:

- Transducer assessment to assess tidal fluctuations and background conditions at existing groundwater monitoring wells and new monitoring wells described above.
- Deep zone step-test to determine a reasonable flow rate for the longer term, steady state test.
- Shallow zone step-test.
- Deep zone steady state aquifer test (based on ideal flow rate observed during the step-test).
- Shallow zone steady state test.

These tests will necessitate the installation of a pumping well in the shallow zone and the deep zone (deep zone pumping well to be co-located with the geotechnical boring described in Section 3.4.4). Two additional deep zone monitoring wells and one shallow zone monitoring wells are proposed for installation to support the aquifer test (See Figure 7). Other existing monitoring wells or new wells that are proposed as part of the Upland PRDI activities may be utilized to further support the aquifer tests. Water accumulated as part of the aquifer testing will be containerized and properly disposed pending permitting.

The Upland PRDI data for the aquifer testing in the Creosote/Fuel Oil Area will be utilized to: establish the ROI of the pumping element of the BIO System; aid in determining the estimated rate and volume of dewatering for proposed soil removal areas; designing the shoring required

for the soil removal areas (in addition to geotechnical assessment described in Section 3.4.4); and, design the vertical recirculation component of the BIO System.

3.4.6 BIO System

A hybrid approach using air injection wells along with recirculating a nitrate-based nutrient solution has been selected to bioremediate the COCs within the Creosote/Fuel Oil Area.

As described in the CAP, the BIO System will consist of several components: 1) a series of recirculation wells (horizontal for shallow zones and vertical for deeper zones) for injection of the nitrate/nutrient/surfactant (NNS) solution; 2) a series of wells to inject air in the shallow and deep zones; and 3) an air collection system (sub slab depressurization [SSD]) to capture the injected air.

This Upland PRDI WP describes the tasks required to obtain site specific data on feasibility of the BIO System, aquifer and contamination characteristics, air injection flows and pressures, and flow and vacuum requirements (i.e., ROIs) to design the full-scale BIO System.

3.4.6.1 Bench Scale Treatability Study

A Bench Scale Treatability Study will be used to evaluate destruction of naphthalene from saturated soil and groundwater through bioremediation. Batch tests will be conducted to evaluate biodegradation under aerobic and anaerobic conditions to assess potential variance in the shallow and deep zone groundwater.

Saturated soil and groundwater samples will be collected from three locations within the Creosote/Fuel Oil Area but outside of the Hot Spot removal footprint as the soil removal component of the remedial action will occur first and therefore conditions within the Hot Spot removal footprint are not representative of what conditions will be at time of implementation of the BIO System. Samples will be collected from the shallow zone in conjunction with the Hot Spot Soil Removal Delineation Assessment (Section 3.4.1), and the Shallow Zone Groundwater Assessment (Section 3.4.2).

Soil and groundwater samples will be submitted to a third-party laboratory for chemical analysis (VOCs/Naphthalene) and other parameters (moisture content, total organic carbon (TOC) for soil; and, alkalinity, dissolved oxygen, ferrous iron, nitrate, ORP, pH, and sulfate for groundwater). Chemical analysis of VOCs (including the primary target of naphthalene) will be analyzed using an expedited turnaround time of 48 hours to confirm concentrations are acceptable before proceeding with full scale bench tests. It should be noted that analytical results obtained from the bench test are meant to provide direction regarding design of the BIO System and are not considered valid for compliance purposes.

Bench scale testing of COC removal / secondary effects will be performed utilizing a combination of soil, groundwater, nitrate, surfactant, and sodium azide in various compositions and sample times to determine ideal solution for contaminant destruction (further detailed in the SAP, Appendix A). This bench test will include aerobic conditions (headspace sparged with oxygen gas) and anaerobic conditions (headspace sparged with nitrogen gas).

The Upland PRDI data from the bench scale treatability study in the Creosote/Fuel Oil Area will be utilized to assess the effectiveness of bioremediation to destroy the contamination in site-specific soil and groundwater conditions. The primary pathway of contamination in the Creosote/Fuel Oil Area is volatilization of VI COCs (naphthalene) to indoor air, while also considering the potential for deep zone volatilization of VI COCs to impact shallow zone groundwater, which in turn could migrate to soil gas and indoor air. The focus of the bench scale

treatability study shall be the effectiveness of the varied injection solution mixtures to destroy lighter hydrocarbons, including those originating from the DNAPL-impacted groundwater of the deep zone.

3.4.6.2 Microbiological Community Assessment

Soil and groundwater samples within the Creosote/Fuel Oil Area treatment area will be submitted for Next Gen Sequencing (NGS) to characterize the microbial population based on metabolic potential or likely function, including an assessment of known impacted areas vs non-impacted areas. Based on the initial screening, follow-up sampling will be performed for analysis of individual functional genes associated with specific steps of the aerobic and anaerobic BTEX and HC degradation pathways as well as sulfate reduction.

The Upland PRDI data from the microbiological community assessment in the Creosote/Fuel Oil Area will be utilized to aid in determining the nature of the existing biological community at the Site and provide information regarding the best options for increasing the biological activity to reduce COC concentrations at the Site, whether by altering subsurface conditions to be more suitable or introducing appropriate bacteria.

3.4.6.3 Air Injection / SSD Pilot Testing

The AI/SSD pilot testing consists of an assessment of the AI component of the BIO System (i.e., air sparging) and the SSD component of the BIO System as these elements will work in conjunction to enhance the bioremediation being driven by the injections and microbial degradation and also controlling the primary exposure pathway of VI.

The SSD pilot test includes installation of a horizontal well (slotted horizontal pipe in a trench excavation that is backfilled with gravel and sealed at the top) within the proposed treatment area (but outside of the preliminary Hot Spot removal area), a horizontal well step test, and a horizontal well constant rate test (Figure 7). To monitor the vacuum influence on the subsurface, 8 vapor pins will be installed around the horizontal well at varied distances with connections for magnehelic differential pressure gauges. A step test will be conducted by connecting a blower to the horizontal well to generate data to select a vacuum for a constant rate test (anticipated to produce an ROI in the range of 40 to 50 feet). Exhaust vapors from the SSD pilot tests will be screened with a PID to assess presence of contaminant removal and sampling or treatment of the emissions may be required pending permitting (it is assumed that the short-term pilot tests will not require authorization from the regional clean air agency, see Section 3.5.2).

AI pilot testing will be performed in both the shallow and deep zones. Similar to other tests being performed, the testing in each zone will consist of a step test to establish flow/pressure curves for the AI point as well as a longer-term steady state test that will help to establish the ROI of the AI in each zone. The AI ROI will be estimated based on measured changes in dissolved oxygen (DO), oxidation reduction potential (ORP), groundwater elevation, well head space PID readings, and presence/absence of bubbles in the monitoring wells (assessed visually or auditorily). Dedicated monitoring wells will be installed or utilized from other components of the Upland PRDI (see Figure 7). The SSD pilot system will be used in conjunction with the AI pilot test to replicate the function of the full-scale system to control sub-slab vapors.

The Upland PRDI data from the AI/SSD testing will be utilized to assess the performance of a horizontal well to capture sub slab vapors generated through sparging of the groundwater zones, and to design the AI/SSD components of the full-scale system based on ROI calculations from the pilot tests.

3.4.6.4 BIO Pilot Test Evaluation

The abovementioned Upland PRDI testing of components and elements of the BIO System is anticipated to produce sufficient data to assess the effectiveness of bioremediation as the remedy action for site-specific conditions and contamination in the Creosote/Fuel Oil Area and initiate initial design of the BIO System. If significant data gaps are identified, then additional pilot testing of the components may be performed (testing wells will be installed as permanent fixtures). Uncertainty as to the effective implementation of the BIO System as a whole may be supplemented with construction and operation of a pilot-scale BIO System. It is anticipated that an additional data gap investigation or pilot-scale BIO System may be performed within the Upland Investigation and Pilot Testing window designated in the project schedule (see Section 4.0).

3.5 Permitting and Regulatory Requirements

3.5.1 Archaeology

An Inadvertent Discovery Plan (IDP) was prepared in accordance with applicable state and federal laws and will be followed in the event of a discovery of archaeological materials or human remains. A copy of the IDP is included as Appendix C.

3.5.2 Air Emissions

The Puget Sound Clean Air Agency regulates business operations with air discharges in King, Kitsap, Pierce, and Snohomish Counties. The SSD pilot testing will produce off-gas which may require notice for registration with the Puget Sound Clean Air Agency to ensure compliance with air pollution control requirements. Per Regulation I, Section 6.03(b)(10), the Puget Sound Clean Air Agency Control Officer will determine based on the provided emission information if the project is under the de minimis impact levels per WAC 173-460-150, or if an Order of Approval is required. Due to the brief nature of emissions from the SSD pilot testing, it is assumed that this project will not require an air emissions permit.

3.5.3 Water

Wastewater discharge to the sanitary sewer is regulated by the City of Everett. Prior to discharge of wastewater to the sanitary sewer, authorization with the City of Everett per the 2008 Pretreatment Ordinance #3070-08 must be obtained. Section 2.4 of the ordinance states that the wastewater must be sampled prior to being discharged, and the sample results cannot be higher than the allowed discharge limits provided in the ordinance. If sample results are above the allowable wastewater discharge limits, a plan detailing how the discharge will meet the required limits will be provided to the City of Everett. Due to the expected volume of water generated during the aquifer tests, a wastewater discharge permit will likely be required as part of these Upland PRDI activities.

3.5.4 Waste Management

Solid waste generated as part of the Upland PRDI activities (soil cuttings, disposable sampling equipment) will be handled in accordance with applicable solid waste handling and disposal requirements in regards to storage, labelling, profiling, and disposal destination. Documentation of disposal, aside from general refuse, will be kept in project files.

4.0 Schedule

The final Project schedule was established in the Second Amendment to the AO. Mobilization for the Upland PRDI activities will occur following Ecology's approval of the final version of the Upland PRDI WP, currently anticipated for May to June 2024. The current schedule from the CAP denotes the duration of Upland Investigation and Pilot Testing at 1 year.

5.0 Closure

This document has been prepared by SLR International Corporation (SLR). The material and data in this report were prepared under the supervision and direction of the undersigned.

Sincerely,

SLR International Corporation

[DRAFT FOR ECOLOGY]

R. Scott Miller, P.E.
Senior Principal

[DRAFT FOR ECOLOGY]

Chris Kramer
Principal

6.0 References

SLR International Corp./Anchor QEA LLC (SLR/Anchor). 2021. Final Remedial Investigation / Feasibility Study. Jeld-Wen / Former Nord Door Facility. January.

Washington Department of Ecology (Ecology). 2023 (Amended). Model Toxics Control Act (MTCA) Cleanup Regulation Chapter WAC 173-340.

Ecology. 2023. Final Cleanup Action Plan. Jeld Wen Site. August (included as Exhibit H of the Second Amendment to Agreed Order for Remedial Investigation/Feasibility Study and Draft Cleanup Action Plan between JELD-WEN, Inc. and Department of Ecology, effective date of July 28. 2023).

Figures

LEGEND

EXISTING BUILDINGS

REMOVED BUILDINGS

SLR

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
PRE-REMEDIAL DESIGN INVESTIGATION WORK PLAN - UPLAND AREAS OF JELD-WEN SITE

Drawing
SITE PLAN

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

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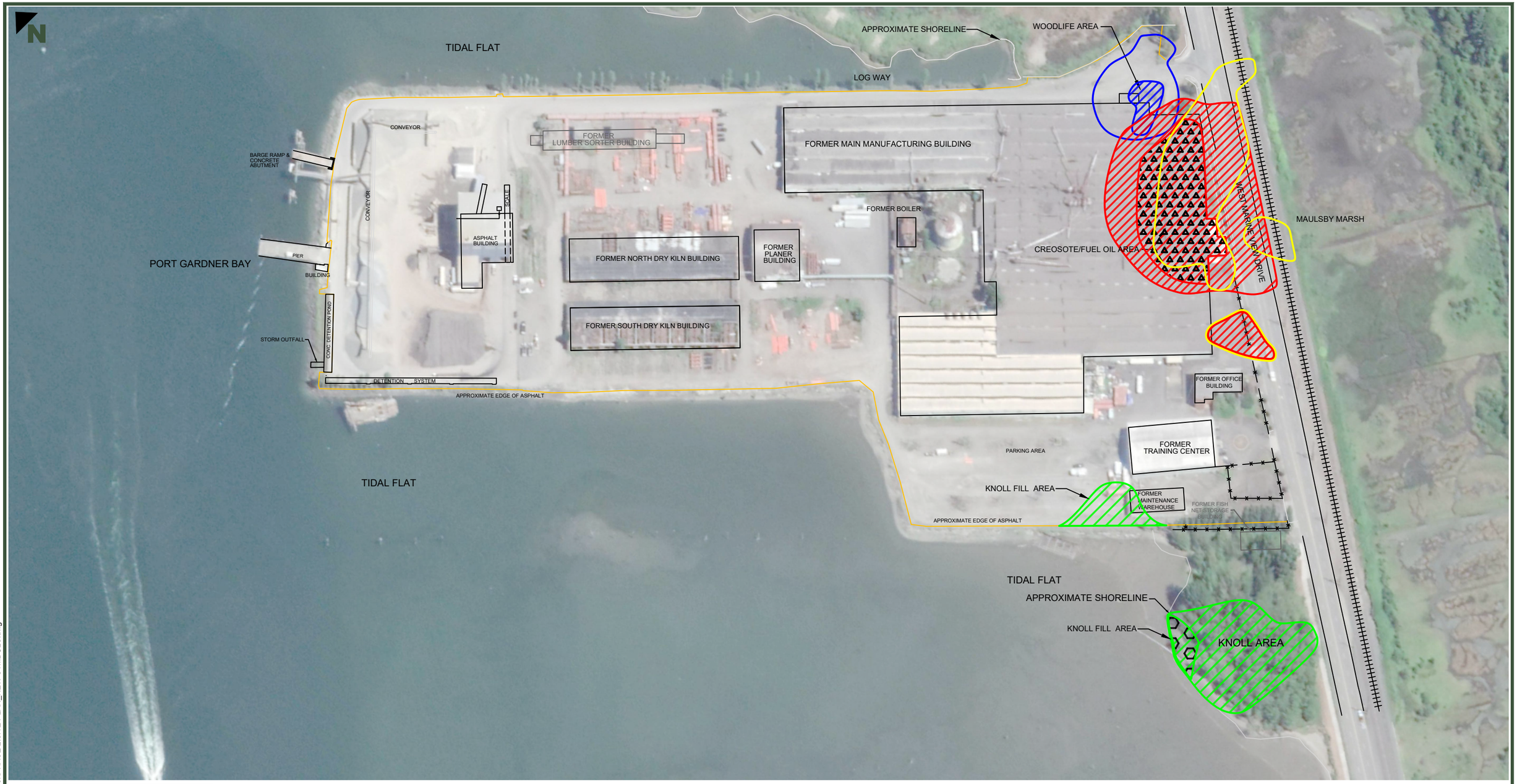

LEGEND

- EXISTING BUILDINGS
- REMOVED BUILDINGS
- cPAH IN SOIL
- NAPHTHALENE IN GROUNDWATER
- NAPHTHALENE IN SOIL–GAS
- PCB CONGENERS IN GROUNDWATER
- PCB CONGENERS IN GROUNDWATER SEEP
- DIOXINS IN SOIL
- DIOXINS IN GROUNDWATER

SLR

NOTES

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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 CLEANUP ACTION PLAN

Drawing
CUL EXCEEDANCES IN DIFFERENT MEDIA

Date	MARCH 2021	Scale	AS SHOWN	Fig. No. 2
File Name	SITE PLAN_NEW SYMBOLS	Project No.	108.00228.00061	

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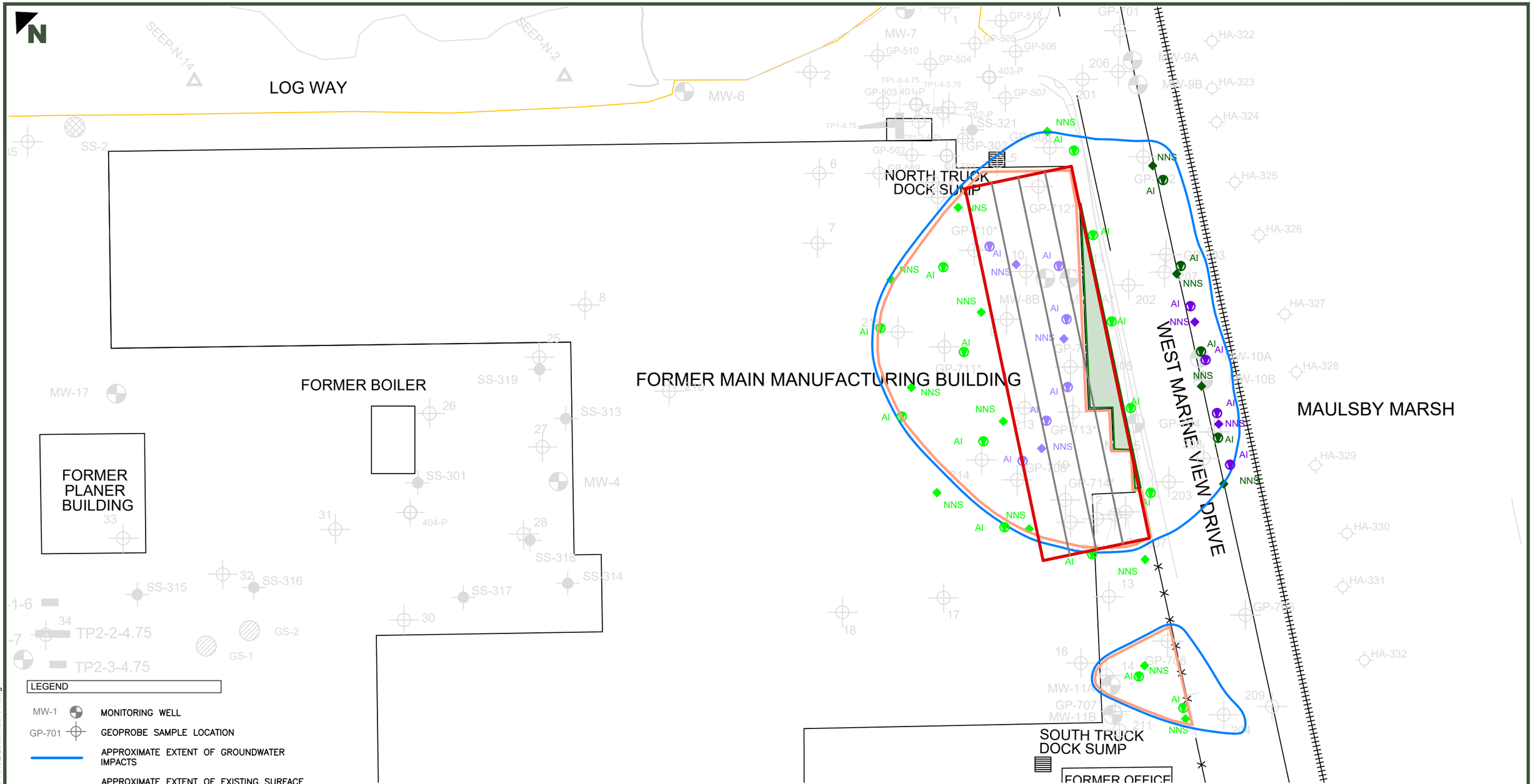

LEGEND

- 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)
- HOTSPOT REMOVAL AREA (100 FT X 350 FT)
- PROPOSED SHORING (25 FT SPACING)

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

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0 90 180 270'

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

Report
PRE-REMEDIAL DESIGN INVESTIGATION WORK PLAN - UPLAND AREAS OF JELD-WEN SITE

Drawing
UPLAND CLEANUP ACTION - CREOSOTE/FUEL OIL AREA

Date	January 2024	Scale	AS SHOWN	Fig. No. 3
File Name	Alternative 7	Project No.	108.00228.00061	

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LEGEND

- EXISTING BUILDINGS
- REMOVED BUILDINGS
- SITE SURVEY AREA

SLR

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

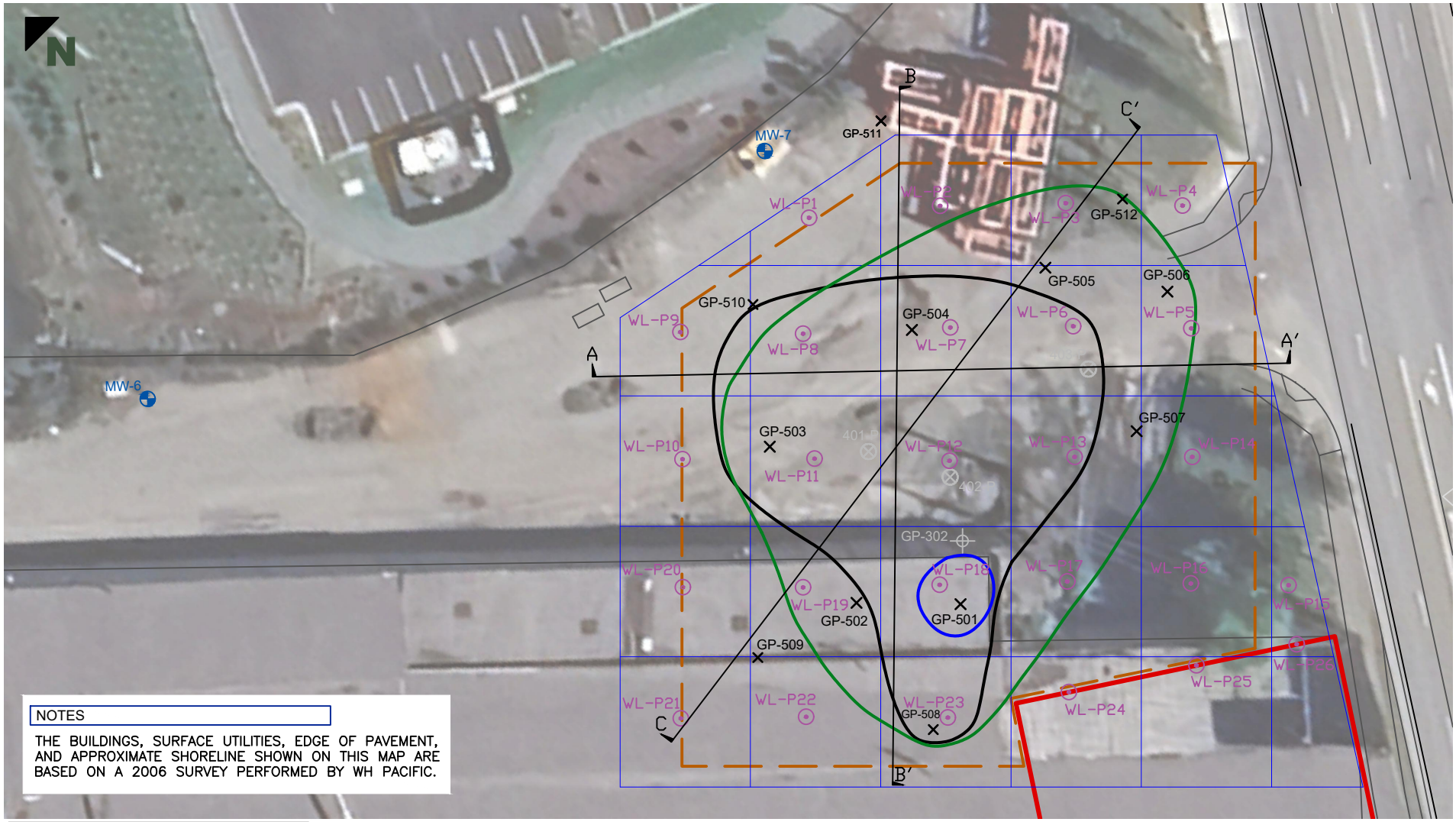
0 200 400 600'

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

Report
PRE-REMEDIAL DESIGN INVESTIGATION WORK PLAN - UPLAND AREAS OF JELD-WEN SITE

Drawing
SITE SURVEY SCOPE OF WORK

Date	MARCH 2021	Scale	AS SHOWN	Fig. No.	4
File Name	SITE PLAN_NEW SYMBOLS	Project No.	108.00228.00061		



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.

LEGEND

- GEOPROBE SAMPLING LOCATION, SLR 2012
- GEOPROBE SAMPLE LOCATION, SLR 2009
- SURFACE SOIL SAMPLE LOCATION, SLR 2009
- NEAR SURFACE SOIL SAMPLE LOCATION, SLR 2009
- EXISTING MONITORING WELL
- GEOPROBE SAMPLING LOCATION, SLR 2013
- PROPOSED SOIL BORING LOCATION
- HOTSPOT REMOVAL AREA (100 FT X 350 FT)
- WOODLIFE SOIL REMOVAL AREA
- ESTIMATED EXTENT OF IMPACTS AT 1' bgs
- ESTIMATED EXTENT OF IMPACTS AT 3' bgs
- ESTIMATED EXTENT OF IMPACTS AT 5' bgs
- 40'x40' SAMPLING GRID

0 45 90 135'

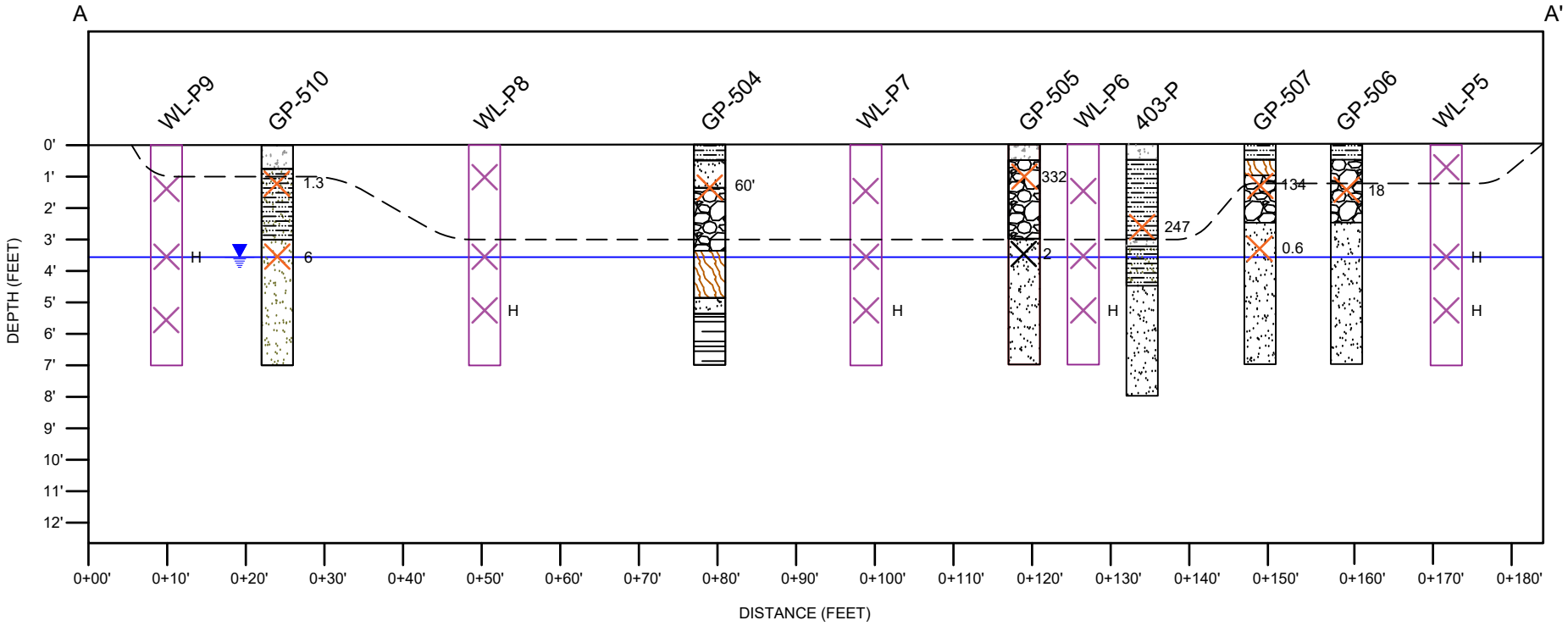
JELD-WEN SITE
300 WEST MARINE VIEW DRIVE
EVERETT, WASHINGTON

Report
PRE-REMEDIAL DESIGN INVESTIGATION WORK PLAN - UPLAND AREAS OF JELD-WEN SITE

Drawing
WOODLIFE AREA PROPOSED SAMPLE LOCATIONS

Date January 19, 2024	Scale AS SHOWN	Fig. No. 5
File Name RD Workplan-3	Project No. 108.00228.00026	

Last Saved: January 19, 2024 11:43:02 AM by kcook Drawing path: N:\Portland\Figures\JELD-WEN\JELD-WEN NordDoor\PHASE 2\RD Workplan.dwg



LEGEND

- ASPHALT/CONCRETE
- SAND
- GRAVEL
- SILT
- CLAY
- WOODY DEBRIS
- APPROXIMATE WATER LEVEL
- GEOPROBE GROUNDWATER SAMPLING LOCATION, SLR 2013
- 60 DIOXINS TEQ VALUE (pg/g)
- ESTIMATED EXTENT OF EXCAVATION
- PROPOSED SOIL BORING
- GEOPROBE SAMPLING LOCATION
- H SAMPLE INTERVAL TO BE HELD BY LABORATORY PENDING RESULT OF SHALLOWER SAMPLE

SLR

JELD-WEN SITE
300 WEST MARINE VIEW DRIVE
EVERETT, WASHINGTON

Report
PRE-REMEDIAL DESIGN INVESTIGATION WORK PLAN - UPLAND AREAS OF JELD-WEN SITE

Drawing
CROSS-SECTION A - A'

Date January 19, 2024	Scale AS SHOWN	Fig. No. 6A
File Name RD Workplan-3	Project No. 108.00228.00026	

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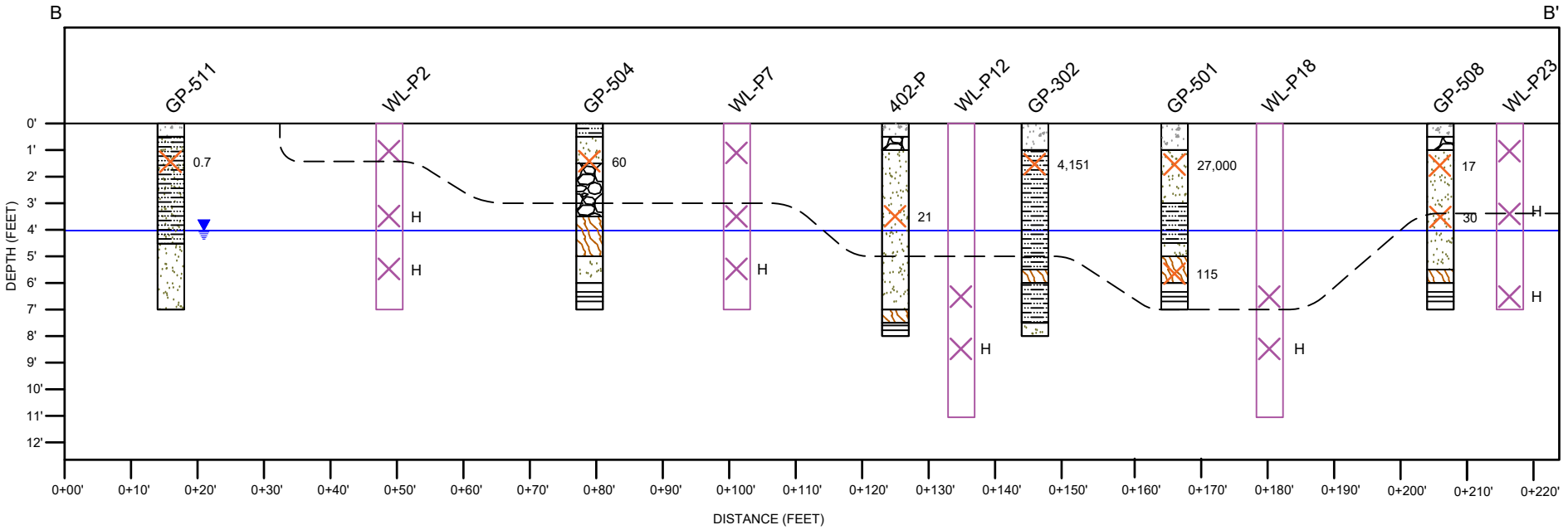


LEGEND

- ASPHALT/CONCRETE
- SAND
- GRAVEL
- SILT
- CLAY
- WOODY DEBRIS
- APPROXIMATE WATER LEVEL
- GEOPROBE GROUNDWATER SAMPLING LOCATION, SLR 2013
- 60 DIOXINS TEQ VALUE (pg/g)
- ESTIMATED EXTENT OF EXCAVATION
- PROPOSED SOIL BORING
- GEOPROBE SAMPLING LOCATION
- H SAMPLE INTERVAL TO BE HELD BY LABORATORY PENDING RESULT OF SHALLOWER SAMPLE

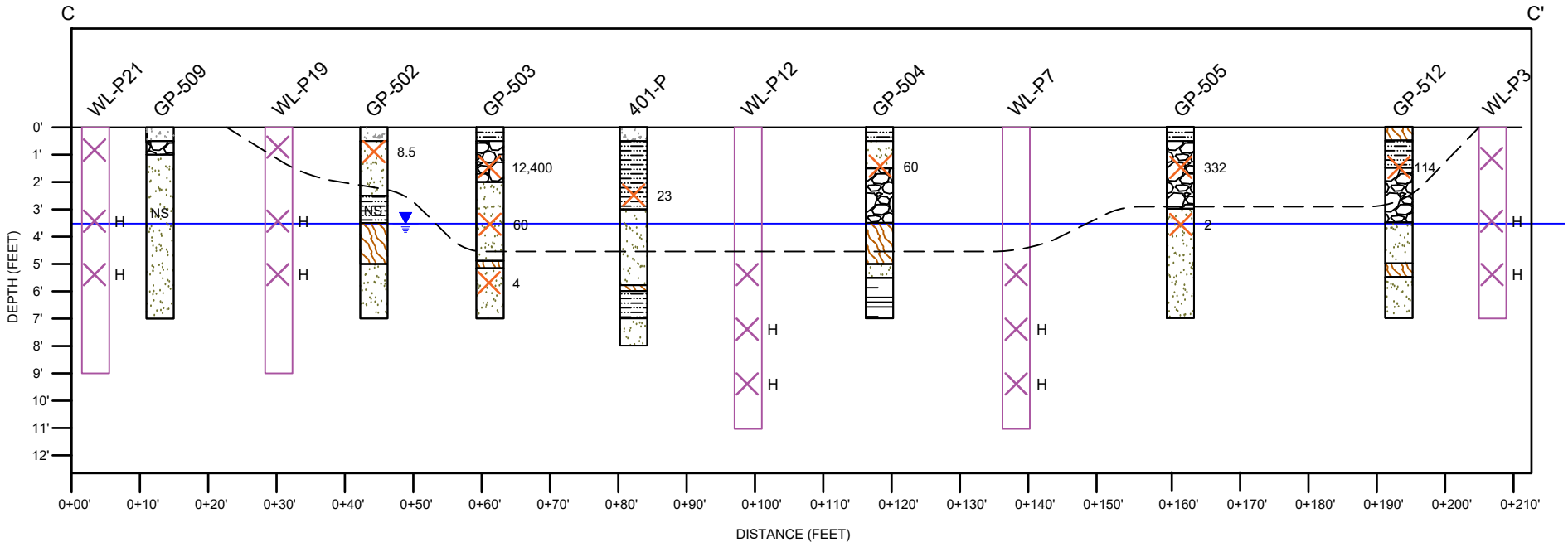
SLR

JELD-WEN SITE
300 WEST MARINE VIEW DRIVE
EVERETT, WASHINGTON

Report
PRE-REMEDIAL DESIGN INVESTIGATION WORK PLAN - UPLAND AREAS OF JELD-WEN SITE

Drawing
CROSS-SECTION B - B'

Date January 19, 2024	Scale AS SHOWN	Fig. No. 6B
File Name RD Workplan-3	Project No. 108.00228.00026	



LEGEND

- ASPHALT/CONCRETE
- SAND
- GRAVEL
- SILT
- CLAY
- WOODY DEBRIS
- APPROXIMATE WATER LEVEL
- GEOPROBE GROUNDWATER SAMPLING LOCATION, SLR 2013
- 60 DIOXINS TEQ VALUE (pg/g)
- ESTIMATED EXTENT OF EXCAVATION
- PROPOSED SOIL BORING
- GEOPROBE SAMPLING LOCATION
- H SAMPLE INTERVAL TO BE HELD BY LABORATORY PENDING RESULT OF SHALLOWER SAMPLE

NOTES

NS = NOT SAMPLED

CLEANUP LEVEL (CUL) FROM CAP IS 5.2 pg/g FOR DIOXINS TEQ.

SLR

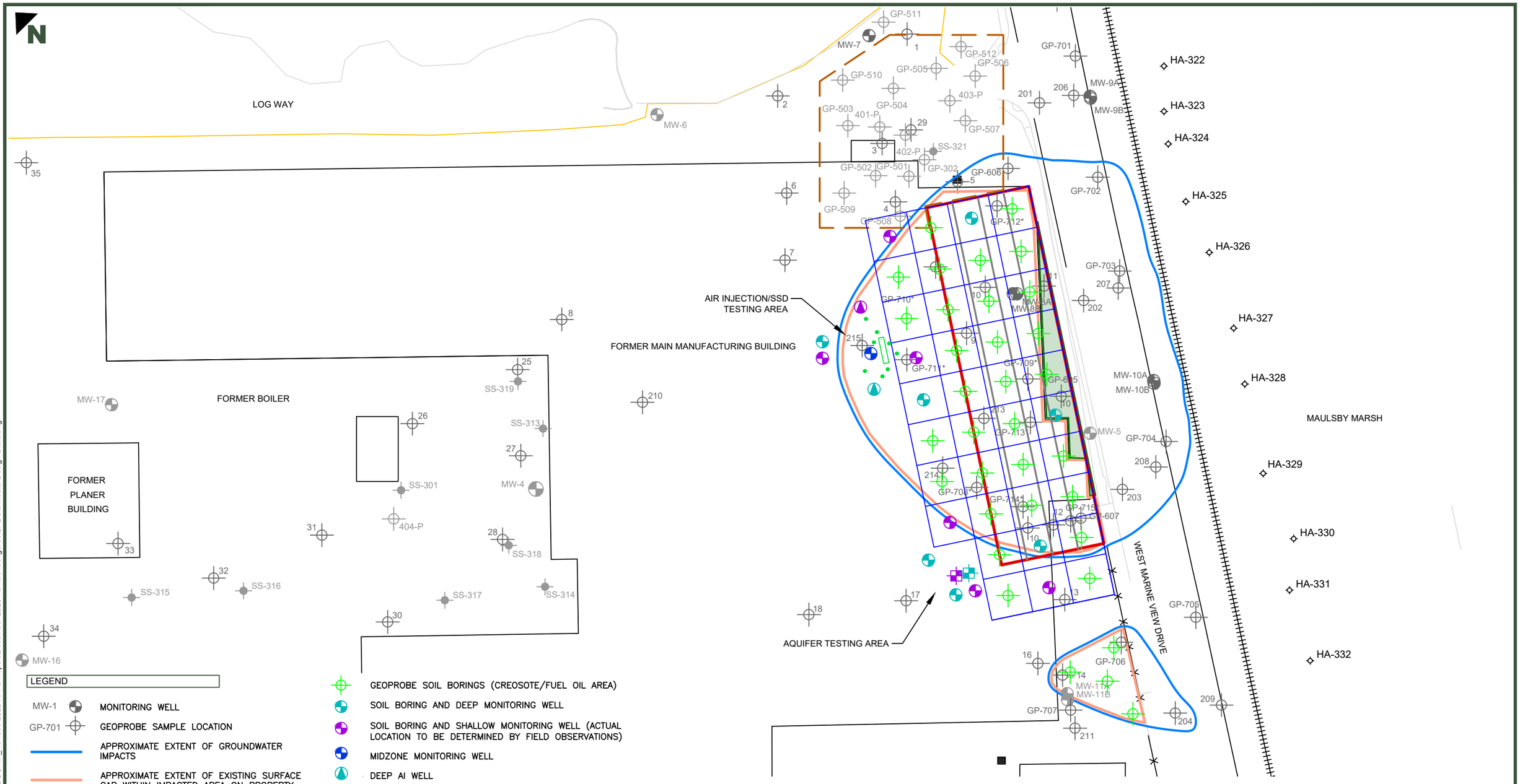
JELD-WEN SITE
300 WEST MARINE VIEW DRIVE
EVERETT, WASHINGTON

Report
PRE-REMEDIAL DESIGN INVESTIGATION WORK PLAN - UPLAND AREAS OF JELD-WEN SITE

Drawing
CROSS-SECTION C - C'

Date January 19, 2024	Scale AS SHOWN	Fig. No. 6C
File Name RD Workplan-3	Project No. 108.00228.00026	

Last Saved: January 19, 2024 11:43:02 AM by kcook Drawing path: N:\Portland\Figures\JELD-WEN\JELD-WEN NordDoor\PHASE 2\RD Workplan.dwg



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)
	HOTSPOT REMOVAL AREA (100 FT X 350 FT)
	PROPOSED SHORING (25 FT SPACING)
	WOODLIFE SOIL REMOVAL AREA

	GEOPROBE SOIL BORINGS (CREOSOTE/FUEL OIL AREA)
	SOIL BORING AND DEEP MONITORING WELL
	SOIL BORING AND SHALLOW MONITORING WELL (ACTUAL LOCATION TO BE DETERMINED BY FIELD OBSERVATIONS)
	MIDZONE MONITORING WELL
	DEEP AI WELL
	SHALLOW AI WELL
	DEEP PUMPING WELL AND GEOTECHNICAL BORING
	SHALLOW PUMPING WELL
	VAPOR PIN
	SSD HORIZONTAL WELL
	40'x40' SAMPLING GRID

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

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

Report
PRE-REMEDIAL DESIGN INVESTIGATION WORK PLAN - UPLAND AREAS OF JELD-WEN SITE

Drawing
CREOSOTE/FUEL OIL AREA PROPOSED SAMPLE LOCATIONS

Date	October 2023	Scale	AS SHOWN
File Name	Remedial Design Draft	Project No.	108.00228.00063

Fig. No. 7

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Appendix A Upland Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP)

Appendix A: Upland SAP and QAPP

Pre-Remedial Design Investigation Work Plan – Upland Areas of Jeld Wen Site

Jeld-Wen Site

300 West Marine View Drive
Everett, Washington

Making Sustainability Happen

Table of Contents

Tables

Figures

Appendices

1.0 Introduction

SLR International Corporation (SLR) has prepared the following Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP) to accompany the Pre-Remedial Design Investigation (PRDI) Work Plan – Upland Areas of the Jeld Wen Site (Upland PRDI WP).

1.1 Objectives

The overall objectives of the Upland PRDI activities are to assess the extent of contamination identified during completion of the Remedial Investigation (RI) and to evaluate the feasibility and design specifications of the selected remedial actions evaluated in the Feasibility Study (FS) and presented in the Cleanup Action Plan (CAP).

The Upland PRDI scope of work specifically entails the following tasks that are summarized in the Upland PRDI WP:

- Assessment of Site features including surface topography, underground utilities, and subsurface infrastructure of the main manufacturing building (i.e., configuration of pilings).
- Lateral and vertical delineation of soil impacts for soil removal in Woodlife Area.
- Lateral and vertical delineation of soil impacts for Hot Spot soil removal in Creosote/Fuel Oil Area.
- Bench testing of bioremediation solution(s) in site-specific soil and groundwater and assessment of existing subsurface bacteriological community in impacted and non-impacted areas.
- Aquifer testing of the shallow and deep groundwater zones to assist with shoring and excavation design, and injection/recirculation parameters.
- Pilot testing components of the BIO system for the Creosote/Fuel Oil Area; including soil air injection (AI) / sub-slab depressurization (SSD) testing to determine effective radius of influence (ROI) to assist with full-scale design. Data from the pilot testing of the various components of the BIO system will be evaluated to assess if sufficient data has been generated to complete design of the full system. If it is determined that significant data gaps remain after completion of the initial pilot tests, a pilot-scale BIO system will be constructed and operated.

Upland PRDI activities will be performed in accordance with the SAP (Section 2) and the analytical methodology and quality assurance protocols to be used during the Upland PRDI activities are described in the QAPP (Section 3).

1.2 General Site Information

Site Name: Jeld Wen Site

Site Address: 300 West Marine View Drive

City and State: Everett, WA 98201

County: Snohomish

Latitude: 48.014780°

Longitude: -122.211467°

Washington State Department of Ecology (Ecology) Facility Site ID Number: 2757

Ecology Region: Northwest Region

Ecology Project Manager/Coordinator: Frank P. Winslow, LHG, Ecology, Toxics Cleanup Program

JELD-WEN Project Coordinator: Eric Rapp, JELD-WEN, Inc.

JELD-WEN Project Manager: Scott Miller, SLR

A Site Plan is included as SAP Figure 1.

2.0 Sampling and Analysis Plan

This SAP presents the detailed scope of work for implementation of the Upland PRDI activities described in the Upland PRDI WP.

2.1 General Procedures

To support project objectives (see Section 1.1), the following general procedures shall be used during the sampling efforts:

- Sample collection methods have been designed to evaluate soil and groundwater per similar methodology as previous site investigations for comparison purposes. Environmental sample collection specifications (sampling container, preservative, and hold time) are shown in Table 1.
- The field sampling team will document the sampling efforts with photographs as well as field notes and sampling documentation sheets. Example Field Forms are included in Appendix A.
- Sample collection efforts will be implemented in such a manner as to minimize worker exposures in compliance with applicable Occupational Safety and Health Administration (OSHA) regulations 29 CFR 1910.120 and other applicable federal, state, and local laws, regulations and statutes. It is anticipated that the work will be performed in the exclusion zones in Level D or Level C personal protective equipment (PPE). For additional detail on minimizing worker exposures, please refer to the site-specific HASP (included as Appendix B of the Upland PRDI WP).
- Groundwater and soils will be analyzed by accredited laboratories using U.S. Environmental Protection Agency (EPA)-approved analytical methods with appropriate detection limits. Laboratory quality objectives are shown in Table 2.
- Total concentrations of carcinogenic polynuclear aromatic hydrocarbons (cPAHs) and polychlorinated dibenzo-p-dioxins and dibenzofurans (dioxins) will be reported as toxic equivalents (TEQs) in accordance with Model Toxics Control Act (MTCA) Table 708-1 and Table 708-2.
- Final specifications of soil borings and well constructions will be dependent upon conversations with the drilling subcontractors and field observations. A summary of the proposed boring and well program is included in Table 3.

- Laboratory analytical data validation will be performed as presented in the QAPP (Section 3) and in general accordance with data quality control guidance. Internal data validation guidance is included in Table 4.

2.2 Site Features (Survey)

Prior to performance of any subsurface work, a licensed surveyor will be subcontracted to survey the Site and select features.

Sample Locations, Types, and Frequency

Survey locations and features include: parcel and property boundaries, current shoreline and edge of asphalt (to support design of sediment remedy), surface topography (particularly for the Woodlife Area due to the presence of stormwater surface flow that enters the property from the adjacent public roadway), subsurface utilities within the proposed soil removal areas, and the location and configuration of the pilings supporting the main manufacturing building within the treatment area (see SAP Figure 2). Identifying the location and configuration of the pilings will be an essential element to the design of the shoring for the Hot Spot soil removal in the Creosote/Fuel Oil Area. Understanding the site topography in this area is essential to properly design the construction activities, as well as to assist in designing post-construction conditions that account for changes in site stormwater conditions due to the proposed soil removal, surface re-paving, and demolition of the main manufacturing building (Note: demolition of the main manufacturing building is not included as part of the Upland PRDI; however, demolition activities may be performed by others prior to the performance of PRDI activities).

In addition, a private utility locating contractor will mark the location of any publicly or privately-owned utilities within the work areas in accordance with the SLR utility contact prevention program described in the HASP (Appendix C of the Upland PRDI WP).

Sample Analyses and Methods

No analytical testing is required for this task.

Sample Designation

No environmental samples will be collected for this task.

Sample Procedures

Survey information will be collected by a licensed land surveying contractor in accordance with Ecology guidance on horizontal and vertical datum and survey precision and accuracy presented in the *Guidance for Remediation of Petroleum Contaminated Site* (Ecology, 2016).

Requirements for horizontal and vertical datum and survey precision and accuracy include where feasible, measurements should be recorded with at least the following precision relative to an on-site reference monument:

- To facilitate site work, a site coordinate system should be established to tie the locations of points within the site relative to one or more on-site or near-site reference monument(s). The reference monument(s) should be established at a location that is unlikely to be disturbed by future remediation or site redevelopment activities and identified on the site map.

- If it is cost prohibitive to establish coordinates and the vertical elevation of the reference monument(s) using the conventional surveying methods or a survey-grade GPS, coordinates and elevation can be estimated using other methods.
- The horizontal location of objects and sampling locations should be measured to within 1.0 foot.
- The ground surface elevation at boreholes, monitoring wells and soil sampling locations should be measured to within 0.1 foot.
- For boring logs and backhoe test pits, sample depths should be measured to within 1.0 foot. For surface soil samples, the sample depth should be measured to within 0.1 foot.
- For all monitoring wells, the vertical elevation of the reference point on the top of the casing for water levels should be measured to within 0.01 foot. Subsequent water levels should be measured to within 0.01 foot from this reference point to the casing.

2.3 Woodlife Area Soil Removal Area Delineation

As described in the Upland PRDI WP the soil removal boundaries for the Woodlife Area are controlled by dioxins TEQ values that exceed the Cleanup Level (CUL), which is equivalent to the regional natural background concentration. Upland PRDI activities in this area will focus on further delineating and confirming the lateral and vertical extent of dioxins contamination that will require removal to meet cleanup objectives.

Sample Locations, Types, and Frequency

The sampling design to delineate the soil removal area in the Woodlife Area includes collection of discrete soil samples from an approximately 40 x 40-foot grid across the preliminary Hot Spot removal area. Sampling in the Woodlife Area will include 26 soil boring locations to approximately 10 feet below ground surface (bgs) from the approximate center of each grid cell pending access and safety due to site features or utilities (SAP Figure 3 and Table 3). Nine feet bgs is the alternate Point of Compliance (POC) presented in the CAP and soil borings are not anticipated to proceed deeper than this depth, regardless of evidence of impacts.

Grab soil samples will be collected from continuous soil cores generated from a Geoprobe direct push drilling rig operated by a subcontractor.

Up to 3 soil samples at each location will be collected for laboratory analysis based on field observations and previous investigation findings. Cross-sections showing historical investigation results, proposed boring depths and preliminary soil sample intervals are shown on SAP Figure 4a to 4c. The terminal lateral extent and depth of the soil samples are designed to be outside of the anticipated removal area (i.e., free of evidence of impacts).

QA/QC samples will be collected at the frequency described in Section 2.1.4.

Sample Analyses and Methods

Soil samples will be submitted for the following constituents and laboratory methods:

- Dioxins by EPA Method 1613

The samples will be shipped to Pace Analytical in Minneapolis, Minnesota per the procedures described in Section 2.11 of this SAP. Sample container, preservation, and hold time requirements are shown in Table 1 and laboratory quality objectives are shown in Table 2 and are further described in the QAPP (Section 3).

Sample Designation

Soil samples collected for the Woodlife Area soil removal delineation assessment will begin with a “WL” indicator to distinguish as being from the Woodlife Area. These soil samples will also be designated by the sampling grid unit from which they were collected as shown on SAP Figure 3. The sample name will also include the sample depth interval and the sampling date.

For example, a soil sample collected as part of the Woodlife Area soil removal delineation assessment from sample grid P7 at a depth from 3 to 4 feet bgs on June 17, 2024 would be designated WL-P7-1-3-061724.

QA/QC samples will be designated with unique sample names per Section 2.14.

Sample Procedures

A summary of the soil sampling procedures for the Woodlife Area soil removal delineation assessment is listed below.

1. Soil borings will be advanced with a direct push (i.e. Geoprobe) drilling rig operated by a Washington-licensed drilling subcontractor to an initial depth of 10 feet bgs. The soil cores are typically completed as 5-foot intervals. Areas with concrete surface will be cored prior to Geoprobe drilling and areas with asphalt pavement will be driven through the asphalt with the Geoprobe drilling rig.
2. The soil interval will be retrieved from the drilling core via an acetate sampling sleeve, placed on a sampling table with new plastic sheeting, and cut open to expose the full soil core.
3. Soil will be photographed and logged for characteristics consistent with the Unified Soil Classification System (USCS) and for field evidence of impact (e.g., odors, staining). Field logging results will be noted on a field boring log form (example included in SAP Appendix A).
4. Sample intervals for laboratory analysis will be based on the CSM presented in the Upland PRDI WP, field observations, and previous investigation findings, and per the following procedure as shown on SAP Figure 4a to 4c:
    a. Field screening will proceed from the uppermost profile of the soil core. If no evidence of impacts are observed from surface to 3 feet bgs, a soil sample will be collected from 0 to 2 feet bgs and submitted for laboratory analysis. Secondary samples from the same boring will be collected from approximately 3 to 4 feet bgs and 5 to 6 feet bgs and held by the analytical laboratory pending the results of the shallower sample interval.
    b. If field screening indicates impacts in the uppermost profile of the soil core (0 to 2 feet bgs) only, a soil sample will be collected from 3 to 4 feet bgs and submitted for laboratory analysis. Secondary samples from the same boring will be collected from approximately 5 to 6 feet bgs and 7 to 8 feet bgs and held by the analytical laboratory pending the results of the shallower sample interval.
    c. If field screening indicates impacts in the uppermost and lower profiles of the soil core (0 to 5 feet bgs), a soil sample will be collected from 7 to 8 feet bgs and submitted for laboratory analysis. A secondary sample from the same boring will be collected from approximately 9 to 10 feet and held by the analytical laboratory pending the results of the shallower sample interval. As noted above, the alternate

POC is 9 feet bgs and proposed excavation activities are not expected to be feasible beyond this depth.

5. A disposable plastic sampling spoon will be used to transfer the selected sample intervals for laboratory analysis into laboratory-provided sample jars. Care will be taken to minimize disturbance of soil placed in the containers and each jar will be filled as full as possible to minimize headspace. The sample will be labeled, placed on ice in a cooler, and handled as described in Section 2.11.
6. Sampling equipment and reusable materials that will contact the sample will be decontaminated onsite in accordance with procedures identified in Section 2.12. The field sampler and drilling personnel will use clean nitrile gloves prior to handling any sample material or sampling equipment.
7. Residual soil and disposable sampling equipment will be containerized per Section 2.13.
8. Soil borings will be backfilled with bentonite chips to the approximate ground surface and hydrated and the surrounding surface material will be patched with like material.
9. The location of the boring will be field marked using a handheld GPS device for latitude/longitude information, photographed, and measured from physical site features (i.e., building foundation edges or utility features) and noted on a scaled Site Plan.

2.4 Creosote/Fuel Oil Area Hot Spot Soil Removal Area Delineation

Sampling in this area will focus on further delineating and confirming the lateral and vertical extent of Hot Spot cPAH contamination.

Sample Locations, Types, and Frequency

The sampling design to delineate the Hot Spot soil removal area includes collection of discrete soil samples and field screening from an approximately 40 x 40-foot grid across the preliminary Hot Spot removal area (SAP Figure 5). Sampling in the Creosote/Fuel Oil Area will include 36 soil boring locations to up to 10 feet bgs from the approximate center of each grid cell pending access (including location of building support pilings) and safety due to site features or utilities. Nine feet bgs is the alternate POC presented in the CAP and soil borings are not anticipated to proceed deeper than this depth, regardless of evidence of impacts.

Grab soil samples will be collected from continuous soil cores generated from a Geoprobe direct push drilling rig operated by a subcontractor.

One soil sample at each location will be collected for laboratory analysis based on field observations and screening with a PID.

QA/QC samples will be collected at the frequency described in Section 2.14.

Sample Analyses and Methods

Soil samples will be submitted for the following constituents and laboratory methods:

- cPAHs by EPA Method 8270E

The samples will be delivered to Friedman & Bruya laboratory (F&B) in Seattle, Washington per the procedures described in Section 2.11 of this SAP. Sample container, preservation, and hold time requirements are shown in Table 2 and laboratory quality objectives are shown in Table 3 and are further described in the QAPP (Section 3).

Sample Designation

Soil samples collected for the Creosote/Fuel Oil Area Hot Spot soil removal delineation assessment will begin with a “CF” indicator to distinguish as being from the Creosote/Fuel Oil Area. These soil samples will also be designated by the sampling grid unit from which they were collected as shown on SAP Figure 5. The sample name will also include the sample depth interval and the sampling date.

For example, a soil sample collected as part of the Creosote/Fuel Oil Area Hot Spot soil removal delineation assessment from sample grid P9 at a depth from 7 to 8 feet bgs on June 27, 2024 would be designated CF-P9-7-8-062724.

QA/QC samples will be designated with unique sample names per Section 2.14.

Sample Procedures

A summary of the soil sampling procedures for the Creosote/Fuel Oil Area Hot Spot soil removal delineation assessment is listed below.

1. Soil borings will be advanced with a direct push (i.e. Geoprobe) drilling rig operated by a Washington-licensed drilling subcontractor to an initial depth of 10 feet bgs (if significant field evidence of impacts is noted in soils greater than 10 feet, the boring may be extended). The soil cores are typically produced in 5-foot intervals.
2. The soil interval will be retrieved from the drilling core via an acetate sampling sleeve, placed on a sampling table with new plastic sheeting, and cut open to expose the full soil core.
3. Soil will be photographed and logged for characteristics consistent with the USCS and for field evidence of impact (e.g., odors, staining). The soils will be individually bagged in 1-foot increments and allowed to rest in a sealed zip lock bagged after being slightly agitated. The bags will be pierced with the tip of the PID to record a head space vapor measurement. Field logging results and PID measurements will be noted on a field boring log form (example included in SAP Appendix A).
4. Sample intervals for laboratory analysis will be based on field observations and previous investigation findings, per the following procedure:
    a. Field screening will proceed from throughout the soil profile. While PID measurements will be recorded throughout the soil core in one-foot increments, only one soil sample interval will be collected for laboratory analysis.
    b. The approximately one-foot interval with the highest PID head space reading will be selected for laboratory analysis of cPAHs.
    c. If field screening does not indicate significant impacts throughout the soil profile, one soil sample will be collected from approximately 4.5 feet bgs to represent the approximate middle of the sidewalls for the proposed excavation.

2. A disposable plastic sampling spoon will be used to transfer the selected sample intervals for laboratory analysis into laboratory-provided sample jars. Care will be taken to minimize disturbance of soil placed in the containers and each jar will be filled as full as possible to minimize headspace. The sample will be labeled, placed on ice in a cooler, and handled as described in Section 2.11.
3. Sampling equipment and reusable materials that will contact the sample will be decontaminated onsite in accordance with procedures identified in Section 2.12. The field

sampler and drilling personnel will use clean nitrile gloves prior to handling any sample material or sampling equipment.

4. Residual soil and disposable sampling equipment will be containerized per Section 2.13.
5. Soil borings will be backfilled with bentonite chips to the approximate ground surface and hydrated and the surrounding surface material will be patched with like material.
6. The location of the boring will be field marked using a handheld GPS device for latitude/longitude information, photographed, and measured from physical site features (i.e., building foundation edges or utility features) and noted on a scaled Site Plan.

2.5 Shallow Zone Groundwater Assessment

Sample Locations, Types, and Frequency

Five shallow groundwater monitoring wells to 15 feet bgs will be installed outside of the horizontal extents of the Hot Spot excavation area to assess the extent of shallow groundwater impacts (see SAP Figure 5). The shallow groundwater monitoring wells will be co-located with soil borings completed as part of the Hot Spot delineation assessment and their location will be based on whether they will remain outside of the excavation footprint, but still within the shallow groundwater zone area of impacts (see estimated locations on SAP Figure 5, however actual soil borings that will be converted to shallow wells will be determined based on findings of the soil assessment).

Soil samples will be collected as part of the Hot Spot delineation assessment; therefore, no soil samples will be collected as part of the Shallow Zone Groundwater Assessment.

An initial round of groundwater samples will be collected from the shallow monitoring wells per low-flow purging and sampling methodology; however, the shallow monitoring wells will be installed as permanent fixtures that will allow for subsequent sample collection to assess seasonal variability, contaminant migration, and/or to support compliance monitoring during and following implementation of the remedies.

QA/QC samples will be collected at the frequency described in Section 2.14.

Sample Analyses and Methods

Groundwater samples will be submitted for the following constituents and laboratory methods:

- Naphthalene by EPA Method 8260D

The samples will be delivered to F&B per the procedures described in Section 2.11. Sample container, preservation, and hold time requirements are shown in Table 2 and laboratory quality objectives are shown in Table 3 and are further described in the QAPP (Section 3). Additional samples may be collected from the shallow groundwater monitoring wells to support other components of the Upland PRDI activities and details on those analyses are presented in their individual section of this SAP.

Sample Designation

Groundwater samples collected for the Shallow Zone Groundwater Assessment will begin with a “MW” indicator to distinguish as being from a permanent monitoring well. The numeric order of monitoring wells will continue from existing monitoring well network starting at MW-22. The new shallow groundwater monitoring wells will also be designated with an “s” to distinguish as being

representative of the shallow zone groundwater. The sample name will also include the sample sampling date.

For example, a groundwater sample collected from new shallow groundwater monitoring well MW-22s on June 4, 2024 would be designated MW-22s-060424.

QA/QC samples will be designated with unique sample names per Section 2.14.

Sample Procedures

The shallow monitoring wells will be installed with a hollow-stem auger drilling rig at locations of previous soil borings completed as part of the Hot Spot delineation assessment.

1. Following completion of the Geoprobe drilling, the soil boring will be overdrilled with an auger using a hollow-stem auger drilling rig (or auger attachment for the Geoprobe rig) to approximately 15' bgs. No split spoons or soil sampling/screening will be performed; however, the soil cuttings will be visually observed for significant field impacts not observed in the Geoprobe cores.
2. A 2-inch diameter 10-foot section of slotted well screen will be installed with blank PVC risers to above the ground surface. The annulus of the well screen interval will be backfilled with a silica sand filter pack to approximately one-foot above the well screen, followed by a hydrated bentonite seal to approximately one-foot bgs. A concrete surface seal and traffic-rated flush mount well box will be installed at the surface and allowed to set for a minimum of 48 hours.
3. After the monument has set the well will be developed by surge and bail method to remove fines or leftover drilling materials, and to enhance the continuity of the surrounding groundwater formation and the conditions within the screened section of the well. The wells will be developed until the produced water is clear and measures less than 5 nephelometric turbidity units (NTUs) using a field turbidimeter. After development the well will be allowed to set for a minimum of 24 hours.
4. After 24 hours post-development, the shallow groundwater wells will be checked with a bailer for the presence of NAPL. No groundwater sample will be collected for laboratory analysis if the presence of NAPL is confirmed.
5. For wells that do not contain measurable NAPL, a decontaminated submersible bladder pump with new polyethylene tubing will be inserted into the well casing to the approximate middle of the saturated zone within the well screen. The polyethylene tubing will be connected to variable frequency drive (VFD) controller. Tubing will be sourced from a new unopened spool designated for this investigation.
6. Groundwater samples will be collected per EPA Low Stress (low flow) protocol (*EPA, 2017)* using water quality parameter stabilization via a hand-held multi-parameter meter with a transparent flow-through-cell on the following basis for stabilization:
    a. Stabilization is considered to be achieved when three consecutive readings are within the following limits:
        i. Turbidity (10% for values greater than 5 NTU; if three Turbidity values are less than 5 NTU, consider the values as stabilized),
        ii. Dissolved Oxygen (10% for values greater than 0.5 milligrams per liter [mg/L], if three Dissolved Oxygen values are less than 0.5 mg/L, consider the values stabilized),

iii. Specific Conductance (3%),

iv. Temperature (3%),

v. pH (+/- 0.1 unit),

vi. Oxidation/Reduction Potential (+/- 10 millivolts).

7. After stabilization, the polyethylene sample tubing will be removed from the flow-through-cell and used to directly fill laboratory provided containers with appropriate preservative (Table 1). The sample will be labeled, placed on ice in a cooler, and handled as described in Section 2.11.
8. Sampling equipment and reusable materials that will contact the sample will be decontaminated on-site in accordance with the procedures identified in Section 2.12 prior to and before each use. The field sampler and drilling personnel will use clean nitrile gloves for handling each sample or sampling equipment.
9. Soil cuttings, development water, purge water and disposable sampling equipment will be containerized per Section 2.13.

2.6 Deep Zone Groundwater Assessment

Sample Locations, Types, and Frequency

Five deep groundwater monitoring wells will be co-located with soil borings completed as part of the Hot Spot delineation assessment and their location will be based on an estimate of whether they will remain outside of the excavation footprint, but still within the deep groundwater zone area of impacts (see proposed locations on SAP Figure 5). As opposed to the shallow monitoring well installations, it is not feasible to advance every soil boring that is part of the Hot Spot soil delineation to the deep zone.

Soil samples will be collected as part of the Hot Spot delineation assessment for the upper 10 feet bgs. Additional deeper soil samples may be collected to support other components of the PRDI activities (i.e., bench scale testing) and details on those locations are presented in their individual section of this SAP.

An initial round of groundwater samples will be collected from the deep monitoring wells; however, the deep monitoring wells will be installed as permanent fixtures that will allow for subsequent sample collection to assess seasonal variability, contaminant migration, and/or to support compliance monitoring during and following implementation of the remedies. The well sumps will also be periodically checked for the presence of NAPL.

QA/QC samples will be collected at the frequency described in Section 2.14.

Sample Analyses and Methods

Groundwater samples will be submitted for the following constituents and laboratory methods:

- Naphthalene by EPA Method 8260D

The samples will be delivered to F&B per the procedures described in Section 2.11 of this SAP. Sample container, preservation, and hold time requirements are shown in Table 2 and laboratory quality objectives are shown in Table 3 and are further described in the QAPP (Section 3). Additional samples may be collected from the shallow groundwater monitoring wells to support other components of the Upland PRDI activities and details on those analyses are presented in their individual section of this SAP.

Sample Designation

Groundwater samples collected for the Deep Zone Groundwater Assessment will begin with a "MW" indicator to distinguish as being from a permanent monitoring well. The numeric order of monitoring wells will continue from existing monitoring well network and the proposed shallow groundwater monitoring wells starting at MW-27. The new deep groundwater monitoring wells will also be designated with a "d" to distinguish as being representative of the deep zone groundwater. The sample name will also include the sampling date.

For example, a groundwater sample collected from new deep groundwater monitoring well MW-27d on June 4, 2024 would be designated MW-27d-060424.

QA/QC samples will be designated with unique sample names per Section 2.14.

Sample Procedures

The deep monitoring wells will be installed with a hollow-stem auger drilling rig at locations of previous soil borings completed as part of the Hot Spot delineation assessment.

1. The soil boring initiated for the Hot Spot delineation assessment will be continued to the target depth of 55' bgs to provide for a continuous soil core for observation of deep impacts. Previous Geoprobe borings at the Site have advanced to this approximate depth; however, it is near the extent of capabilities of a direct push rig and may not reach target depth. Ideally, the boring will be advanced until observation of a significant deep fine-grained or confining unit.
2. Following completion of the Geoprobe drilling, the soil boring will be overdrilled with a hollow-stem auger drilling rig to approximately 55' bgs, pending on soil lithology observations. No split spoons or soil sampling/screening will be performed unless they are needed to supplement the observations of the Geoprobe cores, particularly at greater depths.
3. A 2-inch diameter 10-foot section of slotted well screen with a 2-foot bottom sump will be installed with blank PVC risers to above the ground surface. The annulus of the well screen interval will be backfilled with a silica sand filter pack to approximately one-foot above the well screen, followed by a hydrated bentonite seal to approximately one-foot bgs. A concrete surface seal and traffic-rated flush mount well box will be installed at the surface and allowed to set for a minimum of 48 hours.
4. After the monument has set the well will be developed by surge and bail method to remove fines or leftover drilling materials, and to enhance the continuity of the surrounding groundwater formation and the conditions within the screened section of the well. The wells will be developed until the produced water is clear and measures less than 5 NTU using a field turbidimeter. After development the well will be allowed to set for minimum of 24 hours.
5. After 24 hours post-development, the sump of the deep groundwater wells will be checked with a bailer for the presence of DNAPL. No groundwater sample will be collected for laboratory analysis if the presence of DNAPL is confirmed.
6. For wells that do not contain measurable DNAPL, a decontaminated submersible bladder pump with new polyethylene tubing will be inserted into the well casing to the approximate middle of the saturated zone within the well screen. The polyethylene tubing will be connected to a VFD controller. Tubing will be sourced from a new unopened spool designated for this investigation.

7. Groundwater samples will be collected per EPA Low Stress (low flow) protocol (*EPA, 2017)* using water quality parameter stabilization via a hand-held multi-parameter meter with a transparent flow-through-cell on the following basis for stabilization:
    a. Stabilization is considered to be achieved when three consecutive readings are within the following limits:
        i. Turbidity (10% for values greater than 5 NTU; if three Turbidity values are less than 5 NTU, consider the values as stabilized),
        ii. Dissolved Oxygen (10% for values greater than 0.5 mg/L, if three Dissolved Oxygen values are less than 0.5 mg/L, consider the values stabilized),
        iii. Specific Conductance (3%),
        iv. Temperature (3%),
        v. pH (+/- 0.1 unit),
        vi. Oxidation/Reduction Potential (+/- 10 millivolts).
8. After stabilization, the polyethylene sample tubing will be removed from the flow-through-cell and used to directly fill laboratory provided containers with appropriate preservative (Table 1). The sample will be labeled, placed on ice in a cooler, and handled as described in Section 2.11.
9. Sampling equipment and reusable materials that will contact the sample will be decontaminated on-site in accordance with the procedures identified in Section 2.12 prior to and before each use. The field sampler and drilling personnel will use clean nitrile gloves for handling each sample or sampling equipment.
10. Soil cuttings, development water, purge water and disposable sampling equipment will be containerized per Section 2.13.

2.7 Geotechnical Assessment

The scope of work for the Upland PRDI activities needed for full system design of excavation shoring include geotechnical subsurface explorations and field and laboratory testing.

Sample Locations, Types, and Frequency

One geotechnical boring (see SAP Figure 5) will be advanced using a hollow stem auger rig to 50 feet bgs. The geotechnical boring will extend to about 15 feet below the bottom of the anticipated shoring system. For an approximate 10-foot excavation, the cantilevered sheet pile depth in these soils would be of the order of twice the excavation depth, for a minimum depth of 45 feet. To support future liquefaction evaluation, a minimum exploration depth of 50 feet is needed. For sands below the groundwater table, appropriate measures will need to be taken including providing water in the auger to prevent bottom heave and sample disturbance. If very loose sands are encountered, an alternate drilling method (i.e., mud rotary drilling) may be needed.

Samples will be collected alternately with Standard Penetration Test (SPT) and Modified California split spoon samples continuously for the uppermost 10 feet of the soil profile and at 5-foot increments thereafter. SPT tests consist of dropping an SPT hammer (typically approximately 64 kilograms [kg]) onto an 18-inch split spoon sampler from a designated height (typically 30 centimeters [cm]) and counting the number of blows for the split spoon to advance in six-inch

increments. The blow counts can then be used to calculate an N value to support geotechnical engineering design.

The Modified California split spoon samples will provide for enhanced recovery of relatively undisturbed ring samples (i.e., intact soil cores) which can then be used for laboratory direct shear testing to obtain soil strength parameters necessary for shoring design. The samples with the Modified California split spoon sampler will be collected in the same manner as the SPT tests.

Bulk samples will be obtained from soil cuttings from the uppermost 10 feet of the soil column for obtaining representative compaction curves for the site soil types within the excavation and backfill area.

Samples are anticipated to be from outside of the impacted area as Geotechnical laboratories are not accustomed to handle contaminated material. No QA/QC samples will be collected.

Sample Analyses and Methods

Soil samples will be submitted for the following constituents and laboratory methods:

- Moisture and Visual Class per D2216, D2487/D2488
- Percent Passing #200 Sieve per D1140
- Sieve Analysis per D6913/D7928
- Atterberg Limits per D4318
- Direct Shear, 3 Points (Intact Sample) per D3080
- Unconfined Compressive Strength per D2166
- Proctor per D698/D1557

The samples will be delivered to HWA Laboratory in Bothell, Washington per the procedures described in Section 2.11 of this SAP. Sample intervals that will be submitted for laboratory geotechnical analysis will be determined upon review of boring logs and field data by the project geotechnical engineer.

Sample Designation

Soil samples collected for the Geotechnical Assessment will begin with a “GT” indicator to distinguish as being from the geotechnical assessment. The sample name will also include the sample depth interval and the sampling date.

For example, a soil sample collected as part of the Geotechnical assessment boring at a depth from 25 to 26 feet bgs on June 27, 2024 would be designated GT-25-26-062724.

Sample Procedures

1. The Geotechnical boring will be drilled with hollow-stem auger drilling rig to approximately 50’ bgs.
2. Standard Penetration Tests (SPT) will be performed alternately with Modified California split spoons in 18-inch intervals for the first 10 feet of the boring, and then at approximately 5-foot intervals until the terminus of the boring. Blow counts from the SPTs will be recorded on field boring logs (example included in Appendix A).
3. Samples from the Modified California split spoons will consist of the bottom 6” of the split spoon core to avoid capturing slough or other disturbance of the soil core.

4. Soil cuttings from the uppermost 10 feet of the boring will be collected as a bulk sample into large plastic bags.
5. Following completion of the geotechnical boring, the location will be converted to a deep pumping well (See Section 2.8).
6. The samples will be labeled and handled as described in Section 2.11.
7. Sampling equipment and reusable materials that will contact the sample will be decontaminated on site in accordance with procedures identified in Section 2.12, if field evidence of impacts are observed.
8. Residual soil and disposable sampling equipment will be containerized per Section 2.13.

2.8 Aquifer Pump Test

Characteristics of the aquifer underlying the Creosote/Fuel Oil Area will be assessed using traditional aquifer testing protocols to support dewatering, shoring, and BIO System recirculation design considerations.

Sample Locations, Types, and Frequency

The following aquifer tests will be performed as part of the Upland PRDI activities:

- Transducer assessment to assess tidal fluctuations and background conditions at existing groundwater monitoring wells and new monitoring wells described above.
- Deep zone step-test to determine a reasonable flow rate for the longer term, steady state test.
- Shallow zone step-test.
- Deep zone steady state aquifer test (based on ideal flow rate observed during the step-test).
- Shallow zone steady state test.

These tests will necessitate the installation of a 4-inch pumping well in the shallow zone and the deep zone (deep zone pumping well to be co-located with the geotechnical boring described in Section 2.7). Two additional deep zone monitoring wells and one shallow zone monitoring wells are proposed for installation to support the aquifer test (See SAP Figure 5). Other existing monitoring wells or new wells that are proposed as part of the Upland PRDI activities may be utilized to further support the aquifer tests. Water accumulated as part of the aquifer testing will be containerized and properly disposed pending permitting.

Sample Analyses and Methods

No analytical testing is required for this task.

Sample Designation

No environmental samples will be collected for this task.

Sample Procedures

Shallow Pumping Well Installation

1. A soil boring will be drilled with an auger using a hollow-stem auger drilling rig to approximately 20’ bgs. No split spoons or soil sampling/screening will be performed.
2. A 4-inch diameter 5-foot section of slotted well screen will be installed with blank PVC risers to above the ground surface. The annulus of the well screen interval will be backfilled with a silica sand filter pack to approximately one-foot above the well screen, followed by a bentonite grout seal to approximately one-foot bgs. A concrete surface seal and traffic-rated flush mount well box will be installed at the surface and allowed to set for a minimum of 48 hours.
3. After the monument has set the well will be lightly developed by surge and bail method to remove fines or leftover drilling materials. After development the well will be allowed to set for minimum of 24 hours.

Deep Pumping Well Installation

1. A soil boring will be drilled with an auger using a hollow-stem auger drilling rig to approximately 50’ bgs (completed as the Geotechnical boring described in Section 2.7).
2. A 4-inch diameter 5-foot section of slotted well screen will be installed with blank PVC risers to above the ground surface. The annulus of the well screen interval will be backfilled with a silica sand filter pack to approximately one to three-feet above the well screen, followed by a bentonite grout seal to approximately one-foot bgs. A concrete surface seal and traffic-rated flush mount well box will be installed at the surface and allowed to set for a minimum of 48 hours.
3. After the monument has set the well will be lightly developed by surge and bail method to remove fines or leftover drilling materials. After development the well will be allowed to set for minimum of 24 hours.

Monitoring Well Installation

1. One additional shallow groundwater monitoring well will be installed per procedures in Section 2.5, with the exception that soil samples will not be collected for laboratory analysis, pending observations of impacts during field screening.
2. Two additional deep groundwater monitoring wells will be installed per procedures in Section 2.6, with the exception that soil samples will not be collected for laboratory analysis, pending observations of impacts during field screening.

Aquifer Testing Procedures:

1. Background water level information will be collected prior to the start of the aquifer testing via pressure transducers placed within key observation wells at the Site, including existing monitoring wells MW-4, MW-5, MW-6, MW-7, MW-8A/8B, MW-9A/9B, MW-10A/10B, MW-11A/11B, the new shallow and deep monitoring wells to be installed as part of the Upland PRDI activities, and the new pumping wells.
    a. Background data will be collected for approximately two weeks.
    b. Manual soundings will be made when the pressure transducers are installed and before the aquifer test begins. Data from the pressure transducers will be downloaded before every test to ensure that data is being recorded properly.
    c. The background data will be used if correcting water levels for tidal or barometric effects is warranted. Tidal fluctuations in the estuary will be monitored by installing a temporary well that extends into the adjacent surface water at the end of the property.

1. The aquifer test in the deep zone will be performed first:
    a. A temporary submersible pump will be installed in the well just above the screened interval.
    b. A short-term step test will be performed to help determine a reasonable flow rate for the longer term, steady state test.
    c. The well will be pumped at three rate steps of approximately 5, 10, and 15 gallons per minute (gpm). Each step will last for approximately 30 minutes. During this time the water level in the pumping well and nearest well completed at the same depth will be monitored manually every 5 minutes.
    d. The flow rate will be monitored and adjusted as necessary to maintain the target value. Water levels will also be recorded by pressure transducers.
    e. The water level response in the monitored wells will be evaluated to determine the steady state test rate.
2. At least 24 hours after the step test in the deep pumping well, a step test will be performed in the shallow pumping well. Testing will proceed similarly to Step 2, except that the flow rates will likely range from 5 to 10 gpm.
3. The steady state aquifer test in the deep zone will begin at least 24 hours after the shallow zone step test to allow water levels to recover.
    a. Prior to starting the pump, the logging frequency of the pressure transducers will be increased to every minute for at least the first hour of pumping.
    b. Thereafter the frequency may be reduced to every 5 minutes until the recovery period of the test where the frequency will again be increased to every minute for the first hour of recovery.
    c. A manual sounding of water level will be collected in all wells to be monitored during the test.
4. During active pumping, manual soundings at the pumping and select observation wells will be collected every hour.
    a. The flow rate and pressure at the pumping well will be monitored and adjusted as necessary to maintain a nearly constant flow rate.
    b. Pumping at a steady rate will continue for at least 6 hours.
    c. After the pump is turned off recovery measurements will be made manually in the pumping well every 30 seconds for 5 minutes.
        i. One round of manual soundings will be made 30 minutes into the recovery period.
        ii. Pressure transducers will continue to record water levels at one-minute intervals for at least the next 4 hours.
5. The steady state shallow zone aquifer test will begin at least 24 hours after the end of pumping for the deep zone aquifer test. This test will be conducted similarly to the deep zone test in terms of the frequency of data collection and pumping duration.
6. Groundwater pumped during the testing will be containerized pending disposal or discharge.

2.9 BIO System Components

A hybrid approach using air injection wells along with recirculating a nitrate-based nutrient solution has been selected to bioremediate the COCs within the Creosote/Fuel Oil Area.

As described in the CAP, the BIO System will consist of several components: 1) a series of recirculation wells (horizontal for shallow zones and vertical for deeper zones) for injection of the nitrate/nutrient/surfactant (NNS) solution; 2) a series of wells to inject air in the shallow and deep zones; and 3) an air collection system (sub slab depressurization [SSD]) to capture the injected air.

This SAP describes the tasks required to obtain site specific data on feasibility of the BIO System, aquifer and contamination characteristics, air injection flows and pressures, and flow and vacuum requirements (i.e., ROIs) to design the full-scale BIO System.

2.9.1 Bench Scale Treatability Study

A Bench Scale Treatability Study will be used to evaluate destruction of naphthalene from saturated soil and groundwater through bioremediation. Batch tests will be conducted to evaluate biodegradation under aerobic and anaerobic conditions. The Bench Scale Treatability Study will be performed by a third-party laboratory in accordance with their standard operating procedure (SOP) for the method; however, environmental media from the Site will be collected during the Upland PRDI activities and provided to the third-party laboratory for the Bench Scale Treatability Study.

Sample Locations, Types, and Frequency

Saturated soil and groundwater samples will be collected from within the Creosote/Fuel Oil Area but outside of the Hot Spot removal footprint as this component of the remedial action will occur first and therefore conditions within the Hot Spot removal footprint are not representative of what conditions will be at time of implementation of the BIO System. Samples will be collected from the shallow zone in conjunction with the Hot Spot Soil Removal Delineation Assessment (Section 2.4) and the Shallow Zone Groundwater Assessment (Section 2.5).

Once received by the laboratory the soil will be sieved to remove particles greater than 4 mesh (3/16 inch) then homogenized. Homogenized soil will be analyzed for chemical and soil characteristics. Groundwater received in multiple containers will be composited prior to testing to minimize loss of volatile compounds. Composited groundwater will be analyzed for chemical and groundwater characteristics. VOCs will be analyzed using an expedited turnaround time of 48 hours to confirm concentrations are acceptable before proceeding.

Soil, groundwater, nitrate and nutrients, surfactant, and sodium azide will be combined as appropriate to give the initial conditions shown in Table A and a soil to groundwater ratio of 1:2 and headspace of approximately 50% of the reactor volume. (Reactor volume will be nominally 2L.) The large headspace will ensure a large reservoir of oxygen (if applicable). For aerobic tests, the headspace will be sparged with oxygen gas. For the anaerobic NNS only tests, the headspace will be sparged with nitrogen gas. Reactors will be stored upside down in the dark at room temperature (approximately 20C) and swirled twice per week to help maintain elevated dissolved oxygen in the oxygen-containing reactors. At the specified times, one reactor from each series will be destructively sampled and the soil and water analyzed for VOCs. Water will also be analyzed for dissolved oxygen, ferrous iron, nitrate, ORP, pH, sulfate, and functional genes.

Table A. Initial Conditions and Testing Schedule

Test	# Reps	Treatment	Est. Sample Time (Weeks)
Time 0	1	None	0
Sterile Control	4	Sodium azide	1, 4, 8
O2 Only	4	O2 in headspace	1, 4, 8
O2/NNS	4	O2 in headspace, nitrate, surfactant	1, 4, 8
NNS	4	N2 in headspace, nitrate, surfactant	1, 4, 8

Sample Analyses and Methods

Soil and groundwater samples will be submitted to the third-party laboratory performing the Bench Scale Treatability Study for chemical analysis and other parameters per Table B.

Table B. Analytical Methods.

Analyte	Method
VOCs (Naphthalene)	EPA 8260
Alkalinity	EPA 310.1
Dissolved oxygen	EPA 300
Ferrous iron	218.8/Hach**
Functional genes	CENSUS
Metals (total/dissolved)	EPA 6020
Moisture	Gravimetric
Nitrate	EPA 300
ORP	Probe
pH	Probe
TOC (soil)	EPA 9060

** Hach DR 2800 Spectrophotometer and appropriate Hach kit reagents

It should be noted that analytical results obtained from the bench test are meant to provide direction regarding feasibility of bioremediation in site-specific soil and groundwater conditions and are not considered valid for compliance purposes.

Sample Designation

Sample designation will follow the procedures in Section 2.4 (soils) and Section 2.5 (groundwater).

Sample Procedures

Soil and groundwater samples for the Bench Scale Treatability Study will be collected per the procedures in Section 2.4 (soils) and Section 2.5 (groundwater). The soil volume required by the third-party laboratory may require the collection of soil from multiple borings.

2.9.2 Microbiological Community Assessment

Soil and groundwater samples within the Creosote/Fuel Oil Area treatment area will be submitted for next gen sequencing to characterize the existing microbial population based on metabolic potential or likely function. Based on the initial screening, follow-up sampling will be performed for analysis of individual functional genes associated with specific steps of the aerobic and anaerobic BTEX and HC degradation pathways as well as sulfate reduction.

Sample Locations, Types, and Frequency

Soil and groundwater samples collected for the microbiological community assessment will be co-located with other Upland PRDI samples in the Creosote/Fuel Oil Area. Representative samples of the impacted and unimpacted shallow and deep zone soils and groundwater will be collected, for a total of 8 samples.

Sample Analyses and Methods

Soil samples will be submitted for the following constituents and laboratory methods (target, Gene-Trac Test Name, and Relevance provided by SiREM):

- Bacteria Groups
    - Next Generation Sequencing (NGS) of 16S rRNA gene of Bacteria and Archaea per Gene-Trac NGS method (Characterize entire microbial communities to determine metabolic functions and response to changing conditions)
    - Sulfate Reducing Bacteria (*dsrA*) per SRB method (partners to ORM-2 in anaerobic benzene degradation)
- Anaerobic BTEX (based on results of the Bacteria Groups analysis)
    - Deltaproteobacterium ORM-2 per ORM-2 method (Anaerobic benzene degrader [SO4/CH4 reducing conditions])
    - Benzene degrading (Peptococcacaeae) per Pepto-ben method (Anaerobic benzene degrader under NO3 reducing conditions)
    - Benzene Carboxylase (abcA) per abca method (involved benzene ring cleavage under anaerobic conditions)
    - Benzyl Succinate Synthase (bssA) by bssa method (functional gene for anaerobic toluene biodegradation
- Aerobic hydrocarbon degradation (based on results of the Bacteria Groups analysis)

- Naphthalene Dioxygenase (nahAc) per NDO method (Catalyzes the first step in aerobic degradation of naphthalene reported activity for other polycyclic compounds with less than 3 rings)

The samples will be delivered to SiREM Laboratory in Knoxville, Tennessee per the procedures described in Section 2.11 of this SAP.

Sample Designation

Sample designation will follow the procedures in Section 2.4 (soils) and Section 2.5 or Section 2.6 (groundwater).

Sample Procedures

Soil and groundwater samples for the microbiological community assessment will be collected per the procedures in Section 2.4 (soils) and Section 2.5 (groundwater).

2.9.3 Air Injection / SSD Pilot Testing

The AI/SSD pilot testing consists of an assessment of the AI component of the BIO System (i.e., air sparging) and the SSD component of the BIO System as these elements will work in conjunction to enhance the bioremediation being driven by the injections and microbial degradation and also controlling the primary exposure pathway of VI.

Sample Locations, Types, and Frequency

The air injection components of the pilot test include installation of a deep AI well, installation of a shallow AI well, and installation of a mid-range monitoring well. Other monitoring wells installed as part of the Shallow Zone Groundwater Assessment and Deep Zone Groundwater Assessment (Section 2.5 and 2.6) will also be utilized as monitoring points for the pilot test (see SAP Figure 5).

The SSD components of the pilot test include installation of a horizontal well (slotted horizontal pipe in a trench excavation that is backfilled with gravel and sealed at the top of the trench excavation) within the proposed treatment area (but outside of the preliminary Hot Spot removal area), and vapor pins to monitor induced sub-slab vacuum.

Sample Analyses and Methods

Soil and/or groundwater samples will not be collected for analytical testing from the borings or wells installed as part of the AI/SSD pilot test.

Effluent air samples from the SSD system will be submitted for laboratory analysis:

- BTEX and Naphthalene per TO-15 method

Samples will be analyzed by F&B laboratory.

Sample Designation

Effluent air samples collected during the AI/SSD pilot test will begin with an “SSD” to distinguish as being part of the sub-slab depressurization test. The sample name will also include the sampling date and will end with an “EFF” designation to indicate an effluent sample.

For example, an effluent air sample collected from the SSD on June 4, 2024 would be designated SSD-060424-EFF.

QA/QC samples will be designated with unique sample names per Section 2.14.

Sample Procedures

SSD Testing Procedures:

1. Installation of horizontal well
    a. The existing concrete floor will be cut to allow for excavation of a trench. The excavation area will be located in gaps between the building support pilings.
    b. An approximately 10-foot long trench will be excavated to approximately 2-feet bgs to remain above the shallow groundwater table.
    c. Filter fabric will be placed in the trench to minimize migration of fines into the gravel.
    d. A bed of ¾"-minus gravel will be equally distributed in the excavation trench.
    e. Two 5-foot sections of 3-inch diameter perforated/slotted section of PVC piping will be placed into the excavation atop the gravel bedding. The 5-foot sections will be connected with a blank PVC Tee that will extend to above the ground surface. Each end of the 5-foot sections will be capped.
    f. The horizontal well will be covered with gravel and a 6-mil plastic vapor barrier will be installed over the gravel and up the sides of the trench excavation to below the bottom of the concrete surface pavement. Additional backfilling needed to return the excavated area to just below the concrete surface will be sourced from the excavation spoils.
    g. The concrete surface will be restored to match the surrounding thickness, with the PVC Tee protruding through the concrete pad. The annulus between the PVC Tee and concrete will be sealed with a silicone sealant.
2. Prior to beginning the testing of the horizontal well, the PVC Tee will be connected to a temporary 2-inch diameter PVC piping that is connected to a blower system.
    a. The blower system will consist of a manifold for monitoring and adjusting the flow and vacuum of the extracted vapor and a sample collection port.
    b. The blower system will also include a moisture knockout drum and a fresh air inlet that can be opened to operate at low vacuums applied to the horizontal piping.
    c. Vapors from the blower during this short-term test will be discharged to atmosphere; however, the local clean air agency will be engaged prior to beginning the pilot test to confirm that authorization is not required (see Section 4 of the Upland PRDI WP).
3. Testing of the horizontal well will consist of a step test and a constant rate test. Prior to the test, all shallow wells in the area shall be fitted with caps with vapor monitoring ports.
    a. Vapor Pins® shall be installed through the slab to monitor the induced vacuum under the slab.
    b. Eight Vapor Pins® shall be installed as shown on SAP Figure 5.

4. The condition of the existing slab shall be inspected and any significant joints or crack in the slab shall be sealed with a silicone sealant to prevent short circuiting of induced vacuum through the cracks.
5. Before vapor extraction begins, the ambient pressure or vacuum at all monitoring points will be measured with a magnehelic (or comparable) differential pressure gauge capable of recording differential pressures to the nearest hundredth of an inch of water. Field measurements throughout the pilot test will be recorded on standard field forms (examples included in Appendix A).
6. Then the blower shall be started, and the system shall apply a vacuum of 10 inches of water to the horizontal well. Flow from the well shall be monitored and the vacuum shall be adjusted to maintain a vacuum of 10 inches of water.
    a. Two rounds of vacuum readings shall be collected – one at approximately 15 minutes of operation and another at approximately 30 minutes of operation.
        i. PID readings of the extracted vapor shall also be collected at 15 and 30 minutes.
    b. After two rounds of data collection, the vacuum shall be increased to 20 inches of water.
        i. Vacuum, flow, and PID readings shall be collected at the same frequency as the first step.
    c. Vacuum, flow, and PID readings shall be collected at the same frequency as the first step, conducted at a vacuum of 30 inches of water or the maximum capacity of the blower/manifold system.
7. Based on the data collected during the step test, a vacuum for the steady state test will be selected.
    a. The vacuum selected is expected to produce an ROI in the range of 40 to 50 feet. The steady state test shall continue for 4 hours.
8. During that time, vacuum readings in the monitoring points and at the horizontal well shall be collected at least once an hour.
    a. Flow and PID readings shall also be collected hourly at the horizontal well.
9. Near the end of the 4 hours, one sample shall be collected from the extracted vapor for laboratory analysis.

AI Testing Procedures:

AI testing will be performed in both the shallow and deep zones. Similar to other tests being performed, the testing in each zone will consist of a step test to establish flow/pressure curves for the AI point as well as a longer-term steady state test that will help to establish the ROI of the AI in each zone.

1. Deep Well Install
    a. The Deep Zone AI well will be installed in a similar manner as the Deep Zone Groundwater Assessment wells with the following exceptions:
        i. The well will be completed to 50 feet bgs with a HSA drilling rig.
        ii. The well will be constructed of 2” PVC with only a 2-foot section of screen.

iii. The well screen will be backfilled with silica sand to approximately 1 foot above the screen and the annulus above the filter sand will be sealed with approximately 1 foot of hydrated bentonite chips and then bentonite grout to 1 foot bgs.

iv. The well will be completed with a concrete surface seal and flush-mount well monument.

v. Soil and/or groundwater samples will not be collected as part of this AI test.

2. Shallow well install
    a. The Shallow Zone AI well will be installed in a similar manner as the Shallow Zone Groundwater Assessment wells with the following exceptions:
        i. The well will be completed to 20 feet bgs with a HSA drilling rig.
        ii. The well will be constructed of 2" PVC with only a 2-foot section of screen.
        iii. The well screen will be backfilled with silica sand to approximately 1 foot above the screen and the annulus above the filter sand will be sealed with approximately 1 foot of hydrated bentonite chips and then bentonite grout to 1 foot bgs.
        iv. The well will be completed with a concrete surface seal and flush-mount well monument.
        v. Soil and/or groundwater samples will not be collected as part of this AI test.
3. Mid-Zone Monitoring Well Install
    a. The Mid-zone monitoring well will be installed in a similar manner as the Shallow Zone Groundwater Assessment wells with the following exceptions:
        i. The well will be completed to 35 feet bgs with an HSA drilling rig.
        ii. The well will be constructed of 2" PVC with only a 5-foot section of screen.
        iii. The well screen will be backfilled with silica sand to approximately 1 foot above the screen and the annulus above the filter sand will be sealed with approximately hydrated bentonite chips to 1 foot bgs.
        iv. The well will be completed with a concrete surface seal and flush-mount well monument.
        v. Soil and/or groundwater samples will not be collected as part of this AI test.
4. AI testing will be performed first in the shallow zone. The shallow AI well shall be connected to a compressor with pressure rated hose or piping.
    a. The headworks at the well shall include a means of measuring flow and pressure with valving to allow the adjustment of the flow.
    b. Shallow zone monitoring wells shall be capped as in the SSD testing and the SSD blower shall be started.

c. Vacuums in the shallow wells and monitoring points shall be measured after 30 minutes.

d. PID, flow and vacuum readings shall also be collected from the SSD.

i. At that time depth to water, dissolved oxygen (DO), and oxidation/reduction potential (ORP) in the shallow and medium zone wells will be measured.

ii. DO and ORP shall be measured with a down hole probe.

1. The probe that collects the DO and ORP measurements shall be lowered to a consistent depth below the water level in each well to collect the data.

2. This depth shall correspond to the top of the screen interval or 2 feet below the water level, whichever is deeper.

5. After the collection of the above data, the compressor shall be started and the pressure to the AI shall be slowly increased until flow is detected. This “breakthrough” pressure shall be recorded.

a. The pressure shall be increased until an AI flow of approximately 3 cfm is achieved. After 30 minutes, a round of water level, DO, and ORP measurements shall be collected from the shallow and medium zone monitoring wells in the area.

i. PID, flow and vacuum readings shall also be collected from the SSD at the end of each step. Then the flow will be increased to approximately 6 cfm.

ii. After 30 minutes a round of water level, DO, and ORP measurements shall be collected. Then the flow will be increased to approximately 9 cfm.

iii. After 30 minutes a round of water level, DO, and ORP measurements shall be collected.

6. At the end of these steps, a flow rate for the steady state test shall be selected. The AI well flow rate shall be adjusted to this rate and shall operate for at this flow for at least 6 hours.

a. During this time, depth to water, DO, and ORP measurements shall be collected hourly from the shallow and medium zone monitoring wells in the area.

b. PID, flow, and vacuum readings shall also be collected every hour from the SSD system.

c. Near the end of the 6 hours of operation a sample from the SSD system shall be collected for laboratory analysis for TPH and VOCs.

i. At least 15 minutes after the compressor has been turned off another round of water levels shall be collected.

7. The deep zone AI testing will be performed at least 12 hours after the shallow AI testing. Testing will be performed similarly to the testing performed for the shallow zone.

a. The SSD blower shall be started and vacuum measurements at the shallow monitoring points shall be collected after 30 minutes of operation.

b. PID, flow and vacuum readings shall be collected from the SSD. At that time, depth to water, dissolved oxygen (DO), and oxidation/reduction potential (ORP) in the shallow, medium, and deep zone wells will be measured.

8. The deep zone AI will be operated at three flow steps of approximately 3, 6, and 9 steps.

    a. The length of the steps and the measurements collected will be the same as those for the shallow zone AI test.

    b. The steady state test will also be conducted similarly to the test performed in the shallow zone.

2.10 Sampling Procedure Alterations

Any deviations from the general sampling procedures presented here will be brought to the attention of the SLR Project Manager.

2.11 Sample Management

Sample Labeling

Sample container labels will be completed immediately before or immediately after sample collection with the sample designations described throughout Section 2 of this SAP. Container labels will also include the following information:

- Project name
- Sample number
- Name/Initials of collector
- Date and time of collection
- Analyses requested

Sample Shipping

Samples will be transported in a sealed, iced cooler. In each cooler, glass bottles will be separated by a shock-absorbing and absorbent material to prevent breakage and leakage. Ice, sealed in separate plastic bags, will be placed into each cooler with the samples. All sample coolers will be accompanied by a Chain-of-Custody (COC) Form (example included in Appendix A). The completed form will be sealed in a plastic bag and will be transported with the cooler(s). Sample coolers will either be: hand delivered to the analytical laboratory by SLR personnel; picked up by a laboratory-designated courier; or, transported via a commercial shipping site (i.e. FedEx) for overnight shipping.

Chain-of-Custody

Once a sample is collected, it will remain in the custody of the sampler or other SLR personnel until shipped to the laboratory, delivered to the laboratory, or picked up by laboratory-designated courier. Upon transfer of sample containers to subsequent custodians, a COC (Appendix A) will be signed by each person transferring custody of the sample container with the exception of the

commercial shipping provider (i.e. FedEx), however a shipping receipt and tracking number will be retained in the project files. Upon receipt of samples at the laboratory, the condition of the samples will be recorded by the receiver and login and COC details will be provided to SLR for review. Login and COC records will be included in the analytical reports prepared by the laboratory.

2.12 Decontamination Procedures

Non-disposable sampling equipment that comes into contact with the sampling media will be decontaminated prior to each use. A decontamination zone will be established inside the exclusion zone for cleaning the sampling equipment. The non-disposable sampling equipment that is anticipated to be utilized consists of drilling accessories (drill rods and endpoints; auger flights) used by the drilling subcontractor. Non-disposable sampling equipment will be decontaminated by the following general procedure; however, the specifics of the equipment decontamination procedure will be determined by the drilling subcontractor:

- Pressure wash or steam clean (for larger non-disposable sampling equipment);
- Tap water rinse;
- Scrubbing equipment thoroughly with water and a non-phosphatic detergent (i.e., Liquinox, Alconox, or similar);
- Tap water rinse;
- Isopropanol rinse (for smaller non-disposable sampling equipment);
- Tap water rinse;
- Final rinse with deionized or organic-free water (provided by analytical laboratory), if an associated Equipment Rinsate Blank is to be collected.

Wash water from the decontamination zone will be containerized per Section 2.13.

Disposable sampling equipment that is only used one time to collect samples (e.g. plastic spoons, dedicated polyethylene tubing) will not require decontamination. This equipment will be disposed of with investigation derived waste (IDW) debris. To the extent possible, disposable sampling equipment (e.g. sample gloves, tubing) will be sourced from new unopened supplies dedicated to this investigation. In addition, new plastic sheeting will be used to cover the sample table between each sampling location. Used plastic sheeting will be disposed of with the IDW debris.

2.13 Residuals Management

IDW, including soil cuttings, groundwater purge water, wastewater generated by the cleaning of the sampling equipment, and personal protective equipment used during sampling will be temporarily stored in properly labeled 55-gallon drums at the property. For disposal purposes, these materials may be represented by samples collected during this investigation unless IDW specific sampling is utilized. These materials will be grouped and disposed of as IDW waste.

2.14 Field Quality Assurance

Due to the objective of the Upland PRDI activities to support the engineering design of the selected remedies, field quality assurance procedures are less stringent than for compliance-related or risk assessment-related field activities. It should be noted that even for compliance related field activities (delineation of soil removal areas) post-excavation confirmation sampling

and screening is proposed. Field quality assurance will be maintained through compliance with the sampling plan and documentation of sampling plan alterations.

Field QA will still be assessed per the following protocols:

Field Duplicates

Field duplicate samples will only be collected for the soil removal delineation tasks (Woodlife Area and Creosote/Fuel Oil Area Hot Spot) and shallow and deep groundwater assessment tasks presented in this SAP. Field duplicates will be collected at a rate of 1 for every 20 project samples collected. Field duplicates will be labeled with a fictious sample name but in a similar manner as the sample designation instructions included in this SAP. The associated project sample location for each duplicate sample will be noted in field forms.

It should be noted that for solid samples, field duplicates are more likely to be affected by variability in constituent concentrations due to sorption and the generally higher variability of constituents in solids as opposed to liquids. As a result, field duplicates will be assessed for variability taking into account sampling technique and possible sample heterogeneity. Differences between each set of sample results will be considered as part of the overall analysis and quality assurance evaluation rather than on the merits of this result alone. Consideration will be given to both field and laboratory precision with respect to field duplicates. Field duplicate quality assurance will be evaluated by the SLR project manager and SLR QA staff. Steps taken based on field duplicate data will include an evaluation of data variability, sampling technique, and laboratory analytical methods and results.

Trip Blanks

Laboratory-provided trip blanks will be included in all coolers transporting VOC samples. Trip blanks will be used to assess contamination introduced during shipping. Trip blanks will be labeled with the TB identifier, the number, and the date.

For example, the second trip blank on April 10, 2024 will be labeled TB2-041024. Trip blanks will likely be held by the laboratory pending the results of the original samples. Trip blank data will be evaluated by SLR QA Staff as appropriate during the progression of the sampling and data evaluation process.

Temperature Blanks

A temperature blank will be provided by the analytical laboratory for each sample cooler. The temperature of the blank will be measured with a calibrated digital thermometer at the time of sample receipt by the laboratory and that temperature shall be immediately noted on the COC. The temperature blank will not be opened during sampling activities.

2.15 Standard Field Forms and Equipment List

Standard field forms used to record sampling data and field observations include:

- Chain of Custody Form
- Boring Log
- Groundwater Purging and Sampling Form
- Soil Sampling Form
- Pumping Test Log

- Air Sparging Pilot Test Form

Example forms are presented in Appendix A of this document. Revised field forms may be used for the Upland PRDI activities (i.e., each laboratory will have their own standard COC).

2.16 Schedule and Deliveries

Field activities will be coordinated upon Ecology approval of the final Upland PRDI WP and SAP/QAPP but is estimated to coincide with the revised project schedule. Project reporting will be submitted per the schedule presented in the AO.

3.0 Quality Assurance Project Plan

3.1 Purpose

The purpose of this Quality Assurance Project Plan (QAPP) is to identify the quality assurance and quality control (QA/QC) protocols necessary to achieve the project-specific data quality objectives (DQOs) for the proposed Upland PRDI sampling activities at the Site.

3.2 Project Organization

Primary responsibility for project quality rests with SLR project manager (PM), Mr. Scott Miller. The PM will review all project deliverables before submittal to appropriate regulatory agencies. Where quality assurance problems or deficiencies are observed, the PM will identify the appropriate corrective action to be initiated.

Subcontractors will be screened by SLR administrative staff for a health & safety prequalification and for confirmation of applicable state licensures and certifications.

3.3 Data Quality Objectives

This section presents the DQOs for the sampling project. This sampling program is being initiated to support engineering design of the selected remedial alternatives at the Site. As noted above, soil removal delineation sampling will still be supplemented with post-excavation confirmation sampling. Pilot test data will be interpreted using accepted engineering practice and industry standards as applied by the project engineers.

DQO's from the analytical laboratory for internal quality control measures are summarized in Table 3.

3.3.1 Quantitative Objectives: Precision, Accuracy, and Completeness

3.3.1.1 Accuracy

Accuracy quantifies the extent to which a measurement agrees with a known reference or true value. It is determined in the analytical laboratory by "spiking" samples with a known concentration of analyte and comparing the measured concentration with the spiked value. Accuracy is expressed as a percentage, known as the recovery (R) of the measured concentration (C_m) less the sample or "background" concentration (C_b) to the spike concentration (C_s):

$$R = \frac{(C_m - C_b)}{C_s} x100$$

Accuracy can be measured on both an individual sample basis with the use of surrogate spikes (organic analyses only) and for each group of samples analyzed together as a "batch." For this project, accuracy will be assessed through the use of both surrogate and batch QC.

For the batch QC, one or more of the following types of spiked samples are used to assess the accuracy of the method for the batch:

- Matrix or Sample Spike (MS): One sample in the batch is spiked and analyzed to determine R (usually analyzed with a matrix or sample spike duplicate; see Precision)
- Blank Spike (BS): A laboratory-prepared blank sample is spiked and analyzed to determine R (usually analyzed with a blank spike duplicate; see Precision)
- Laboratory Control Sample (LCS): A laboratory-prepared blank sample is spiked and analyzed to determine R (may be analyzed with a duplicate)

Accuracy goals (acceptance limits for R) are established by the analytical laboratory for each method and detailed in the analytical reports. Accuracy goals vary by MS, BS, and LCS, and they are updated annually (see Table 3 of this QAPP for accuracy goals provided by the analytical laboratories). Out-of-range recoveries are summarized by the laboratory in the case narrative for the analytical report. This information is used for data validation as described in Section 3.3.5 of this QAPP.

3.3.1.2 Precision

Precision (reproducibility) is estimated by comparing the analytical results of duplicate samples. Precision is determined at both the field and laboratory levels. Blind duplicates will be collected at the frequency and locations described in Section 2.14. The blind duplicate will be analyzed for the same suite of analyses as the corresponding sample.

Precision is also measured as an internal laboratory batch QC check for all analytical methods. Laboratory MS and/or BS analyses are analyzed in duplicate. The analytical results are compared and reported by the laboratory as the relative percent difference (RPD),

$$RPD = \frac{2|C_1 - C_2|}{C_1 + C_2} x100$$

where C_1 and C_2 are the concentrations in the duplicate samples.

In addition to the MS and BS, the laboratory may split an environmental sample from a single container to create a laboratory duplicate.

Precision goals (upper limits for the RPD) are established by the analytical laboratory for each method and detailed in analytical reports. Precision goals vary by MS, BS, and laboratory duplicates, and they are updated annually. Current precisions goals provided by the analytical laboratories are included in Table 3. Out-of-range precisions are summarized by the laboratory in

the case narrative for the analytical report. This information is used for data validation as described in Section 3.3.5 if this QAPP.

Precision values for the field duplicates will be calculated upon receipt of the analytical data and compared to SLR internal alert limits. Exceedance of the alert limits will trigger a thorough review of field protocols as wells as discussions with the laboratory. Precision will only be calculated for analytes at or above concentrations five times the reporting limit. Out-of-range precision values for field duplicates will be used for data validation as described in Section 3.3.5 of this QAPP.

3.3.1.3 Completeness

Completeness (C) is the percentage of measurements planned (N_p) that are actually obtained and validated (N_v):

$$C = \frac{N_v}{N_p} x100$$

Each of the QC sample types described in the SAP (i.e. field duplicates) is used in the data validation process; consequently, each plays a role in assessing completeness. Completeness provides a final, overall measure of data quality for each sampling event.

The goal is to achieve 100% data completeness. Where data are not complete, professional judgment will be used to either qualify the data or reject the data. Actions and remedies such as re-sampling or re-analysis may be necessary, depending on the required data quality.

3.3.2 Qualitative Objectives: Comparability and Representativeness

3.3.2.1 Representativeness

An important goal of the sampling events is to collect data that are representative of conditions at the site. Since the true conditions, i.e., chemical concentrations, are not known in an absolute sense, they cannot be compared to the measured values in a quantitative fashion. Instead, quality control samples and other procedures are used to qualitatively assess data representativeness.

Field procedures such as equipment decontamination before sampling and adherence to established practices for sample collection (described in Section 2), help ensure that the data collected represent conditions at the site and are not compromised by sampling methods or cross-contamination.

3.3.2.2 Comparability

Comparability describes the extent to which valid comparisons between measurements taken at different locations and different times can be made. Like representativeness, comparability can only be ensured in a qualitative fashion. Consistency in sampling methods, measurement devices, calibration practices, and reporting limits and units will help to ensure comparability. Deviations from protocols will be noted and used for data validation as described in Section 3.3.5.

3.3.3 Field Data Quality Assurance Objectives

This QAPP also presents the field data quality assurance objectives for the sampling project. The field data quality assurance objectives include field measurements and observations, chain-of-custody procedures, and sample handling procedures.

Field Measurement and Observation

Field measurements and observations will be recorded in the project log notes or on designated field data sheets. Sufficient information will be recorded so that all field activities can be reconstructed without reliance on personnel memory. Entries will be recorded legibly directly in waterproof ink and will be signed/initialed and dated by the person conducting the work at the end of each field day. If changes are made, the changes will not obscure the previous entry, and the changes will be initialed and dated. At a minimum, the following data will be recorded:

- Location of activity
- Description of sampling reference point(s)
- Date and time of any activity
- Sample number and volume or number of containers along with preservatives (if necessary)
- Field measurements made
- Relevant comments regarding field activities
- Initials of responsible personnel
- Any deviations from the original sampling plan and reasons for those deviations

Chain-of-Custody Procedures

The management of samples collected in the field will follow specific procedures to maintain sample integrity. To maintain sample integrity, the samples will be handled by as few people as possible and the sample collector will be responsible for the care and custody of the samples. Sample possession will be tracked from collection to analysis. Each time the samples are transferred between parties, both the sender and receiver will sign and date the chain-of-custody form and specify what samples have been transferred, with the exception of commercial shipping activities (i.e., FedEx). When a sample shipment is sent to the laboratory, the original form will be placed with the samples and transmitted to the laboratory. A copy of the form will be retained in the project files. A chain-of-custody record will be completed for each batch of samples hand delivered or shipped to the laboratory.

The following information will be included on the chain-of-custody form:

- Sample number
- Sampler signature
- Sample collection date and time

- Site Name
- Sample type
- Inclusive dates of possession
- Signature of sender and receiver

In addition to the chain-of-custody form, other components of sample tracking will include the sample labels and seals, field logs, sample shipment receipt, and laboratory log book. The sample labels and seals will include the following information:

- Project name and number
- Name/initials of sampler
- Date and time of sample collection
- Sample location and number
- Preservation, if applicable

Sample Handling Procedures

Sampling plan design, sampling techniques, sampling locations, and sample handling protocols are included in the Section 2.11 to ensure that samples collected are representative of site conditions within the limitations of the collection technologies.

3.3.4 Quality Control

Quality control checks consist of measurements and tests performed in the field and laboratory. The analytical methods that will be performed as a part of this project have routine quality control checks performed to evaluate the precision and accuracy and to determine whether the data are within the quality control limits.

3.3.4.1 Field Quality Control Methods

Blind Duplicate

The analytical results between the sample/blind duplicate will be used to assess variance of the total method, including sampling and analysis. As presented in the Section 2.14, one blind duplicate will be collected for every 20 environmental samples for the Woodlife Area soil removal delineation soil samples, the Creosote/Fuel Oil Area Hot Spot delineation soil samples, and the shallow and deep zone groundwater assessment only.

Trip Blanks

A trip blank will accompany any cooler that contains sample material selected for volatile analysis (i.e., VOCs). Analysis of the trip blank will be held by the laboratory pending the results of original sample analysis.

3.3.4.2 Laboratory Quality Control Methods

Specific procedures and frequencies for laboratory quality control are detailed by the analytical method in the laboratory's Quality Assurance Manual. A general description of the types of laboratory quality control samples is as follows:

Method Blanks

A minimum of one laboratory method blank will be analyzed per twenty samples or one per batch (whichever is greater) to assess possible laboratory contamination. Method blanks will contain all reagents and undergo all procedural steps used for analysis.

Control Samples

A minimum of one laboratory control sample per twenty samples or one per batch (whichever is greater) will be analyzed to verify the precision of the laboratory equipment. The control sample will be at a concentration within the calibration range but at a different concentration than the standards used to establish the calibration curve.

Matrix Spike

A minimum of one laboratory matrix spike sample will be analyzed per twenty samples or one per batch (whichever is greater) to monitor recoveries and assure that extraction and concentration levels are acceptable for quality assurance and quality control review.

3.3.5 Data Validation and Usability

This section of the QAPP addresses the final project QA to determine if the data collected during site sampling activities conform to the specified criteria discussed in the SAP and estimate the effects of any deviations.

Data Validation Guidance

Field and laboratory data will be evaluated with respect to the DQOs discussed in Section 2.0 of this QAPP and based on the United States Environmental Protection Agency (EPA)'s *National Functional Guidelines for Organic Superfund Methods Data Review* (EPA, 2017) and *National Functional Guidelines for High Resolution Superfund Methods Data Review* (EPA, 2016). In accordance with these guidance documents, the process presented below will invalidate data determined to be inaccurate, imprecise, unrepresentative, or incomparable. Completeness will be calculated for each analyte as the last step in the validation process. Guidelines for internal data validation tasks are shown in Table 4.

Step 1 – Laboratory Evaluation

The standard laboratory data package will correspond with the EPA2B validation level, with the exception of high-resolution method analyses (i.e., 1613 Method) which will include an EPA4 validation level initially for 10% of the project samples. If significant issues are identified by the data validator, the remaining results may be submitted for EPA4 validation.

Each laboratory data package will be checked to ensure that the samples arrived intact and cold (temperature blank measure of ≤6°C), properly preserved, and arrived at the laboratory in proper condition. For each analyte, the sample collection dates and times will be compared to the dates of analysis to ensure that required hold times were not exceeded. Any non-conformances will be discussed with the laboratory to determine the effects on the validity of the analytical results. This discussion will be used to determine, on a case-by-case basis, if the data are unrepresentative and should be invalidated.

Second, each laboratory report will be reviewed for non-conformances in internal laboratory QC samples – positive detects in method blanks, surrogate or spiked sample recoveries that are out the accepted accuracy range, and relative percent differences between spiked sample duplicates that may indicate an unacceptable method precision. Usually, any non-conformances will be noted in the laboratory report case narrative along with an assessment, based on internal laboratory procedures, of whether the batch data are acceptable. Any data deemed invalid by the laboratory will also be invalidated by SLR's validation process; conversely, data deemed acceptable by the laboratory will also be accepted by SLR.

In addition, information regarding instrument performance checks, initial calibration and verification, and continuing calibration verification will be reviewed as part of the laboratory evaluation.

Step 2 – Field Procedures Evaluation

To assess method precision, the RPD will be calculated for field duplicates as discussed in Section 3.3.1 and compared to SLR internal alert limits. Out-of-range precision values for field duplicates will trigger a detailed review of field procedures and potential discussions with the analytical laboratory.

Step 4 – Completeness

Completeness will be calculated for each analyte as outlined in Section 3.3.2 to provide a final, overall measure of data quality for the project. A completeness goal of 100 percent is established.

3.3.6 Data Management

This section addresses issues related to data sources, data processing, and data evaluation. Raw data generated in the field or received from analytical laboratories will be validated, entered into a computerized database, and verified for consistency and correctness.

Field Data Management

Accurate documentation of field activities (e.g., field parameters measurements, field notes) will be maintained using field log books and/or field data forms. Entries will be made in sufficient detail to provide an accurate record of field activities without reliance on memory.

Field log entries will be dated and include a chronological description of task activities, names of individuals present, names of visitors, weather conditions, etc. All entries will be legibly entered in waterproof ink and initialed at the end of each field day by personnel performing the work.

Analytical Data Management

Following QA/QC, all analytical data will be entered into a computerized database (i.e., MS Excel). The data may require some manipulation, such as common unit conversions and extraction from support information. To accomplish these manipulations, data reduction and tabulation techniques will be applied to the data and documented.

Several different tabular reports will be generated from the database. All analytical, locational, and tracking data will be stored in the database. Data reports for each type of analysis will be generated to produce standard reports.

Project data backups will be made concurrently with internal network server backup activities. Access to the database will be limited to the project manager and authorized project personnel.

Sample Management

The sample management system forms the foundation of all other analytical data collection, verification, and QA/QC tasks. Analytical data cannot be considered valid unless all the proper steps have been carried out with respect to sample management. These include:

- Sample properly documented in field notes
- Chain of-custody requirements met
- All sample-related documents filed
- Use of unique sample identification numbers

Data that do not pass the QA/QC process either will be assigned data qualifiers to restrict or modify usage or will be rejected for use. Modifications to the use of data will be documented in data validation reports.

Data Reporting Requirements

Quality assured and validated data will be submitted to the Washington Department of Ecology's Environmental Information Management (EIM) database established for the project, per the EIM data submittal protocol. This will not include laboratory analytical data performed for the Geotechnical Assessment, Bench Scale Treatability Test, Microbial Community Assessment, or the AI/SSD test.

References

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USEPA. 2017b. Low Stress (low flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells (EQASOP-GW4) USEPA Region 1, Quality Assurance Unit. September.

USEPA. 2017. National Functional Guidelines for Organic Superfund Methods Data Review (EPA-540-R-2017-002). January.

Tables

Table 1: Sample Container Information
Appendix A - Upland SAP and QAPP
PRDI Work Plan - Upland Areas of the Jeld Wen Site

ANALYTES	ANALYTICAL METHOD[1]	SAMPLE CONTAINER / PRESERVATIVE	HOLDING TIME
Groundwater Samples			
VOCs (Naphthalene)	EPA 8260	(3): 40-mL glass vials / preserved with HCl to pH <2	14 Days
Soil Samples			
cPAHs	EPA 8270E	(1): 8-oz. glass jar with Teflon lined cap / Unpreserved	14 Days
Dioxins	EPA 1613B	(1): 8-oz. amber glass jar with Teflon lined cap / Unpreserved	365 Days
Bench Scale Treatability Study			
Solids	Varies[2]	12kg soil (approx. 18 2-inch diameter by 6-inch sleeves, or equivalent)	NA[3]
Aqueous	Varies[2]	(22): 1L / Unpreserved	NA[3]
Microbiological Community Assessment			
Solids	NGS	(1): 50mL conical tube / Unpreserved	NA
Aqueous	NGS	(1): 1-L Nalgene bottle / Unpreserved / Field Filtered	NA

1 - USEPA or SW-846 Analytical Methods

2 - Analytical methods for Bench Scale Treatability Study shown in Table B of SAP Section 2.9.1

3 - Sample analyses for the Bench Scale Treatability Study will support design of the BIO System and analytical results are not to be used to compliance or risk assessment purposes.

Hold times listed above represent the minimum allotted time between sampling and lab extraction, prep, or analysis.

All samples should be kept cold at 6 degrees C.

Table 2: Laboratory Method Quality Objectives
Appendix A - Upland SAP and QAPP
PRDI Work Plan - Upland Areas of the Jeld Wen Site

			Limits		LCS/LCSD		MS/MSD		Duplicate
ANALYTES	ANALYTICAL METHOD[1]	Units	PQL	MDL	%R	RPD	%R	RPD	RPD[4]
Groundwater Samples									
Naphthalene	EPA 8260	ug/L	1	0.12	70-130	20	70-130	20	60
Soil Samples									
cPAHs									
Benzo(a)pyrene	EPA 8270E	mg/kg	0.01	0.00016	50-150	20	50-150	20	100
Benzo(a)anthracene	EPA 8270E	mg/kg	0.01	0.00021	50-150	20	50-150	20	100
Benzo[b]fluoranthene	EPA 8270E	mg/kg	0.01	0.00024	50-150	20	50-150	20	100
Benzo[k]fluoranthene	EPA 8270E	mg/kg	0.01	0.00023	50-150	20	50-150	20	100
Chrysene	EPA 8270E	mg/kg	0.01	0.00015	50-150	20	50-150	20	100
Dibenzo[a,h]anthracene	EPA 8270E	mg/kg	0.01	0.00031	41-136	20	41-136	20	100
Indeno[1,2,3-cd]pyrene	EPA 8270E	mg/kg	0.01	0.00034	40-140	20	40-140	20	100
TEQ	Calculated[2]	mg/kg	0.08	-	-	-	-	-	-
Dioxins									
2,3,7,8-TCDF	EPA 1613B	ng/Kg	1	0.221	70-130	20	70-130	20	80
2,3,7,8-TCDD	EPA 1613B	ng/Kg	1	0.193	70-130	20	70-130	20	80
1,2,3,7,8-PeCDF	EPA 1613B	ng/Kg	5	0.227	70-130	20	70-130	20	80
2,3,4,7,8-PeCDF	EPA 1613B	ng/Kg	5	0.206	70-130	20	70-130	20	80
1,2,3,7,8-PeCDD	EPA 1613B	ng/Kg	5	0.202	70-130	20	70-130	20	80
1,2,3,4,7,8-HxCDF	EPA 1613B	ng/Kg	5	0.393	70-130	20	70-130	20	80
1,2,3,6,7,8-HxCDF	EPA 1613B	ng/Kg	5	0.402	70-130	20	70-130	20	80
2,3,4,6,7,8-HxCDF	EPA 1613B	ng/Kg	5	0.347	70-130	20	70-130	20	80
1,2,3,7,8,9-HxCDF	EPA 1613B	ng/Kg	5	0.385	70-130	20	70-130	20	80
1,2,3,4,7,8-HxCDD	EPA 1613B	ng/Kg	5	0.382	70-130	20	70-130	20	80
1,2,3,6,7,8-HxCDD	EPA 1613B	ng/Kg	5	0.469	70-130	20	70-130	20	80
1,2,3,7,8,9-HxCDD	EPA 1613B	ng/Kg	5	0.452	70-130	20	70-130	20	80
1,2,3,4,6,7,8-HpCDF	EPA 1613B	ng/Kg	5	0.35	70-130	20	70-130	20	80
1,2,3,4,7,8,9-HpCDF	EPA 1613B	ng/Kg	5	0.431	70-130	20	70-130	20	80
1,2,3,4,6,7,8-HpCDD	EPA 1613B	ng/Kg	5	0.338	70-130	20	70-130	20	80
OCDF	EPA 1613B	ng/Kg	10	1.09	70-130	20	70-130	20	80
OCDD	EPA 1613B	ng/Kg	10	0.956	70-130	20	70-130	20	80
TEQ	Calculated[3]	ng/Kg	5.7	-	-	-	-	-	-

1 - USEPA or SW-846 Analytical Methods

2 - Toxic Equivalency (TEQ) calculated using the Toxicity Equivalent Factors (TEFs) presented in MTCA Table 708-2 and using ND values as 1/2*PQL

3 - TEQ calculated using the TEFs presented in MTCA Table 708-1 and using ND values as 1/2*PQL

4 - SLR Internal Alert Limits for Field Duplicate and Original Sample. Concentrations of each must be >5x MDL for valid comparison

Table 3: Upland PRDI Well and Boring Summary
Appendix A - Upland SAP and QAPP
PRDI Work Plan - Upland Areas of the Jeld Wen Site

Purpose	No.	Method	Boring Depth	Boring Dia.	Well Casing Dia.	Screen Interval	Sampling Plan	Other Details
Woodlife Area								
Excavation Extents Borings	26	Geoprobe	10'	2"	-	-	Grab soil samples, up to 3 at each boring	Soil borings only
Creosote/Fuel Oil Area								
Excavation Extents Borings	36	Geoprobe	10'	2"	-	-	Grab soil samples, 1 per boing, PID screening in 1' intervals	Soil borings only
Shallow Groundwater	5	Hollow-Stem Auger	15'	6"	2"	5-15'	Low flow groundwater samples	Co-located with Creosote/Fuel Oil Area Extents Geoprobes. To be utilized in Aquifer Tests and Air Injection Tests, as needed
Deep groundwater	5	Hollow-Stem Auger	55'	6"	2"	45-55' (with 2' sump)	Low flow groundwater samples	Co-located with Creosote/Fuel Oil Area Extents Geoprobes. To be utilized in Aquifer Tests and Air Injection Tests, as needed
Geotechnical Assessment Boring	1	Hollow-Stem Auger/Mud Rotary	50'	6"	-	-	SPT and California Modified Split Spoons	Boring completed as Deep Pumping Well
Shallow Pumping Well	1	Hollow-Stem Auger	20'	6" to 8"	4" or 6"	15-20'	-	-
Shallow Pump Test Observation Well	1	Hollow-Stem Auger	15'	6"	2"	5-15'	-	-
Deep Pumping Well	1	Hollow-Stem Auger	50'	6" to 8"	4" or 6"	45-50'	-	Co-located with Geotechnical Assessment Boring
Deep Pump Test Observation Well	2	Hollow-Stem Auger	55'	6"	2"	45-55'	-	-
SSD Horizontal Well	1	Excavator	2 to 3'	-	3"	10' length (horizontal)	Effluent air samples during test	Installed near the AI wells
SSD Vapor Pins	8	Hammer Drill	1'	1"	-	-	-	Vapor pins for vacuum measurements during SSD test
Deep Air Injection Well	1	Hollow-Stem Auger	50'	4"	1"	48-50'	-	-
Shallow Air Injection Well	1	Hollow-Stem Auger	20'	4"	1"	18-20'	-	-
Medium Air Injection Test Observation Well	1	Hollow-Stem Auger	30'	6"	2"	20-30'	-	-

Ultimate drilling method and boring diameter to be determined based upon discussions with selected drilling contractor
Ultimate boring and well depths to be determined based on field observations

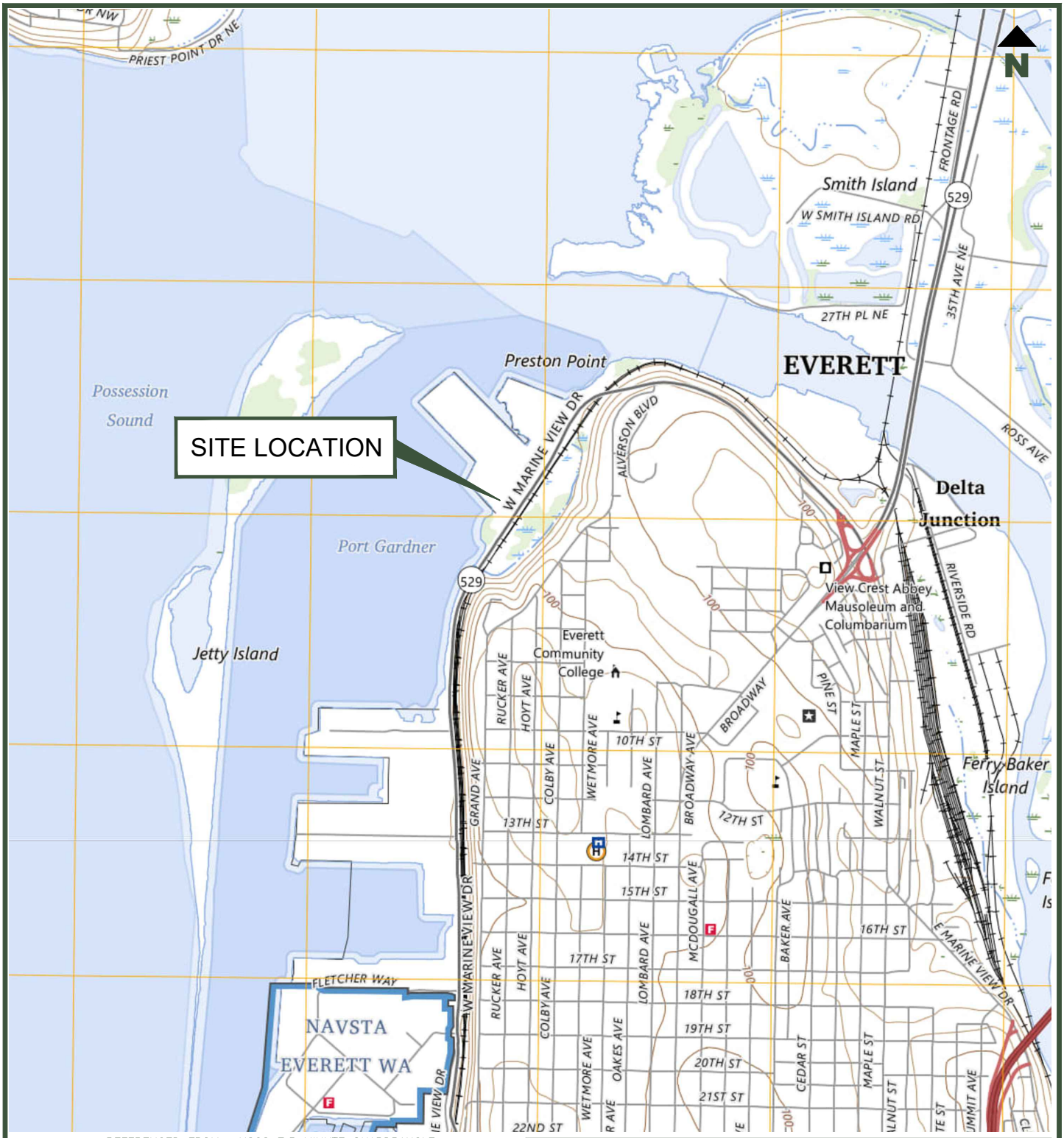
Table 4: Data Validation Guidance
Appendix A - Upland SAP and QAPP
PRDI Work Plan - Upland Areas of the Jeld Wen Site

Data Validation Parameter	Evaluation Procedure	Acceptance Criteria	Guidelines for Corrective Action
Holding Time	Compare date of sample collection on Chain-of-Custody with date of analysis on laboratory reports.	Each sample should meet holding times (presented in Attachment 2)	Analytical results flagged as estimated concentrations (J) or as estimated quantitation limits (UJ). A slight exceedance may not be qualified at the discretion of the data validator.
Field and Method Blanks	Compare results of field and method blanks for the presence of field or laboratory contamination.	Contaminants are not present in the blanks.	Flag values as estimated (J) if less than 10X for method specific laboratory contaminants and 5X for other contaminants. Request that laboratory review data. Carefully consider type of blank, compounds present, and origin of contaminants. Modify sampling procedures or laboratory SOPs.
Practical Quantitation Limits	Compare the analytical results for each parameter with the method sensitivity for each parameter.	Positive results are above the lowest practical quantitation limit. If dilution is required as a result of matrix interference, the practical quantitation limits will be adjusted by the laboratory and the lowest practical quantitation limits may not be achievable.	Concentrations reported below the practical quantitation limit will be flagged as estimated (J). Review sensitivity data and discuss specific results with testing laboratory in a qualitative manner to determine if reanalysis or modification of procedures should be performed to meet desired objectives.
Matrix Spike/Matrix Spike Duplicate	Compare the spike recoveries and RPDs to laboratory-generated QC limits.	Spike recoveries and RPDs within laboratory- generated QC limits.	Refer to LCS for data acceptability when the MS/MSD fails. Data are not qualified based on MS/MSD results alone. Verify that the associated LCS is within QC limits.
Surrogates	Compare surrogate recoveries to laboratory-generated QC limits.	Surrogate recoveries within QC limits.	Samples with surrogate recoveries below QC limits will be flagged as estimated (J) for detected results and (UJ) for non-detects. Samples with surrogate recoveries above QC limits will be flagged as estimated (J) for detected results. Non-detects will not be qualified. In all cases, qualification of the data is at the discretion of the data validator, i.e., where dilutions are involved, the validator may determine that data qualifications are not necessary.
Laboratory Control Sample	Compare the LCS recovery to QC limits specified by the method.	LCS recovery within laboratory-generated limits.	Review data and discuss with laboratory. Reanalysis may be necessary. Data qualifications may be necessary at the discretion of the data validator.
Initial Calibration	For organic analysis, check % RSD is within method limits.	Organics - % RSD is less 30 for calibration check compounds and less than 15 for other analytes.	Laboratory should recalibrate instrument. Samples run on ICAL which is out of QC limits are qualified as estimated (J) for detected results and (UJ) for non-detects.
Continuing Calibration Verification	For organic analysis, compare the % D between ICAL and CCAL to the method limits.	Organics - % D is less than 20% for calibration check compounds.	Calibration standard should be reinjected. A new calibration curve should be run if reinjection fails. Analyses associated with the CCAL will be qualified as estimated (J) for detected results and (UJ) for non-detects.
General Quality of Data	Qualitatively evaluate the performance of the laboratory based on completeness evaluation, the quality of data generated, and other intangible factors. Summarize qualitative evaluation in writing.	Completeness of data should range between 90 and 100 percent complete.	Review completeness data and discuss results with testing laboratory in a qualitative manner to determine if reanalysis or modification of procedures should be performed to meet desired objectives.

Data Validation Qualifiers

U - The analyte was analyzed for, but not detected above the reported sample quantitation limit.
J - The analyte was positively identified; the associated numerical value is an estimated quantity.
UJ - The analyte was not detected above the reported sample quantitation limit. The associated quantitation limit is estimated.
N - The analysis indicates the presence of an analyte for which there is presumptive evidence to make a 'tentative identification.'
NJ - The analysis indicates the presence of an analyte that has been 'tentatively identified' and the associated numerical value is an estimated quantity.
R - The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

Figures



REFERENCED FROM : USGS 7.5 MINUTE QUARDRANGLE
<EVERETTE, WA & MARYSVILLE, WA, 2023>

LEGEND

0 2,000 4,000 6,000’

SLR

JELD-WEN SITE
300 WEST MARINE VIEW DRIVE
EVERETT, WASHINGTON

Report
APPENDIX A - UPLAND SAP AND QAPP

Drawing
SITE PLAN

Date	January 23, 2024	Scale	AS SHOWN	Fig. No. 1
File Name	RD Workplan-3	Project No.	108.00228.00026	

Drawing path: N:\Portland\Figures\JELD-WEN\JELD-WEN NordDoor\PHASE 2\RD Workplan.dwg

LEGEND

- EXISTING BUILDINGS
- REMOVED BUILDINGS
- SITE SURVEY AREA

SLR

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
APPENDIX A - UPLAND SAP AND QAPP

Drawing
SITE SURVEY SCOPE OF WORK

Date	MARCH 2021	Scale	AS SHOWN	Fig. No.	2
File Name	SITE PLAN_NEW SYMBOLS	Project No.	108.00228.00061		

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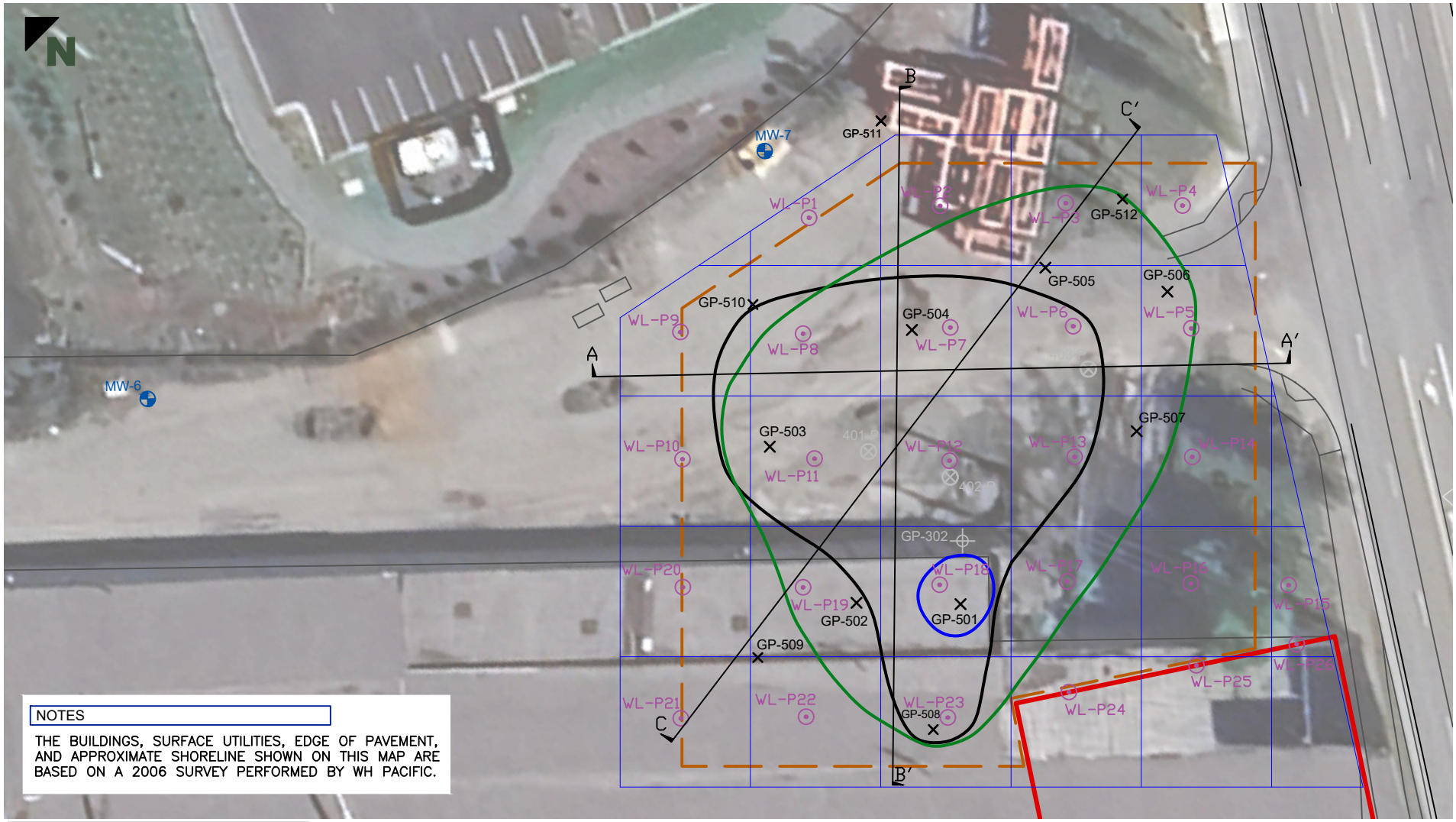

NOTES

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

LEGEND

- GEOPROBE SAMPLING LOCATION, SLR 2012
- GEOPROBE SAMPLE LOCATION, SLR 2009
- SURFACE SOIL SAMPLE LOCATION, SLR 2009
- NEAR SURFACE SOIL SAMPLE LOCATION, SLR 2009
- EXISTING MONITORING WELL
- GEOPROBE SAMPLING LOCATION, SLR 2013
- PROPOSED SOIL BORING LOCATION
- HOTSPOT REMOVAL AREA (100 FT X 350 FT)
- WOODLIFE SOIL REMOVAL AREA
- ESTIMATED EXTENT OF IMPACTS AT 1' bgs
- ESTIMATED EXTENT OF IMPACTS AT 3' bgs
- ESTIMATED EXTENT OF IMPACTS AT 5' bgs
- 40'x40' SAMPLING GRID

0 45 90 135'

JELD-WEN SITE
300 WEST MARINE VIEW DRIVE
EVERETT, WASHINGTON

Report: APPENDIX A - UPLAND SAP AND QAPP

Drawing: WOODLIFE AREA PROPOSED SAMPLE LOCATIONS

Date: January 19, 2024	Scale: AS SHOWN	Fig. No. 3
File Name: RD Workplan-3	Project No.: 108.00228.00026	

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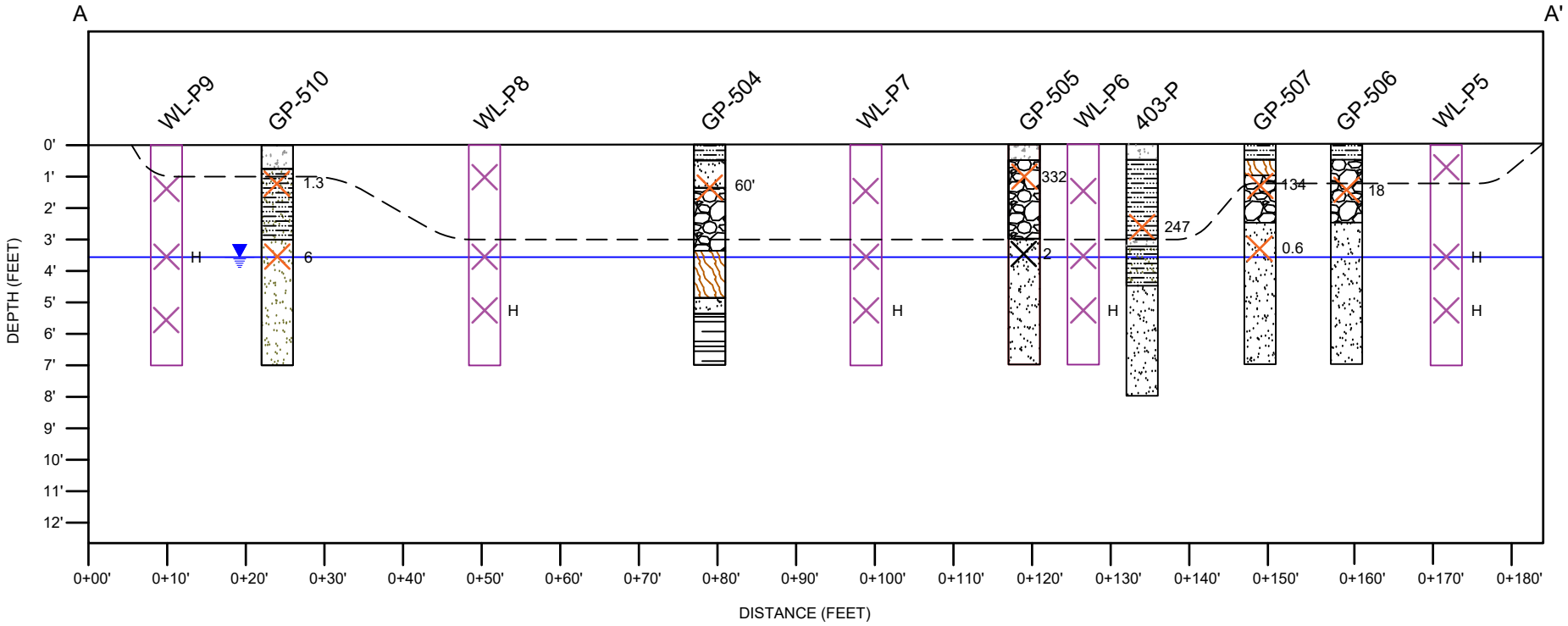

LEGEND

- ASPHALT/CONCRETE
- SAND
- GRAVEL
- SILT
- CLAY
- WOODY DEBRIS
- APPROXIMATE WATER LEVEL
- GEOPROBE GROUNDWATER SAMPLING LOCATION, SLR 2013
- 60 DIOXINS TEQ VALUE (pg/g)
- ESTIMATED EXTENT OF EXCAVATION
- PROPOSED SOIL BORING
- GEOPROBE SAMPLING LOCATION
- H SAMPLE INTERVAL TO BE HELD BY LABORATORY PENDING RESULT OF SHALLOWER SAMPLE

SLR

JELD-WEN SITE
300 WEST MARINE VIEW DRIVE
EVERETT, WASHINGTON

Report
APPENDIX A - UPLAND SAP AND QAPP

Drawing
CROSS-SECTION A - A'

Date	January 19, 2024	Scale	AS SHOWN
File Name	RD Workplan-3	Project No.	108.00228.00026

Fig. No. 4A

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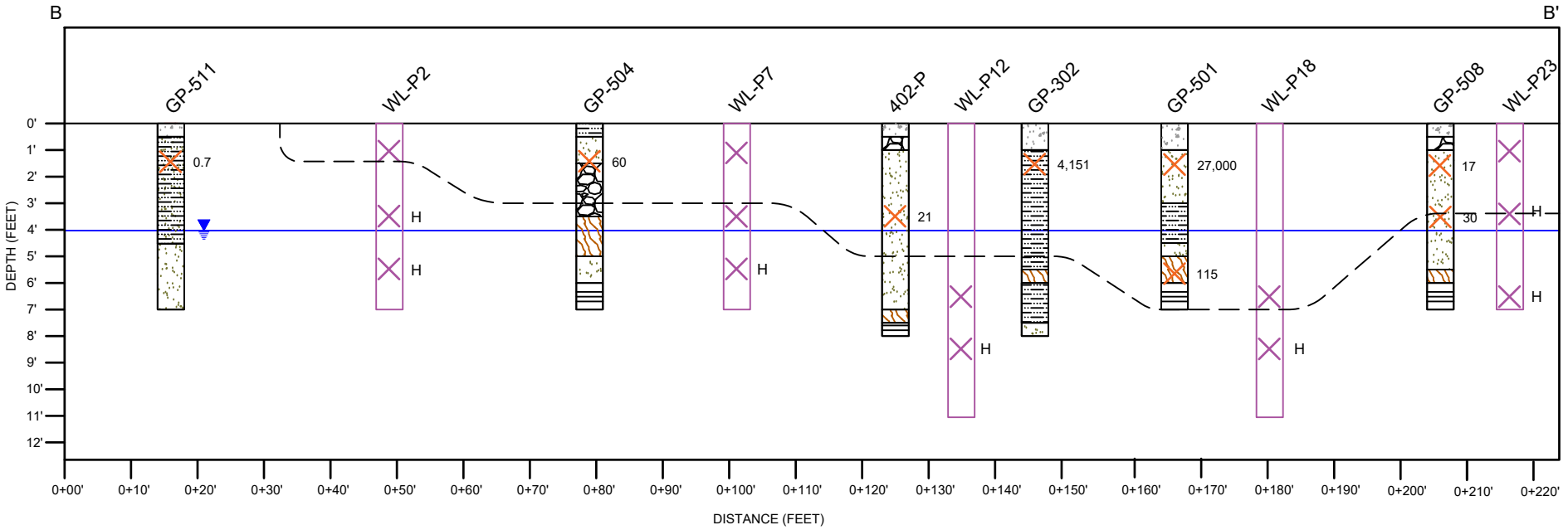

LEGEND

- ASPHALT/CONCRETE
- SAND
- GRAVEL
- SILT
- CLAY
- WOODY DEBRIS
- APPROXIMATE WATER LEVEL
- GEOPROBE GROUNDWATER SAMPLING LOCATION, SLR 2013
- 60 DIOXINS TEQ VALUE (pg/g)
- ESTIMATED EXTENT OF EXCAVATION
- PROPOSED SOIL BORING
- GEOPROBE SAMPLING LOCATION
- H SAMPLE INTERVAL TO BE HELD BY LABORATORY PENDING RESULT OF SHALLOWER SAMPLE

SLR

JELD-WEN SITE
300 WEST MARINE VIEW DRIVE
EVERETT, WASHINGTON

Report
APPENDIX A - UPLAND SAP AND QAPP

Drawing
CROSS-SECTION B - B'

Date	January 19, 2024	Scale	AS SHOWN
File Name	RD Workplan-3	Project No.	108.00228.00026

Fig. No. 4B

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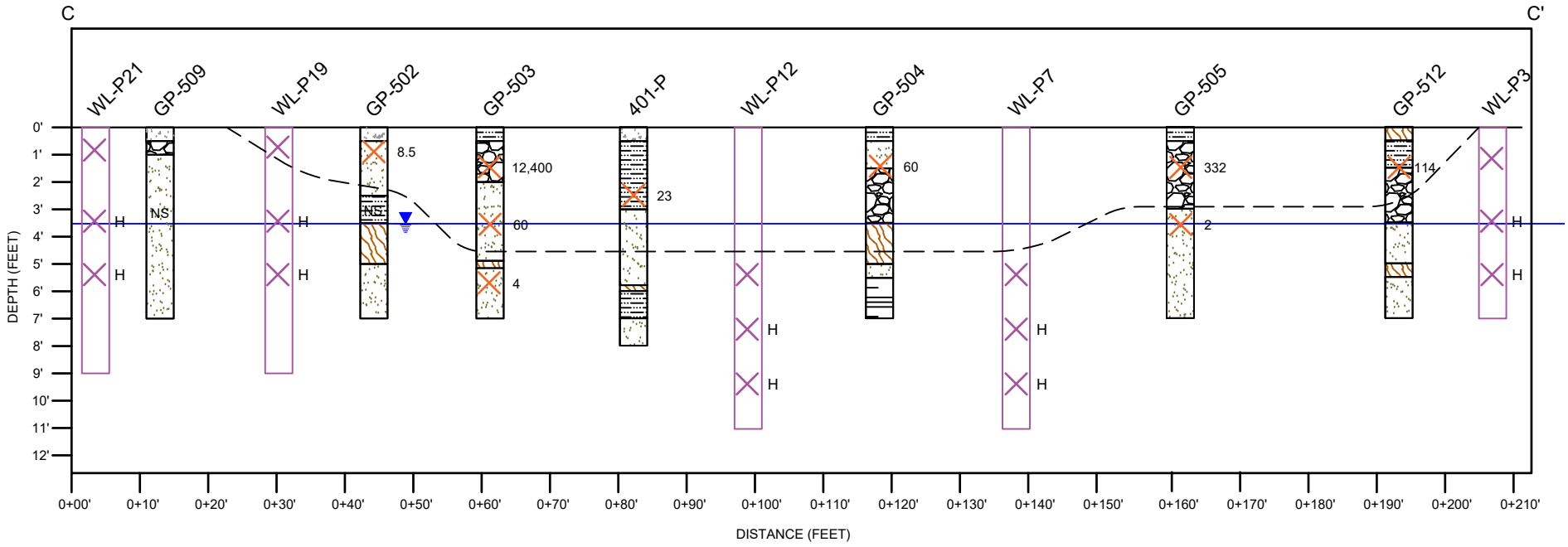


LEGEND

- ASPHALT/CONCRETE
- SAND
- GRAVEL
- SILT
- CLAY
- WOODY DEBRIS
- APPROXIMATE WATER LEVEL
- GEOPROBE GROUNDWATER SAMPLING LOCATION, SLR 2013
- 60 DIOXINS TEQ VALUE (pg/g)
- ESTIMATED EXTENT OF EXCAVATION
- PROPOSED SOIL BORING
- GEOPROBE SAMPLING LOCATION
- H SAMPLE INTERVAL TO BE HELD BY LABORATORY PENDING RESULT OF SHALLOWER SAMPLE

NOTES

NS = NOT SAMPLED

CLEANUP LEVEL (CUL) FROM CAP IS 5.2 pg/g FOR DIOXINS TEQ.

SLR

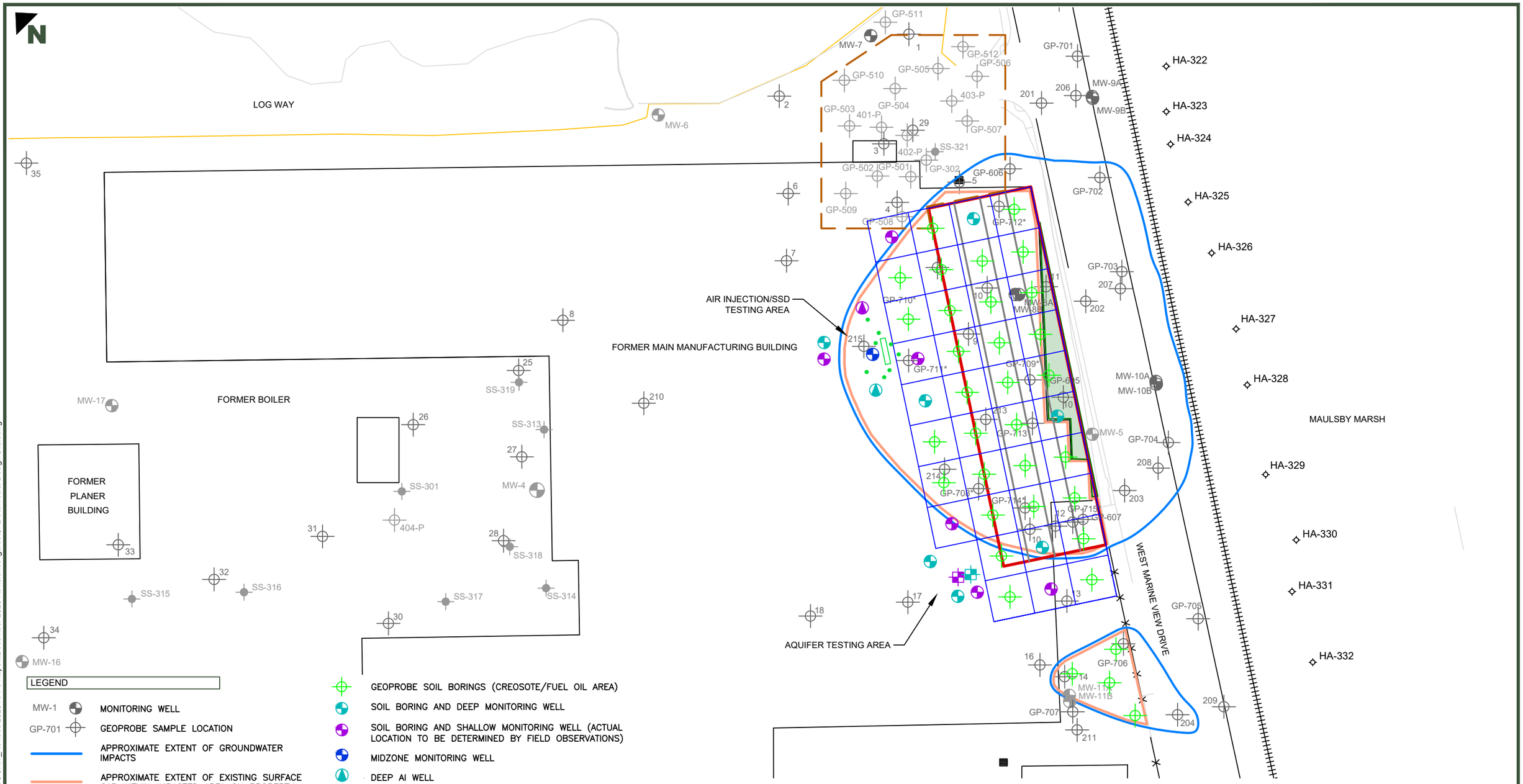
JELD-WEN SITE
300 WEST MARINE VIEW DRIVE
EVERETT, WASHINGTON

Report
APPENDIX A - UPLAND SAP AND QAPP

Drawing
CROSS-SECTION C - C'

Date	January 19, 2024	Scale	AS SHOWN
File Name	RD Workplan-3	Project No.	108.00228.00026

Fig. No. 4C



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)
	HOTSPOT REMOVAL AREA (100 FT X 350 FT)
	PROPOSED SHORING (25 FT SPACING)
	WOODLIFE SOIL REMOVAL AREA
	GEOPROBE SOIL BORINGS (CREOSOTE/FUEL OIL AREA)
	SOIL BORING AND DEEP MONITORING WELL
	SOIL BORING AND SHALLOW MONITORING WELL (ACTUAL LOCATION TO BE DETERMINED BY FIELD OBSERVATIONS)
	MIDZONE MONITORING WELL
	DEEP AI WELL
	SHALLOW AI WELL
	DEEP PUMPING WELL AND GEOTECHNICAL BORING
	SHALLOW PUMPING WELL
	VAPOR PIN
	SSD HORIZONTAL WELL
	40'x40' SAMPLING GRID

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
APPENDIX A - UPLAND SAP AND QAPP

Drawing
CREOSOTE/FUEL OIL AREA PROPOSED SAMPLE LOCATIONS

Date	October 2023	Scale	AS SHOWN	Fig. No.	5
File Name	Remedial Design Draft	Project No.	108.00228.00063		

N:\Portland\Projects\JELD-WEN\JELD-WEN NORD DOOR\1_Revised 2020 RI FS Report\December 2020 Revisions\Figures\CAD\Remedial Design Draft.dwg

Appendix A Example Field Forms

SAMPLE CHAIN OF CUSTODY

Report To_____

Company_____

Address_____

City, State, ZIP_____

Phone_____Email_____

SAMPLERS (*signature*)	
PROJECT NAME	PO #
REMARKS Project Specific RLs - Yes / No	INVOICE TO

Page # _____ of _____

TURNAROUND TIME
Standard Turnaround
RUSH_____
Rush charges authorized by:
_____

SAMPLE DISPOSAL
Dispose after 30 days
Archive Samples
Other_____

						ANALYSES REQUESTED											
Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082						Notes

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:				
Received by:				
Relinquished by:				
Received by:				

Friedman & Bruya, Inc.
5500 4th Avenue S
Seattle, WA 98108
Ph. (206) 285-8282

Project:		**Boring/Well Name:**
Boring Location:	**Job #:**	
Drilling Company:	**Logged by:**	
Equipment:	**Start Date/Time:**	
Sampling Method:	**Finish Date/Time:**	
Hammer Weight:	**Monitoring Device: PID**	
	First Water (bgs):	

Sample I.D.	Sample Interval	Recovery (%)	PID (ppm)	Blow Counts	Depth (feet bgs)	USCS Code	Graphic Log	Lithologic Description	Boring Abandonment or Well Construction Details

Depth of Boring (bgs):	**Filter Pack:**
Depth of Well (bgs):	**Annulus Seal:**
	Surface Seal:

LOW-FLOW GROUNDWATER SAMPLING FIELD DATA SHEET

Project No. _____ Purged By: _____ Well I.D.: _____

Project Name: _____ Sampled By: _____ Sample I.D.: _____

Location: _____ QA Samples: _____

Date Purged: _____ Start (2400hr): _____ End (2400hr): _____

Date Sampled: _____ Sample Time (2400hr): _____

Casing Diameter:	2" ____	3"____	4"____	5" ____	6" ____	8" ____	Other ____
Casing Volume: (gallons per foot)	(0.17)	(0.38)	(0.67)	(1.02)	(1.50)	(2.60)	( )

Total depth (feet) = _____ Casing Volume (gal) = _____

Depth to water (feet) = _____ Minimum Purge (gal) = _____

Water column height (feet) = Actual Purge (gal) =

FIELD MEASUREMENTS

Volume (Gal)	Time (2400hr)	Temp. (degrees C)	Conductivity (mS/cm)	TDS (g/L)	DO (mg/L)	pH (units)	ORP (mV)	Turbidity (Visual)	Color (Visual)

PURGING & SAMPLING EQUIPMENT

___ Well Wizard Bladder Pump
___ Active Extraction Well Pump
___ Submersible Pump
___ Peristaltic Pump
___ Bailer (disposable)
___ Bailer (PVC)
___ Bailer (Stainless Steel)
___ Dedicated _____
Other: _____
Pump Intake Depth: _____ (feet)

SAMPLE VESSELS

___ 40mL VOA
___ 40mL VOA w/ HCL
___ ____mL amber glass
___ ____mL amber glass w/ HCl
___ ____mL HDPE
___ ____mL HDPE w/ HNO3
___ ____mL HDPE w/ H2SO4
_____
_____
_____
_____

Well Integrity: _____ Odor: _____

Remarks: _____

Signature: Page of __

Soil Sampling Form

Site Name:	**Location/Area:**
Sampled By:	Sample ID:
Approx. Air Temperature (C)	Sample Time: Sample Date:
Weather Conditions:	Duplicate ID:
	MS/MSD ☐ Yes ☐ No Trip Blank Required: ☐ Yes ☐ No

Location Information

☐ Surface ☐ Boring ☐ Test Pit (floor / sidewall) ☐ Excavation (floor / sidewall) | Sample Depth (ft bgs):

Water level Depth (ft bgs)_____ Frozen Soil Depth (ft bgs)_____

Note- If not known at sample location, list as not determined "ND"

Sample Description - circle applicable classification(s)

GRAVEL (3 – 0.08 IN)	SAND (0.08 – 0.003 IN)	SILT (< 0.003 IN)	CLAY (NO GRAINS VISIBLE)	ORGANIC SOIL	PEAT
GW GP GM GC	SW SP SM SC	ML MH	CL CH	OL/OH	PT

Color_____ %Coarse_____ %Fines_____ Peat/Organic Soil Likely Present (Y/N)_____

Moisture (Dry, Moist, Wet/Saturated)_____ Stained _____ Odor_____

PID_____ppm ☐ Headspace ☐ In-Sampler ☐ In-Situ

Analyses	Check Applicable	Analyses	Check Applicable	Analyses	Check Applicable	Analyses	Check Applicable
VOCs		DRO/RRO		RCRA Metal			
BTEX		PAHs		Lead (only)			
GRO		PCBs					

Equipment Used: PID/FID(Model\SN)_____Collection Method_____

Notes/Comments (indicate general location, and possible other relevant conditions not listed above)**:**

_____

_____

_____

_____

Site Name:	**Location/Area:**
Sampled By:	Sample ID:
Approx. Air Temperature (C)	Sample Time: Sample Date:
Weather Conditions:	Duplicate ID:
	MS/MSD ☐ Yes ☐ No Trip Blank Required: ☐ Yes ☐ No

Location Information

☐ Surface ☐ Boring ☐ Test Pit (floor / sidewall) ☐ Excavation (floor / sidewall) | Sample Depth (ft bgs):

Water level Depth (ft bgs)_____ Frozen Soil Depth (ft bgs)_____

Note- If not known at sample location, list as not determined "ND"

Sample Description - circle applicable classification(s)

GRAVEL (3 – 0.08 IN)	SAND (0.08 – 0.003 IN)	SILT (< 0.003 IN)	CLAY (NO GRAINS VISIBLE)	ORGANIC SOIL	PEAT
GW GP GM GC	SW SP SM SC	ML MH	CL CH	OL/OH	PT

Color_____ %Coarse_____ %Fines_____ Peat/Organic Soil Likely Present (Y/N)_____

Moisture (Dry, Moist, Wet/Saturated)_____ Stained _____ Odor_____

PID_____ppm ☐ Headspace ☐ In-Sampler ☐ In-Situ

Analyses	Check Applicable	Analyses	Check Applicable	Analyses	Check Applicable	Analyses	Check Applicable
VOCs		DRO/RRO		RCRA Metal			
BTEX		PAHs		Lead (only)			
GRO		PCBs					

Equipment Used: PID/FID(Model\SN)_____Collection Method_____

Notes/Comments (indicate general location, and possible other relevant conditions not listed above)**:**

_____

_____

_____

_____

SLR

Pumping Test Log

Recorded by: _____
Pumping Well ID: _____
Well Location: _____
Static Depth to Water (ft): _____
Stick-up from Datum (ft): _____
Well Screen Interval (ft): _____
Screen Diameter (in): _____
Casing Interval (ft): _____
Casing Diameter (in): _____
Pump Depth (ft): _____

Start Pump: Date: _____ Time: _____
Stop Pump: Date: _____ Time: _____

Notes:

Date/Time	Drawdown Elapsed Time (min)	Recovery Elapsed Time (min)	Downhole Pressure (PSI)	Drawdown or Residual Drawdown (ft)	Flow Meter #1 Rate (gpm)	Flow Meter #1 Total (gal)	Flow Meter #2 Rate (gpm)	Flow Meter #2 Total (gal)	Sounder Depth to Water (ft TOC)	Surface Discharge Pressure (PSI)	Comments

Air Sparging Pilot Test Field Data Form

Date: _____

Site Name: _____

SLR Employee: _____

Monitoring Equipment: _____ Compressor Model No.: _____

Notes and Pilot Test Layout Sketch (with measurements):

FIELD MEASUREMENTS

	Compressor Status			Location _____			Location _____			Location _____			Location _____			Location _____		
Date / Time	On / Off	Pressure (PSI)	Flow (cfm)	D.T.W (feet)	D.O.		D.T.W (feet)	D.O.		D.T.W (feet)	D.O.		D.T.W (feet)	D.O.		D.T.W (feet)	D.O.	

ADDITIONAL INFORMATION / COMMENTS: _____

Soil Vapor Extraction Test Field Data Form

Site Name: _____ Date: _____

SLR Employee: _____ SLR Project # : _____

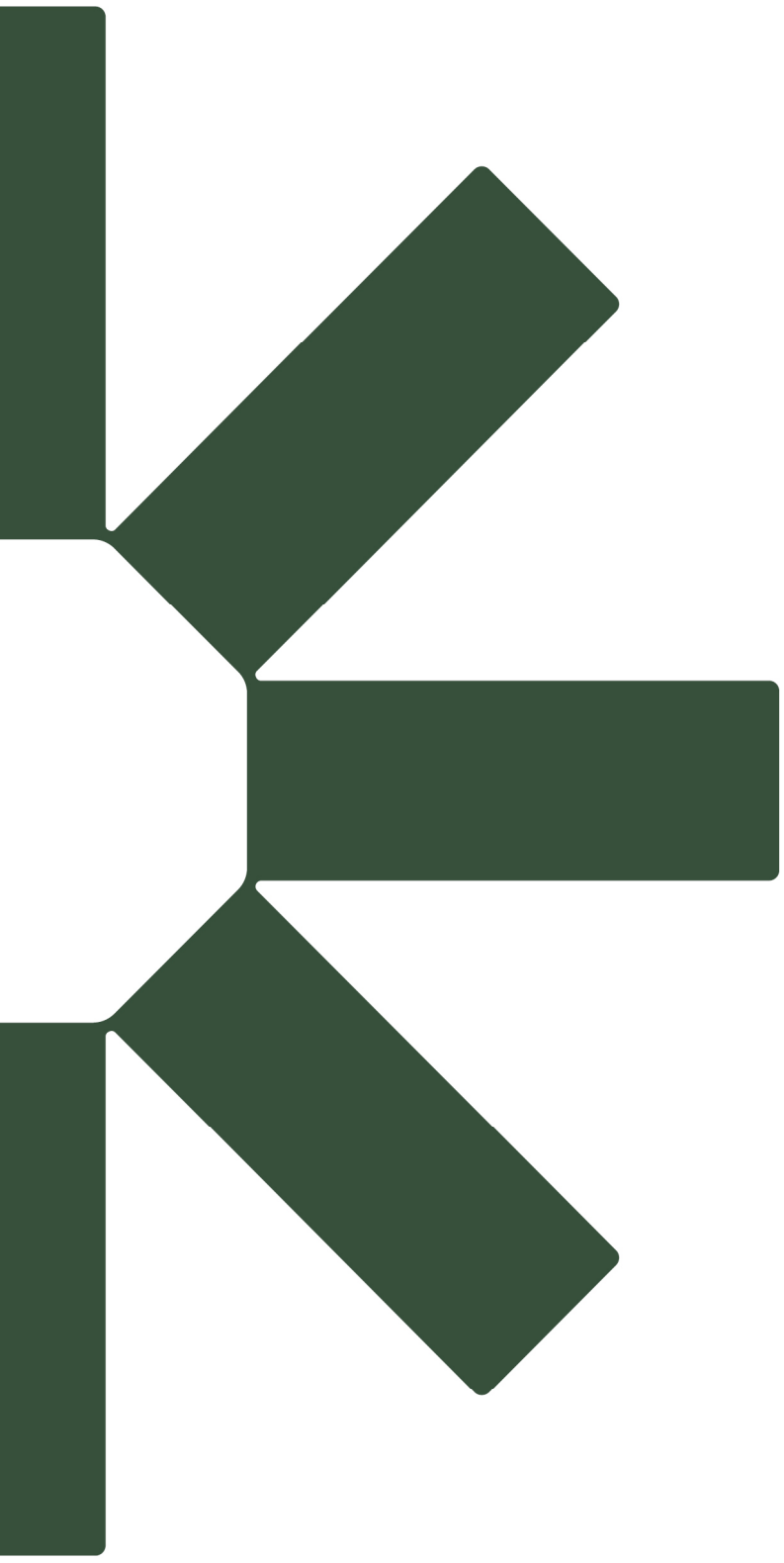
Monitoring Equipment: _____ Blower Model: _____

Pilot Test Layout Sketch (with measurements):

FIELD MEASUREMENTS

	Blower Status			PID (ppm)		Location:	Location:	Location:	Location:	Location:	Location:	Location:
Date / Time	On / Off	Vacuum (inches W.C.)	Flow (cfm)	INF	EFF	Vacuum (inches W.C.)	Vacuum (inches W.C.)	Vacuum (inches W.C.)	Vacuum (inches W.C.)	Vacuum (inches W.C.)	Vacuum (inches W.C.)	Vacuum (inches W.C.)

ADDITIONAL INFORMATION/COMMENTS: _____



Making Sustainability Happen

Appendix B Health and Safety Plan

Project Name: Former E.A. Nord	
Client: JELD-WEN, INC.	Location: 300 West marine View Dr, Everett, WA
SLR Project No: 108.00228.00065	HASP Effective Period: 2024
HASP Approvals	
Project Manager (name/signature): Chris Kramer	
Principal in Charge (name/signature): Scott Miller	
H&S Reviewer (name/signature): Clayton Blackburn	

HASP must be updated if there are any changes in the scope of work

1.0 Project Emergency Contact List

Local Emergency Numbers	Name	Telephone Numbers (Include Area Code)	
For life threatening injuries call 911 to summon emergency responders. For non-life-threatening injuries call XstremeMD (XMD) – **(800) 600-9015.** Report all injuries, regardless of severity, to your supervisor or Project Manager as soon as it is safe to do so (within 1-hour of occurrence).			
Hospital / Ambulance Services	Providence Regional Medical Center	911 for emergencies/ (425) 261-2000	
First Aid Facilities		XstremeMD – (800) 600-9015	
Police	Everett Police Department	911 for emergencies/ (425) 257-8100	
Fire	Everett Fire Department	911 for emergencies/ (425) 257-8100	
Public utility locate services	Public One-Call service	(800) 424-5555	
Private utility locate services			
Client Contacts	**Name**	**Telephone Numbers**	
Corporate Contact	Eric Rapp, JELD-WEN	Office	(304) 742-5180
		Cell	(304) 644-7222
Site Contact	TBD	Office	
		Cell	
SLR Contacts	**Name**	**Telephone Numbers**	
Project Manager	Chris Kramer	Office	(503) 723-4423
		Cell	(503) 341-2187
Site Safety Officer	Emily Hernandez	Office	(425) 402-8800
		Cell	(910) 200-7539
Technical Discipline Manager	Scott Miller	Office	(503) 723-4423
		Cell	(503) 572-1124
Local HSE Coordinator	Mel Bocianowski	Office	(503) 723-4423
		Cell	(503) 720-4870
US Region HSE Management / Incident Reporting	Michael Coon, HSE Manager, or	Cell	(203) 271-1773
	Patrick Moore, HSE Advisor	Cell	(206) 478-6464
Subcontracted Company Role	**Name**	**Telephone Numbers**	

TBD		

2.0 Incident Response and Reporting Guidelines

If an incident or near miss occurs the SLR Site Safety Officer (SSO) will assume charge of the situation in regard to coordination of notification of site emergency response personnel. By default, the SSO is the highest ranking SLR employee on site. The SLR SSO will access the incident situation and make a determination concerning the need to seek medical attention for any injured or ill personnel, and any potential need to shut down the job task to assess work practices/procedures, PPE usage, etc.

DEFINITIONS:
Incident – Any occurrence or event that caused injury, illness, environmental damage, or significant property damage.
Near Miss – Any occurrence or event that, with slightly different circumstances, could have resulted in an incident.

The following steps will be followed by the SLR SSO or their designee in the event of an incident or near miss:

1. Stop work and access the situation. This includes near misses as well as incidents.
2. If possible, move any injured personnel to a safe location if a hazard is still present. Do not attempt to move anyone with a head, neck, or spinal injury, or if they are unconscious unless it is necessary to prevent further injury.
3. Provide first aid and/or CPR within your level of training.
4. **For life-threatening injuries call 911 to summon emergency responders.**
5. For non-life-threatening injuries call the **24/7 nurse hotline** provided through XstremeMD (XMD) – **(800-600-9015)**. They will help to assess the injury, provide first aid recommendations, and directions to an off-site medical facility near you if warranted.
6. Another SLR employee, preferably the injured employee's Supervisor, should accompany them to the hospital or other medical facility and provide information to the medical staff about the incident as requested, especially if the injured employee is unconscious or otherwise unable to property communicate the details of the incident.
7. Report any injuries or near misses to your supervisor or Project Manager as soon as it is safe to do so (within 1 hour of occurrence).
8. Supervisors/Project Managers to promptly report the incident to HSE Management and the appropriate TDM and SLOM.
9. Report the incident to the SLR client representative in accordance with their incident reporting requirements, or as soon as practical.
10. Do not restart work until discussing the circumstance of the incident or near miss with Project Management and HSE Management.
11. Provide a written report by entering all incidents into SLR's online Incident / Pro-active Reporting System (IEX).

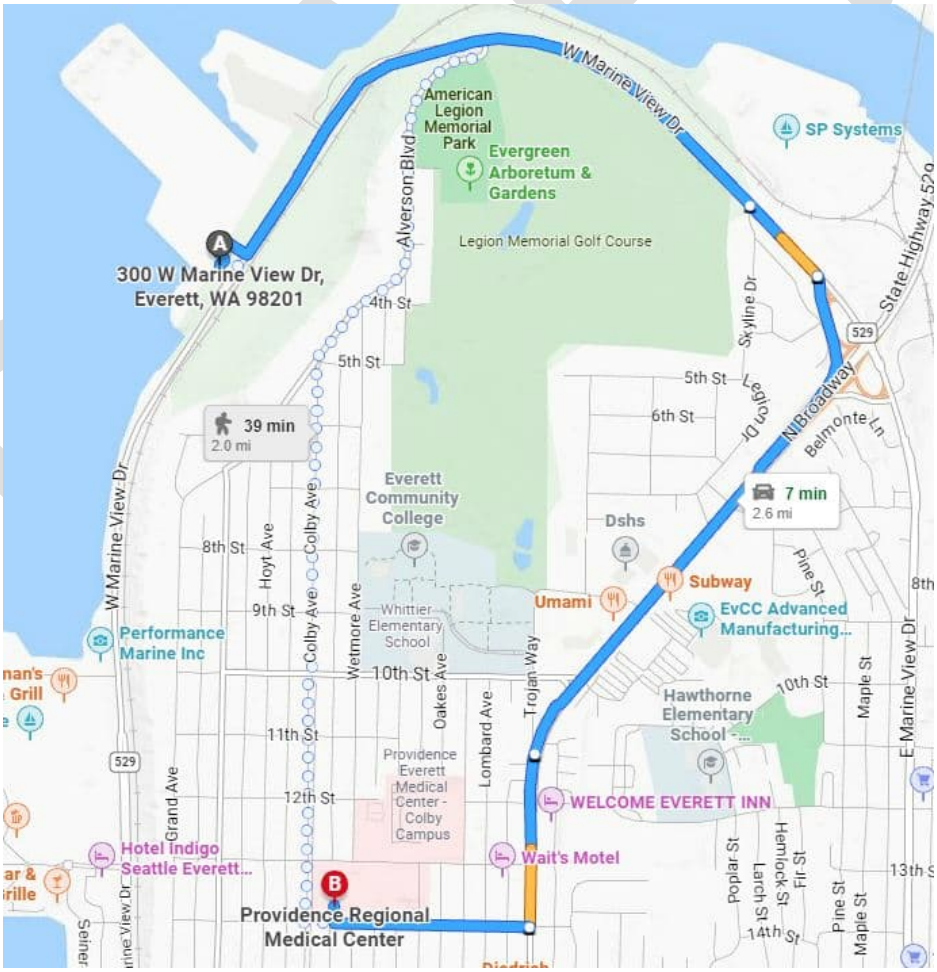
Refer to SLR HSE Manual, *Section 16 – Incident Reporting* for additional incident reporting guidance.

2.1 Hospital Name, Address & Route Map

Name: Providence Regional Medical Center **Address:** 1700 13th Street, Everett, WA 98201

Directions and map from site to hospital:

- **Depart from 300 West Marine View Dr. site entrance (northeast)**
- **Turn left out of the site onto WA-529 / W Marine View Dr.**
- **For 1.0 mi keep right to stay on WA-529 / E Marine View Dr.**
- **In 0.1 mi take the ramp on the right for N Broadway**
- **In 0.9 mi road name changes to Broadway**
- **In 0.3 mi turn right onto 14th street**
- **In 0.3 mi turn right**
- **In 135 ft reach your destination Providence Regional Medical Center**



3.0 Scope of Work

3.1 SLR and Subcontractor Work Tasks:

SLR Field Work Scope: Groundwater monitoring and sampling, product bailing, Geoprobe drilling oversight, well installation oversight, groundwater pump testing, sparge/SVE pilot testing
Does this project involve a SLR Subcontractor(s)? Yes ☒ No ☐ If "Yes", provide a description of their work scope(s): Geoprobe drilling, Hollow-stem Auger drilling, well installation, waste handling and disposal

3.2 Utility Contact Prevention Measures

Does this project involve ground disturbance activities? Yes ☒ No ☐ If "Yes," complete the SLR Utility Clearance Log and Ground Disturbance Checklist (see Appendix B),	
Utility Contact Prevention Measures include:	
Review Existing Plans	☒ Required ☐ H&S Manager Variance Received
One-Call 8-1-1 Service utilized	Ticket Number: TBD
Private Locate Contractor utilized. **Name:** **Phone #:**	☒ Required ☐ H&S Manager Variance Received
'Soft Dig' Clearance to at least 5-feet below ground surface (bgs)	☐ Required ☐ H&S Manager Variance Received

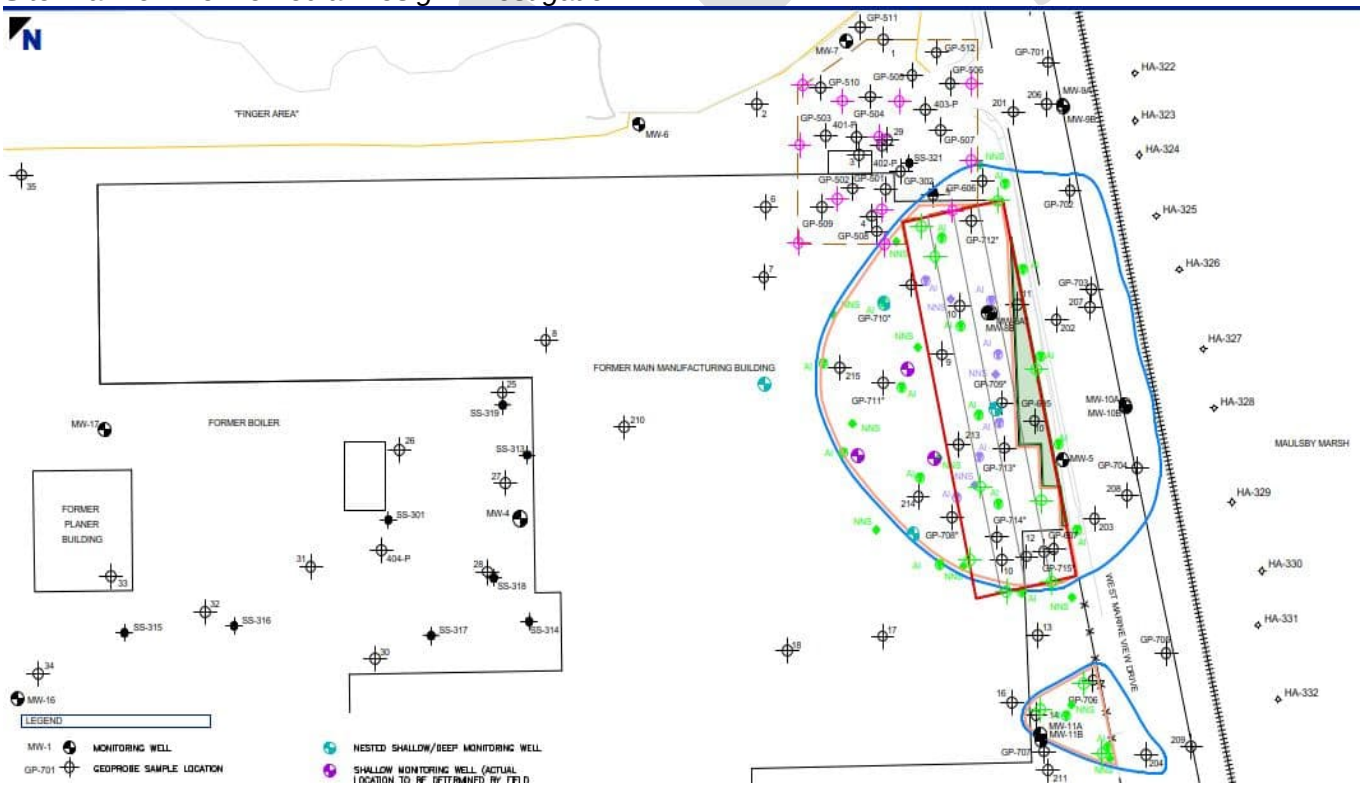
3.3 Site Characteristics:

Past/Present Site Use: The former E.A. Nord facility is a former wood products plant. Currently, portions of the site are leased to various non-mill related operations.
Expected Contaminants of Concern and Concentrations: TPH-Dx, cPAHs, VOCs (benzene and naphthalene), dioxins/furans

Worst Case Vapor Exposure Calculations (if applicable, will be conducted by HSE Manager): N/A
Unusual Site Features (e.g., cell phone coverage, remote site, high onsite traffic, etc.): Some monitoring wells are adjacent to West Marine View Drive (public roadway), one monitoring well is located on portion of Site leased to Cemex (asphalt plant), and also some monitoring wells are adjacent to on-site private roadways. In addition, some monitoring wells are located inside the former main building (limited access, poor lighting, unknown occupants, etc).
Are there site work activities occurring other than SLR activities? Describe any work occurring onsite that SLR is not prime contractor for: Various portions of the Site are leased.

3.4 Site Plan:

Site Plan for Pre-Remedial Design Investigation



4.0 H&S Guiding Principles

The following HSE guiding principles are paramount on SLR projects:

- Injuries and occupational illnesses are preventable.

- Safety is fundamental to the conduct of our business.
- Employee involvement, feedback, and recognition are fundamental to safety.
- Safe behavior is doing the job right.
- Workplace risk will be reduced in the following priority:
  1. Engineering controls.
  2. Administrative controls and operating practices.
  3. Personal protective equipment.
- Management is responsible for visibly and consistently establishing safety as a core value.
- Management is responsible and accountable for the safety of employees, contractors, and the general public.
- Employees and contractors are responsible and accountable for their actions.
- Employees and contractors have an obligation, without fear of reprisal, to notify management of apparent hazards, and they have the right to receive timely and adequate responses.

5.0 Safe Operating Procedures

- All SLR employees and contractors working under this HASP must follow safe procedures and operations
- Report all near-miss events, unsafe conditions, unsafe behaviors, and injuries immediately, regardless of severity, through SLR's incident reporting system (InfoExchange - IEX).
- If an injury is not life-threatening (9-1-1), contact XMD (800.600.9015) as soon as possible for immediate evaluation and care measures.
- If you do not know the proper and safe way to complete your work, stop and contact the Project Manager or Technical Discipline Manager.
- Always assist others at identifying potential hazards.
- Wear clothes suited to the tasks and conditions.
- No dangling or loose clothing or jewelry can be worn around moving machinery.
- No shoes with thin or badly worn soles shall be worn.
- Inspect, use, and store all Personal Protective Equipment (PPE) in accordance with the manufacturer's requirements. If you are unsure of the proper requirements, ask your Project Manager or Technical Discipline Manager before use.
- Required PPE includes:
  - Hard hats
  - safety-toed boots,
  - safety eyewear,
  - hearing protection, and
  - task-appropriate gloves.
- Know the weight of an object before you attempt to lift it.

- The maximum amount of weight SLR employees may lift by themselves is 40 lbs. Never lift anything greater than 40 lbs. without additional help. When lifting:
    - Bend knees
    - Keep back erect
    - Keep the object close to the body
    - Avoid twisting or changing directions while carrying a load.
- Do not throw anything from a height unless there is a chute or ramp to guide it.
- Keep tools, materials, hoses, cords, pumps, meters, and other field devices out of walkways.
- No “horseplay” while at work. To do so may lead to injury.
- Inspect all ladders before use. Use ladder only for its intended purpose as prescribed by the manufacturer.
- Make sure ladders are placed such that they are stable and level.
- Straight ladders should be set at a 4:1 angle.
- Never carry anything in your hands while ascending or descending a ladder.
- Always face the ladder and maintain 3 points of contact at all times when ascending, descending, or working from a ladder.
- Do not ride or get under loads that are being carried by cranes, construction equipment, or powered industrial trucks (forklifts, telehandlers, etc.).
- Obey all warning signs.
- Proper use of both Safety Glasses and a Face Shield are required when grinding or chipping.
- Use of Safety Glasses, Face Shield, cut-resistant gloves and cut resistant chaps are required for any chainsaw use.
- Inspect all tools prior to use. Immediately tag Out-of-Service any damaged tools.
- Do not work if you are not fit for duty or your ability or alertness is impaired by fatigue, heat illness, medication, substance use, or other causes.
- Employees shall not enter confined spaces such as manholes, underground vaults, chambers, tanks, silos, or other similar places that receive little or no ventilation, unless:
    - It has been determined by direct-reading instruments that the atmosphere is safe to enter,
    - Employee has received and SLR has documented proof of user-level Confined Space Entry training,
    - Entry is made under proper CSE procedures including a verified plan for rescue, and
    - Employee has received the direct approval from the SLR US Region Health & Safety Manager for that entry at that time.

- Ensure all guards, handles, and other protective devices are in proper places and adjusted. Do not use equipment with broken or missing guards. Report deficiencies promptly to the Project Manager or the Technical Discipline Manager.
- Gasoline shall never be used for cleaning purposes.
- No burning, welding, or other source of ignition shall be applied to any enclosed tank or vessel, even if there are some openings, until it has first been determined that no possibility of explosion exists, and authority for the work is obtained from the Project Manager or Technical Discipline Manager.
- A proper seal must be achieved with respiratory devices. Employees must be clean shaven, and no facial hair may touch any part of the sealing surface of the respirator.
- No SLR employe may wear a respirator without:
    - Current Medical Clearance,
    - Current Fit Test,
    - Annual Training, and
    - Authorization of the Project Manager or Technical Discipline Manager
- Periodic (at least daily) safety briefings will be held to discuss current site conditions, field tasks being performed, planned modifications, and work concerns.
- Site conditions may include uneven, unstable, or slippery work surfaces. Substantial care and personal observation are required on the part of each employee to prevent injuries from slips, trips, and falls.
- Employees will maintain good housekeeping practices during field activities to establish a working environment free of slip/trip/fall hazards. The work site will be kept free of debris, waste, and trash.
- The “buddy system” will be used whenever possible. If employees must work alone, proper procedures for safety and communication must be established with the Project Manager or Technical Discipline Manager.
- Site personnel will wear high-visibility safety vests for field activities.
- Maintain site control so persons who may be unaware of site conditions are not exposed to hazards. Access inside the specified work area will be limited to authorized personnel. Control measures may include:
    - Erecting barricades using caution tape.
    - High-visibility cones
    - Posting warning signs
- Minimum emergency equipment maintained on site will include:
    - Fully charged 10-pound type ABC dry chemical fire extinguisher
    - Adequately stocked first aid kit

6.0 Risk Assessment and Mitigation

Identification and mitigation of hazards is essential to safe project completion. SLR implements a three-tiered approach to hazard identification and mitigation:

- Job Safety Analysis
- Safe Work Plan
- Daily Tailgate Conversations

The SSO is responsible for ensuring that the Project JSAs and Safe Work Plan form adequately address all potential hazards to project personnel and that they are properly mitigated and documented.

6.1 Job Safety Analysis

Select any of the following risk activities denoted in the JSA Table (Table 6.1) that apply to the planned scope of work (includes SLR's subcontractor(s) as well).

Include the linked JSAs for any identified risks as part of the HASP Risk Assessment documents (Appendix A of this HASP).

If new work tasks develop and/or are encountered that cannot be adequately addressed in the existing JSA documents or the Safe Work Plan, then a field JSA can be developed using the Job Safety Analysis Form (Attachment 9C) provided in Appendix A of this HASP.

Table 6.1 – Job Safety Analysis List
☒ Potential exposure to hazardous chemicals or substances (e.g., inhalation, skin or eye contact, etc.) – JSA #1 Link
☐ Potential need for respiratory protection devices – JSA #2 Link
☒ Elevated noise sources (e.g., working around heavy equipment, industrial sources, etc.) – JSA #3 Link
☒ Unknown industrial or contractor hazards encountered during site visits – JSA #4 Link
☒ Working near moving or rotating parts (e.g., drilling operations, pumps, fans, belts, etc.) – JSA #5 Link
☒ Working near vehicle traffic / heavy equipment (includes work next to roadways, at construction sites, in parking lots, near forklifts, excavators, bulldozers, etc.) – JSA #6 Link
☒ Work near or within the right-of-way of railway tracks – JSA #7 Link
☐ Work adjacent to aircraft runway operations – JSA #8 Link
☐ Potential for entry into excavations, trenches or test pits – JSA #9 Link
☐ Confined space entry (includes tanks, sumps, manholes, etc.) – JSA #10 Link
☒ Pressure washing activities (includes high-pressure water and steam) – JSA #11 Link
☐ Potential for work underground (shafts, tunnels, etc.) – JSA #12 Link

Table 6.1 – Job Safety Analysis List
☒ Exposure to underground or overhead utilities (hazard of electric shock, gas/explosions, etc.) – JSA #13 Link
☐ Work on or around hazardous energy sources – LOTO needed (electric, hydraulic, pneumatic, etc.) – JSA #14 Link
☐ Working from a boat – JSA #15 Link
☐ Working on or near water (e.g. on a pier, in marshland or mudflat, bank of a river/pond, etc.) – JSA #16 Link
☐ Work that requires travel by a small fixed wing plane – JSA #17 LInk
☐ Work that requires travel by helicopter – JSA #18 Link
☐ Use of fixed or portable ladders – JSA #19 Link
☐ Use of Fall Protection Systems (fall arrest or restraint equipment, safety nets, etc.) – JSA #20 Link
☐ Use of Scaffolds (fall protection) – JSA #21 Link
☐ Use of Elevated Work Platforms (aerial lifts, scissor lifts, articulated-boom lifts, etc.) – JSA #22 Link
☐ Working at locations greater than 8,000 feet in elevation – JSA #23 Link
☐ Working near suspended loads (e.g., crane operations and other lifting activities) – JSA #24 Link
☐ Conducting hot work (flame, spark producing or use of non-intrinsically safe equipment) – JSA #25 Link
☐ Exposure to significant heat stress conditions – JSA #26 Link
☐ Exposure to significant cold stress conditions – JSA #27 Link
☐ Anticipated severe weather conditions (tornado season, local flooding, hurricanes, etc.) – JSA #28 Link
☐ Encounters with significant wildlife hazards (bears, foxes, snakes, etc.) – JSA #29 Link
☐ Encounters with significant insect hazards (mosquitoes, ticks, etc.) – JSA #30 Link
☐ Encounters with poisonous plant or other contact dermatitis hazards – JSA #31 Link
☐ Performance of Remote or Lone Work activities (i.e., limited access to people and emergency services) – JSA #32 Link
☐ Potential to encounter unexploded ordinance – JSA #33 Link
☐ Conducting concrete saw cutting, drilling or grinding activities – JSA #34 Link
☐ Conducting fuelling operations – JSA #35 Link

Table 6.1 – Job Safety Analysis List
☐ Hand and power tool usage – JSA #36 Link
☐ Nuclear Density Gauge usage – JSA #37 Link
☐ Working at night / low visibility – JSA #38 Link

6.2 Safe Work Plan

SLR's Safe Work Plan process will be implemented upon initial mobilization to the project site to identify any hazards not already addressed and mitigated by this plan. A copy of the Safe Work Plan is included in Appendix A of this HASP. The Safe Work Plan is a 4-step process for identification and mitigation of hazards in the workplace.

- Step 1 - Identify Hazards & Initial Risk. Identify if any of the hazards noted in this section are associated with your work. If other potential hazards are identified, list them in the 'Other Potential Hazards' section under Step 1.
- Step 2 - Determine Level of Risk. Determine the initial Risk Ranking (risk without controls in place) based on the probability of the hazard taking place and its potential consequence.
- Step 3 - Identify and implement appropriate Hazard Controls & perform a Final Risk Ranking. The Final Risk Ranking is an assessment of the risk with the controls in place.
    - NOTE: As denoted in Section 2 of the Safe Work Plan, additional review, approvals, and controls may be necessary.
- Step 4 - Post-Work Review. Upon completion of the work/project record any Key Learnings (i.e., hazards identified that were not anticipated, hazards that were found to be more dangerous or different than anticipated, additional hazard controls needed, etc.) The Safe Work Plan is then submitted to the PM for review. Completed Safe Work Plans should be maintained in the project file and used to communicate hazards and controls for future mobilizations or similar work.

6.3 Daily Tailgate Conversation

Field team members will meet at least daily to discuss, and document planned activities, hazards, and prescribed mitigations. The conversations will be documented on the Daily Safety Meeting Form provided in Appendix A, or similar document. Copies of safety meeting documentation will be reviewed by the PM and kept in the project file.

7.0 Chemical Hazard Information

NOTE: For any chemicals brought on site by SLR or our Subcontractors be sure to gather Safety Data Sheets (SDS) on the chemicals involved and have them either included in this HASP or otherwise available on site for personnel to reference.

7.1 Contaminants of Concern Information

Compound	Physical/Chemical Characteristics (Target Organs/ Route of Entry)	OEL (STEL)	Odor Threshold	LEL (%)	IP (eV)
Volatile Organic Compounds					
Benzene (71-43-2) 1 ppm = 3.19 mg/m3	Skin, eye, inhalation, and ingestion hazard. Colorless liquid with an aromatic odor. Prolonged skin contact with Benzene or excessive inhalation of its vapor may cause headache, weakness, loss of appetite, and lassitude. A human carcinogen. Extremely flammable, keep sources of ignition away. Incompatible with fluorides, chlorides, oxygen, permanganates, acids, and peroxides.	0.1 ppm TWA_8 (1 ppm) Skin IDLH: 500 ppm (CA)	61 ppm	1.2	9.25
Diesel and Lube Oil Range Organics	Skin and inhalation hazard. Skin irritation; headache, nausea, and confusion. Central nervous system depressant. Long term exposure may result in liver damage.	100 mg/m^3 TWA_8 (as diesel fuel)	0.7 ppm (as diesel fuel)	0.7	N/A
Semi-Volatile Organic Compounds					
Polycyclic aromatic hydrocarbons (PAHs) – as coal tar pitch volatiles. (Includes benzo(a)pyrene, chrysene, phenanthrene, fluoranthene, pyrene, acenaphthene, methylnaphthalenes, and anthracene)	Skin, eye, inhalation, and ingestion hazard. The pitch of coal tar is black or dark brown amorphous residue that remains after the redistillation process. Odor thresholds vary. Direct contact or exposure to the vapors may be irritating to the eyes. Direct contact can be highly irritating to the skin and can cause dermatitis. Exposure to high vapor concentrations may cause headaches, nausea, vomiting, and other symptoms. Includes human carcinogens. Reacts with acids and oxidizers; produces acrid smoke, toxic gases when involved in fires, and thermal decomposition. Exposure to all routes should be carefully controlled to levels as low as possible. Confirmed Animal Carcinogen.	0.2 mg/m^3 TWA_8 0.1 mg/m^3 TWA (Cyclohexane-extractable fraction)	N/A	N/A	Not known
Naphthalene	Skin eye, ingestion, and inhalation hazard. Over exposure may cause	10 ppm TWA_8 (15 ppm)	<0.3 ppm	0.9	8.12

Compound	Physical/Chemical Characteristics (Target Organs/ Route of Entry)	OEL (STEL)	Odor Threshold	LEL (%)	IP (eV)
(91-20-3) 1ppm = 5.24 mg/m^3	headache, nausea, diaphoresis, hematuria, fever, anemia, liver damage, vomiting, convulsions, and coma. Flammable when exposed to heat or flame reacts with oxidizing materials. Reacts violently with CrO3; aluminum chloride + benzoyl chloride.	Skin IDLH: 250 ppm			
Polychlorinated Biphenyls (PCBs)					
Dioxins/Furans	Inhalation, skin adsorption, ingestion skin and/or eye contact. Colorless to white needle-like crystals. Acute effects including irritation to eyes, in animals: liver and kidney damage, hemorrhage. Chronic health effects include allergic dermatitis, chloracne, porphyria, gastrointestinal disturbance, teratogenic effects, damage to liver, kidneys, and reproductive system, potential occupational carcinogenic.	None	UK	UK	UK

OEL – Occupational Exposure Limit STEL – Short Term Exposure Limit (usually 15-minutes) LEL – Lower Explosive Limit IP – Ionization Potential eV – electron volt TWA_8 – 8-hour Time Weight Average C – Ceiling limit (concentration that cannot be exceeded at any time [or for indicated time frame]) IDHL- Immediate Danger to Life or Health concentration Ca – Known or Suspected human carcinogen Skin – indicates significant exposure risk from skin exposure

7.2 Air Monitoring Action Levels for Field Activities

Task	*Monitoring Instrument*	*Monitoring Frequency*	*Action Levels [1]*	*Required Action*
These action levels apply to any work that involves the potential contact or inhalation of chemicals present at this site (e.g., drilling, excavation, soil, or groundwater sampling, opening tanks / drums, etc.)	FID or PID Meter (11.7 eV Lamp)	Use an FID or PID to conduct exposure monitoring whenever product odors or visible sheens are present.	0 to 10 ppm above background in the BZ	Wear Level D protection at a minimum. Use chemical protective gloves and other PPE as necessary to prevent skin contact with contaminants. Work upwind from chemical sources when possible.
		Continuously when VOCs are > 10 ppm in employee's BZ	10 ppm or greater in the BZ for > 15 minutes[1]	Upgrade to Level C respiratory protection or evacuate the work area until BZ concentrations are < 10 ppm.

Task	*Monitoring Instrument*	*Monitoring Frequency*	*Action Levels* [1]	*Required Action*
		Continuously when VOCs are > 10 ppm in employee's BZ	> 30 ppm in the BZ for any period of time.	Regardless of respirator usage, stop work and evacuate work area until concentrations in BZ are < 10 ppm. Use of fans or other engineering controls may be necessary to continue work. Contact HSE Management for assistance.
			> 0.5 ppm	Stop work required. Leave work area and contact PM and HSE Management for guidance.
			> 1 ppm	Stop work required. Leave work area and contact PM and HSE Management for guidance.
			> 5 ppm	Stop work required. Leave work area and contact PM and HSE Management for guidance.
			O_2 < 19.5% or > 22% LEL > 10% H_2S > 1 ppm CO > 25 ppm	Stop work; Evacuate area; determine source of readings and take corrective actions such as installing general ventilation and working upwind. Contact HSE Management for assistance.
Conducting work that produces airborne visible dust (e.g., drilling, test pitting, excavation, etc.)	Dust Monitor (respirable fraction)	Conduct monitoring when dusty conditions are encountered in areas with potentially contaminated soil. Monitor the employees BZ and general areas. Monitor initially and every 15 minutes while dusty conditions persist.	< 0.5 mg/m^3 in the employee's BZ	Continue work
		Monitor continuously	0.5 to 5 mg/m^3 in the employee's BZ	Upgrade to Level C respiratory protection or evacuate the work area until BZ concentrations are < 0.5 mg/m^3
		Monitor continuously	> 5 mg/m^3 in the employee's BZ or general area	Stop dust producing activities if levels cannot be maintained < 5 mg/m^3. Move support zone to upwind location. Contact HSE Management for assistance.

O_2 – Oxygen LEL – Lower Explosive LimitH_2S – Hydrogen Sulfide CO – Carbon Monoxide

[1]Five excursions above the action level in any 15-minute period or a sustained reading in excess of the action levels for five minutes will trigger a response.
[2] For example, the OSHA permissible exposure limit (PEL) for gasoline is 300 ppm, therefore the action level for upgrading to Level C could be adjusted (to 1/2 of the PEL - 150 ppm) if you are certain that gasoline is the only contributor to the VOC measurement. Contact HSE Management for details concerning compound-specific sampling options.
Note: LEL readings should be taken at the point of operation (top of drill stem, well head, etc.). PID, O2, and H2S readings should be taken in the worker's breathing zone (BZ).

8.0 Physical Hazard Information

The following are common physical hazards employees should be alert to during activities at the site:

- Overhead Hazards and/or Suspended Loads
- Underground Utilities
- Heavy Equipment (Drill Rig, Excavator, Front-End Loader, Backhoe, Bulldozer, etc.)
- Vehicle Traffic
- Falls
- Flame or Spark Producing Work (Hot Work)
- Stored Energy (Mechanical, Electrical, Pneumatic, Steam, etc.)
- Weather (Lightning, Tornado, Flood, Heat Stress/Cold Stress, etc.)
- Remote Locations with Limited Communication
- Working Alone
- Material and Equipment Handling
- Live Electrical Conductors
- Excavations and Trenching
- Wildlife and Biological Hazards
- Fire and Explosion
- Hand and Power Tools

8.1 Heavy Equipment Operations

SLR employees are not authorized to operate heavy equipment, but often work near heavy equipment like excavators, powered industrial trucks, backhoes, front end loaders, and drilling equipment. Heavy equipment operation poses many potential physical hazards. The following precautions should be observed whenever heavy equipment is in use:

- Stay out of the path of moving equipment. Limit travel and standing/working locations to areas outside of the travel path of heavy equipment.
- Remain outside of the complete swing radius of an excavator or backhoe until:
  - Eye contact is established with the operator,
  - Operator has grounded the bucket, and
  - Operator's hands and feet are off the controls.
- Never approach, cross behind, or cross in the path of heavy equipment without alerting and receiving the approval of the operator.

- Nonessential personnel must remain outside the work area.
- Overhead and underground utilities must be identified prior to intrusive work through the SLR Utility Contact Prevention Program. Utilities must be precisely located and protected during excavation and backfilling.
- Drilling rigs may not be moved without first fully lowering and securing all cables and tools.
- SLR employees are not permitted to enter any excavation until it has been inspected and determined safe to enter by a Competent Person.
- Heavy equipment and drill rigs may not be positioned or operated where any part of the equipment or tooling is within, or could be within the following standoff distances:

TABLE A—Overhead Electrical Minimum Clearance Distances

Voltage - Nominal (AC)	Minimum clearance distance (feet)
up to 50 kv	10
over 50 kv to 200 kv	15
over 200 kv to 350 kv	20
over 350 kv to 500 kv	25
over 500 kv to 750 kv	35
over 750 kv to 1,000 kv	45
over 1,000 kv	Per utility owner/operator or qualified registered professional engineer

- The minimum PPE requirements when working around heavy equipment include:
  - Safety-Toed Boots
  - Safety Glasses,
  - Hard Hat
  - Task-Appropriate Gloves
  - High Visibility Vest

8.2 Excavation and Trenching

SLR may perform work near or in excavations and trenches. A "Competent Person" is required for all activities where an SLR employee or contractor will or may enter a trench or excavation. A "Competent Person" is defined as someone:

> ***"capable of identifying existing and predictable hazards in the surroundings, or working conditions that are unsanitary, hazardous, or dangerous to employees. The Competent Person must be authorized to promptly take corrective action to eliminate unsafe conditions."***

SLR does not provide "Competent Person" services. The excavation Competent Person must be provided by the excavation contractor, client, or by contracting a third party.

SLR employees operating under this HASP may not enter excavations where there is the potential for oxygen deficient or toxic atmospheres or where flammables may be present. Work on such contaminated sites is done under SLR's Hazardous Waste Operations and Emergency Response (HAZWOPER) program.

Whenever possible, employees should collect required samples from the bucket rather than entering an excavation. Employees may never enter excavations greater than 5 feet in depth, or where the possibility of injury from collapse exists regardless of depth, without appropriate protective systems such as benching, sloping, or shoring in accordance with the requirements in 29 CFR 1926 Subpart P. The depth of an excavation is determined at the deepest point below grade.

Excavated material will be placed far enough from the edge of the excavation (a minimum of 2 feet) so that it does not fall back into the opening or cause undue stress to the sidewalls. At the end of each day's activities, open excavations will either be completely backfilled, or be clearly marked and secured to prevent people from entering.

8.3 Material and Equipment Handling

The movement and handling of equipment and materials poses several risks to those working on site. These risks include:

- Cuts and abrasions from manual material handling.
- Crush injuries, muscle strains, back injuries, and joint soft tissue injuries from material handling.
- Being struck by material falling or sliding if not properly placed.
- Being struck by equipment where material or equipment obscures visibility or where excessive noise impairs hearing.

Means to mitigate these risks include:

- Where practical, using mechanical devices to assist in the movement of equipment and materials. Keep hands, feet, and other body parts out of the line of fire.
- Using safe handling practices, proper lifting techniques, and proper personal safety equipment such as safety-toed boots and sturdy work gloves.
- Employees should not attempt to move heavy objects by themselves without using appropriate mechanical aids such as drum dollies, hydraulic lift gates, or additional people.
- Assuring shelving has adequate capacity for the load and is on solid, flat footing.
- Assuring piles of excavated material, fill material, etc. are set back from excavations and trenches.
- Assuring piles of material are positioned where critical visibility is not obscured.

8.4 Electrical Safety

SLR does not normally perform work that would require isolation of hazardous energy sources. However, in rare cases SLR employees may perform such work if they:

- Are authorized to do so,
- Are properly trained,
- Have the appropriate equipment, and
- Perform the work in accordance with SLR's Standard Operating procedure 039 – Hazardous Energy Isolation.

SLR activities are commonly limited to use of consumer electrical equipment and custom-built electrical equipment. Equipment to be used during field activities will be suitably grounded and insulated. Ground fault circuit interrupters (GFCI), or equivalent, will be used with cord-plugged electrical tools and equipment to reduce the potential for electrical shock. If SLR employees must work in proximity to live electrical conductors, a Qualified Person for electrical work must be provided by a contractor or the client to protect SLR employees from electrical hazards.

Additional electrical safety guidelines include:

- Work on new and existing energized (hot) electrical circuits is prohibited until all power is shut off, properly grounded, and deenergized state is tested and confirmed.
- An effective Lockout/Tagout system must be in place whenever employees are exposed to stored energy.
- Frayed, damaged, or worn electrical cords must be promptly replaced.
- All extension cords must be undamaged and have grounding prongs in place.
- Extension cord sets that are used with portable electric tools and appliances must be the three-wire type and designed for hard or extra-hard service. (Look for some of the following letters imprinted on the casing: S, ST, SO, STO).
- All electrical tools and equipment must be maintained in safe condition and inspected regularly for defects. If defects are identified, the equipment must be tagged "Out-of-Service" and taken out of use.
- Never connect multiple extension cords together. Never connect a surge protector to an extension cord.
- Do not remove any guards or bypass any protective system or device designed to protect employees from contact with electrical energy.
- All electrical tools must be properly grounded unless they are double insulated.
- Multiple Plug adapters (power strips) are prohibited in construction activities.

8.5 Fire/Explosion

Site workers should maintain continual awareness concerning potential fire or explosion hazards. This is especially critical when working with or near flammable materials or performing any activity that may generate sparks, flames, or other sources of ignition. Intrinsically safe equipment is required when working in or near environments with the potential for an explosive atmosphere.

Flammable materials will be kept away from sources of ignition. In the event of fire, work will cease, the area will be evacuated, and the local fire response team will be notified immediately. Only trained, experienced fire fighters should attempt to extinguish substantial fires at the site. Site personnel should not attempt to fight fires unless properly trained and equipped to do so. A fully charged ABC dry chemical fire extinguisher will be readily available for use during field activities.

8.6 Wildlife and Biological hazards

Biological hazards may be encountered at the site include possible exposure to:

- Fur-bearing animals. Animals may potentially carry the rabies virus or ticks that may transmit Lyme disease to humans. Avoid contact. Do not attempt to feed or touch.
- Poisonous reptiles. Primarily snakes (rattlesnake, water moccasin, and copperhead). Avoid contact and areas that may harbor snake populations including high grass, shrubs, and crevices.
- Stinging insects. Common examples include bees, wasps, and mosquitoes. Avoid contact with insects and their hives.
- Spiders. The black widow and brown recluse spiders are the most venomous. Avoid contact with spiders and areas where they may hide.
- Poisonous plants. Common examples include poison ivy and poison oak. Avoid contact. Long-sleeved shirts and pants will allow some protection against inadvertent contact.

If any biological hazards are identified at the site, workers in the area will immediately notify the SSO and other site personnel. Refer to Section 34 Wildlife and Biological Hazards in the 2011 SLR HSE Manual for more detail about SLR management of these hazards.

9.0 Personal Protective Equipment (PPE) Requirements

In general, SLR fieldwork will require the following mandatory PPE.

- ANSI Z41-1991 approved safety toe boots
- ANSI Z87.1-1989 approved safety glasses with side shields
- Reflective / High visibility vest (or included stitched onto coveralls)
- Work gloves providing appropriate protection for the hazards

Additional PPE that may be necessary based on project risks or client requirements.

- Hearing protection (ear plugs or earmuffs required for drilling, excavations, etc.)
- ANSI Z89.1-1986 approved hardhat with side impact protection

- Chemical Resistant Gloves (appropriate to the chemical hazards present)
- Chemical Resistant Coveralls or Apron (appropriate to the chemical hazards present)
- Puncture Resistant Gloves (when handling sharp objects)
- High Temperature Rated Gloves (when working near hot surfaces or handling hot materials)
- Boots equipped with meta-tarsal protection (when working where falling / rolling objects are present)
- Boots equipped with steel shanks (when walking on sharp objects)
- Personal Fall Protection System (including full body harness, lanyard, deceleration device, and anchorage)
- NIOSH approved ½ face air purifying respirator with Organic/HEPA cartridges
- Other NIOSH approved respirators (filtering face-piece, tight-fitting full-face, powered-air-purifying, etc.)
- Fire-retardant coveralls (i.e., Nomex)
- Personal Floatation Device (when working in or around water deep enough for the PFD to work)
- Cold Weather Gear (Required on the Alaska North Slope between October 1st and May 1st)
- Traction spikes for Boots (when walking in icy conditions)
- Knee Pads (any functions the require crawling or consistent kneeling)
- Hip or Chest Waders

10.0 HSE Forms / References to be included in the Field:

Included in the HASP:

☒ Tailgate Safety Meeting Form

☒ Vehicle Inspection Form (Attachment 20J)

☒ Safety Observation/Conversation Form (Attachment 5A)

☒ Incident/Near Miss/Hazard Identification Report Form (Attachment 5B)

☒ Utility Clearance Mark-out Log (Attachment 10A)

☒ Ground Disturbance Checklist (Attachment 10B)

☒ Job Safety Analysis Form (Attachment 9C)

☒ Vehicle Accident Reporting Form (Attachment 16C)

☒ Witness Statement Form (Attachment 17C)

☒ Project Site Checklist

Optional (Dependent upon work scope, copies to be added to this document or kept in field binder.)

☐ Traction Device Selection and Use (Attachment 13H)

☐ Journey Management Plan Form (Attachment 20A)

☐ Contact Schedule Form (Attachment 20B)

☐ Vehicle Operations Guidelines (Attachment 20C)

☐ All-Terrain Vehicles – Off Road Vehicle Operation Guidelines (Attachment 20D)

☐ Snowmobile Operation Guidelines (Attachment 20E)

☐ Helicopter Use Guidelines (Attachment 20F)

☐ Small Aircraft Use Guidelines (Attachment 20G)
☐ Small Vessel-Working Near Water Guidelines (Attachment 20H)
☐ HSE Requirements for Working Abroad (Attachment 20I)
☐ Hand Tool Use (Attachment 21E)
☐ Proper Lifting – Manual Material Handling (Attachment 21F)
☐ Walking on Uneven or Low Traction Surfaces (Attachment 21G)
☐ Heat Stress (Attachment 22A)
☐ Cold Stress (Attachment 22B)
☐ Storm Conditions (Attachment 22C)
☐ Personal Fall Arrest System Requirements (Attachment 23B)
☐ Portable Ladder Use Requirements (Attachment 23C)
☐ Working at Height Tool Management Requirements (Attachment 23D)
☐ Proper Stair Use Requirements (Attachment 23E)
☐ Fall Protection Plan Template (Attachment 23F)
☐ Working at Heights Rescue Plan (Attachment 23G)
☐ Working at Heights Equipment Inspection Forms (Attachment 23H)
☐ Typical Unplanned Prolonged Stay Supplies (Attachment 25A)
☐ Energy Hazard Assessment Form (Attachment 39B)
☐ LOTO Log (Attachment 39C)
☐ LOTO for Electrical Equipment (Attachment 39D)
☐ LOTO for Compressed Air and Gases (Attachment 39E)
☐ LOTO for Steam, Water and Fluid Lines (Attachment 39F)
☐ LOTO for Hydraulic Equipment (Attachment 39G)

11.0 Acknowledgement

(All onsite SLR and SLR subcontractor personnel must sign)

I acknowledge I have reviewed the health and safety plan for this project, understand it, and agree to comply with all of its provisions. I acknowledge that I have participated in the Job Safety Analysis identification of hazards and safety controls and agree to comply with the indicated steps/procedures. I understand that I may be prohibited by the Site Safety Officer or other SLR personnel from working on the project for not complying with any aspect of this Health and Safety Plan.

NAME	SIGNATURE	COMPANY AFFILIATION	DATE

Important Notice to Subcontractor(s):

This Health & Safety Plan (HASP) has been prepared solely for the use of SLR personnel. It is supplied to you for informational purposes only and may not be relied upon for protection of your employees. The Subcontractor is responsible for providing, at its cost, all personal protective clothing and equipment required for its employees to perform their work in a safe manner and in compliance with all applicable state and federal OSHA regulations. The Subcontractor is responsible for ensuring that such equipment is in good condition and is properly inspected and maintained. Subcontractors must, at a minimum, use the equipment and follow the procedures described in this HASP. Failure to do so may result in immediate termination of Subcontractor's services. This does not relieve Subcontractor of the responsibility to provide equipment and institute procedures affording a greater degree of protection than those specified in this HASP should Subcontractor determine such measures are necessary to protect the health and welfare of its employees, second-tier Subcontractors, or others under its control or direction.

12.0 HASP Version History

Revision	Date	Prepared By	Checked By	Authorized By
01	January 24, 2024	DRAFT		

Appendix A
Risk Assessment and Mitigation Documents

Step 1: Identify Workplace Hazards

- ☐ **Work involves overhead hazards or suspended loads**
- ☐ **Work involves moving vehicles or moving equipment -Trucks or heavy equipment, working in traffic, conveyors**
- ☐ **Work involves operation of equipment (forklifts, aerial lifts, telehandlers)**
- ☐ **Work involves working at heights - fall potential of over 4 feet or into dangerous equipment**
- ☐ **Work involves a ground disturbance**
- ☐ **Confined spaces**
- ☐ **Work involves flame or spark producing work (Hot Work) -**
- ☐ **Work involves stored energy (LOTO) - electrical, tension, pneumatic, hydraulic, steam, or gravity**
- ☐ **Work involves use of hand or power tools/equipment**
- ☐ **Working Alone**
- ☐ **Work involves hazardous atmospheres or chemical**
- ☐ **Work involves activities in, on, or over water**
- ☐ **Housekeeping/Jobsite Conditions**
- ☐ **Ergonomics**
- ☐ **Environmental factors – severe weather, extreme hot/cold, animals, poisonous plants, biting/stinging insects**

Step 2: Identify Hazard Controls

Overhead Hazards & Suspended Loads

Do not walk or stand under a suspended load

- ☐ Overhead hazards evaluated and controlled
- ☐ Area under load delineated and access restricted

Moving Vehicles or Moving Equipment

Stay out of the path of moving equipment

- ☐ Barriers or guardrails between traffic and people
- ☐ Hi-Viz vests worn (Class 3 if >50 mph)
- ☐ Travel paths identified for people and equipment
- ☐ Spotters used when backing vehicles
- ☐ Backup alarms functional

Operation of Equipment

Stay out of the path of moving equipment

- ☐ Barriers or guardrails between traffic and people
- ☐ Hi-Viz vests worn (Class 3 if >50 mph)
- ☐ Travel paths identified for people and equipment
- ☐ Spotters used when backing vehicles
- ☐ Backup alarms functional
- ☐ Equipment inspected prior to use
- ☐ Aerial lift operator trained
- ☐ Forklift Operator Cert Expiration Date: _____

Working at Heights

Clip on and tie-off when working at height

- ☐ Work includes possible fall of >4 feet
- ☐ Work includes possible fall into dangerous equipment

Fall Protection Method: _____

- ☐ Plan for rescue

Ground Disturbance

- ☐ 811 Ticket #: _____
- ☐ Utility Contact Prevention Program Implemented
- ☐ Reviewed and Implemented JSA for Excavation
- ☐ Reviewed and Implemented JSA for Drilling

Confined Spaces

All SLR Entries Require US H&S Manager Approval

- ☐ Approval of US Region H&S Manager obtained

Flame or Spark Producing Work (Hot Work)

No Hot Work Until Fire Risks are Eliminated

- ☐ Hot Work Permit
- ☐ Work area inspected and combustibles removed

Stored Energy

Verify There is No Live Energy Before Starting Work

- ☐ Authorized employees performing LOTO
- ☐ Lockout/tagout permit in place
- ☐ All energy brought to zero and verified

Hand and Power Tools/Equipment

- ☐ Proper tools identified for the job
- ☐ Tools equipment inspected & in good condition
- ☐ Ground fault protection in place
- ☐ Pinch points identified

Working Alone

- ☐ Communication Method: _____
- ☐ Communication Frequency: _____
- ☐ Cell Service Works and Verified?
- ☐ Plan for Summoning Aid?

Buddy system required for Work in Watercraft

Hazardous Atmospheres or Chemicals

- ☐ HASP Developed and Reviewed?
- ☐ Suspected/known chemicals and materials identified
- ☐ Work involves asbestos, lead, benzene, silica, or H2S

Work In/On/Over Water

- ☐ PFD inspected and worn –If Necessary
- ☐ Ring buoy with 90 ft of line need evaluated
- ☐ Rescue skiff need evaluated
- ☐ Waders worn with wading belt

Housekeeping/Jobsite Conditions

- ☐ Work area clearly delineated
- ☐ Trip hazards removed, marked, or protected
- ☐ Clutter/debris kept minimal and picked up

Ergonomics

- ☐ Personnel understand proper lifting techniques
- ☐ Mechanical lifting devices identified for heavy loads
- ☐ Work breaks defined to prevent overexertion

Environmental Conditions & Weather

- ☐ Forecast of severe weather reviewed
- ☐ Surveyed work area for biological hazards
- ☐ Heat/cold stress controls implemented
- ☐ Tick protection measures implemented
- ☐ Work area noise levels known or estimated
- ☐ Work area dust levels known or estimated

Other Potential Hazards and Controls:

Personal Protective Equipment (PPE) to be Used:

Head: _____

Feet: _____

Eye/Face: _____

Hearing: _____

Respiratory: _____

Hi-Viz Vest: _____

Other:

Step 3: Post-Work Review

Key Learnings:

Close-Out Signatures

Team Lead: _____

PM/PIC: _____

Date: _____

Emergency Contacts

XstremeMD – 800.600.9015

Michael Coon, US Region H&S Manager
203.444.4069

Pat Moore, US Region H&S Advisor
206.478.6464

Project Contact Numbers:

PM: _____

TDM: _____

Client Contact: _____

Gas: _____

Electric: _____

Water: _____

Sewer: _____

Other: _____

SAFE WORK PLAN

Today's Date: _____ Time: _____

Team Lead: _____

Team Members:

Contractors:

Task Location: _____

Expected Task Duration: _____

Task Description:

Team Lead Signature:

_____

Team Signatures:

_____ _____

_____

_____

_____

SLR TAILGATE SAFETY MEETING FORM

Section 1: General Information		
Date:	**Time:**	**Project #:**
Project Name:		
Project Location:	☐ Remote ☐ Urban ☐ Other_____	
Type of Work: ☐ Sampling ☐ Excavation ☐ Construction ☐ Other (describe below)		
HSE Documents: ☐ SLR JHA (HIRAC) ☐ SLR Site-Specific HSE Plan ☐ Client JHA/JSA ☐ Work Permit ☐ Other:_____ None (explain):_____		

Section 2: Task Description / Health and Safety Discussion

Section 3: Hazard Identification & Control (check all applicable)		
Environmental:	**Chemical Exposure Routes:**	**Physical:**
☐ Remote Travel	☐ Ingestion	☐ Slip/trip/fall
☐ Driving	☐ Inhalation	☐ Heavy Machinery
☐ Temperature Extremes	☐ Dermal Contact	☐ Classified (FRC) areas
☐ Wildlife (bears, moose, etc.)	**Chemical Type**	☐ Noise
☐ Insects (mosquitoes, etc.)	☐ Hydrocarbon/VOC	☐ Dust
☐ Poisonous plants	☐ Metals/PCB/PFAS	☐ Repetitive stress
☐ Other: _____	☐ Asbestos/Lead	☐ Other: _____
☐ Other: _____	☐ Other: _____	☐ Other: _____

Section 4: Personal Protective Equipment (check all applicable)		
General:	**Gloves:**	**Miscellaneous:**
☐ Safety Glasses (required)	☐ Nitrile (disposable)	☐ LEL/VOC/H_2S Monitor
☐ Hardhat	☐ Chemical resistant (e.g. neoprene)	☐ Dust mask (N95)
☐ Safety toe boots	☐ Cut-resistant (e.g. Kevlar®)	☐ ½ Face respirator
☐ Reflective clothing	☐ Abrasion-resistant (e.g. leather)	☐ Fall protection
☐ Hearing protection	☐ Insulating (hot/cold)	☐ Bear Spray
☐ Arctic Gear (boot/jacket/pant)	☐ Other:_____	☐ Other: _____
☐ Flame-resistant (FRC) outerwear		

ATTENDEES:

Name / Signature	Name / Signature

ATTENDEES:	
Name / Signature	Name / Signature
Additional Discussion Items Documentation Section (as needed)	

Attachment 9C: Job Safety Analysis Form

Job Name: _____ Job No. _____

Supervisor: _____ Date: _____

The Job Safety Analysis (JSA) will be developed in collaboration with the field work crew with their input on the necessary job steps, associated hazards and control measures necessary to perform the work safely. If the job steps are found to be different than originally anticipated or additional hazards are noted the work shall be stopped and a new JSA conducted.

	Job Steps	Hazards	Controls
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			

All field work crew members shall review the contents of the JSA and sign below acknowledging their understanding of its contents.

Company Name	**Attendee Name**	**Signature**

Appendix B
Field Documents

Project Site Checklist

Project Activities: _____

Checklist Items	Yes	No	N/A
Written HSEP is on-site			
Addendums to the HSEP are documented on-site			
Information in the HSEP matches conditions and activities at the site			
HSEP has been read and signed by all site personnel, including visitors			
Daily tailgate safety meetings have been held and documented			
Site personnel have appropriate training and medical clearance			
Air monitoring is performed as described in the HSEP			
Air monitoring equipment has been calibrated daily			
Site zones are set up and observed where appropriate			
Access to the work area is limited to authorized personnel			
Decontamination procedures are followed and match the requirements of the HSEP			
Decontamination stations (including hand/face wash) are set up and used			
Personnel protective equipment used matches HSEP requirements			
Hearing protection used where appropriate			
Respirators are properly cleaned and stored			
Overhead utilities do not present a hazard to field equipment/personnel			
Traffic control measures have been implemented			
Emergency and first aid equipment is on-site as described in the HSEP			
Drinking water is readily available			
Accessible phone is readily available for emergency use			
Proper drum and material handling techniques are used			
Drums and waste containers are labeled appropriately			
Extension cords are grounded and protected from water and vehicle traffic			
Tools and equipment are in good working order			
Other:			
Other:			
Other:			

Notes: (All "no" answers must be addressed and corrected immediately. Note additional health and safety observations here).

_____

_____

_____

Conducted by: _____ Signature: _____ Date: _____

ATTACHMENT 20J: VEHICLE INSPECTION FORM

The following vehicle inspection must be performed and documented for all field projects where vehicles (company owned, rented, leased or personal-owned) are utilized on a constant or periodic basis. Inspections shall be conducted at the beginning of the project and per the following schedule.

Remember to perform a 360-degree walk around of the vehicle before each operation.

Project Name: _____ Project #: _____

Vehicle ID Info. (make/model/license #, etc.): _____

Vehicle Inspection Components	Condition		Comments
	Ok	Not Ok	
Weekly Checks			
Tires (legal tread depth, bald spots, sidewall damage, punctures)	☐	☐	
Windshield and windows (cracks)	☐	☐	
Windshield wipers (present, functional, worn)	☐	☐	
Seatbelts (missing, frayed, does not snap)	☐	☐	
Horn (operational)	☐	☐	
Head lights and taillights (all functional, cracks)	☐	☐	
Brake lights and turn signals (all functional)	☐	☐	
Backup lights and four-way flashers (functional)	☐	☐	
Brakes (solid feel, squealing, no warning light)	☐	☐	
Mirrors (present, functional, appropriate to use (trailer)	☐	☐	
Monthly Checks			
Spare Tire (inflated, jack, lug wrench present)	☐	☐	
Windshield wiper fluid (present, appropriate type for conditions)	☐	☐	
Bumpers (missing, lose, broken, dented)	☐	☐	
Body panels (newly dented or scraped)	☐	☐	
Climate control (cabin heat, defrost)	☐	☐	
Oil level	☐	☐	
Battery (color indicator, terminals clean and tight, secured)	☐	☐	
Hoses (cuts, cracks, leaks, bulges, chaffing, deterioration)	☐	☐	
Clutch (engages well, not slipping)	☐	☐	
Fuel tank (leaks, odor)	☐	☐	
Exhaust system (leaks)	☐	☐	
Coolant system (leaks)	☐	☐	
First aid kit (Either sealed or appears to be fully stocked)	☐	☐	
Portable Fire Extinguisher (Proper pressure; maintenance tag up to date)	☐	☐	

Inspected By: _____ Date: _____

Attachment 10A: Utility Clearance Mark-out Log

This log is to be completed by SLR personnel prior to initiation of ground disturbance activities (e.g., boring, excavations, staking, etc.) to assess the potential for underground structures, underground utilities, and aboveground power lines in the area selected for disturbance.

Contact the appropriate local utility locating service (One Call, Miss Dig, etc.) or a local utility locator contractor to have sub grade utilities located and marked. NOTE: Boring locations on private property (out of the public right-of-way) are typically not marked out by the One Call public utility mark-out service, and a private utility locate service must be used.

Utility Service Name	Telephone #	Service Confirmation #	Date / Time Notified

Belowground Services					
Utility	Company Name	Telephone #	Present or Unknown	Not Present	Markings (flags, paint, stakes / colors used)
Bldg. foundation					
Cable/Internet					
Electric					
Gas					
Fiber Optic					
Fire System					
Irrigation					
Landscaping					
Sewer / Septic					
Storm water					
UST					
Water					

If overhead lines could be potentially impacted by site activities, then use the following table to document information for the utilities involved, and contact them as necessary to de-energize or otherwise protect the lines from contact in accordance with Table 10-1.

Aboveground Services					
Utility	Company Name	Telephone #	Present	Not Present	Markings (flags, stakes / colors used)
Cable/Internet					
Electric					
Overhead supports					
Telephone					
Traffic light cables					

Attachment 10B: Ground Disturbance Checklist
(Page 1)

Prior to conducting ground disturbance activities, the SS must conduct a site survey for signs of underground and overhead utilities. If any of the questions below are answered "no," then the Project Manager must be contacted regarding concerns/issues. Document the reason(s) for any "no" answers on page 2 of this form and retain in the project files.

Pre-Ground Disturbance Considerations	Yes	No
1. Has the public One Call Center been contacted?		
2. Are as-built drawings available that show the location of utilities?		
3. Has a visual inspection of the work area(s) been completed?		
4. If One Call is not available or does not completely address the planned work area, has a private locating service been contacted?		
5. Have all utility locating service providers notified by the One Call Center marked out their facilities in the vicinity of the GD operations or otherwise notified SLR that they do not have facilities near the proposed locations?		
6. Have identified utilities been marked on the site plan/drawings?		
7. Were the utility markings conducted no more than 48 hours from the time of the GD activity?		
8. Are any fiber optic cables at least 50 feet away from the GD locations?		
9. If fiber optic cables are within 50 feet of the GD locations, has an agreement been made for the fiber optic company to be present during work?		
10. Does each GD location allow for clear entry and exit, adequate workspace, and a clear path for raising and lowering all equipment?		
11. Are all planned GD locations at least 3 feet from any surface and identified subsurface utility?		
12. Has the site representative indicated no knowledge of any subsurface utilities within 3 feet of the proposed GD locations?		
13. Are all proposed GD locations at least 3 feet from any visual line (straight line) indicators of a potential utility? Examples would be manhole covers, water, gas, and/or electrical meters and visible aboveground lines/poles.		
14. Are all proposed locations for pavement cutting clear of pavement joints, curbs, crash posts, or other engineered structures?		
15. Does the pavement lack signs of previous excavation (e.g., no pavement subsidence, differences in pavement texture or color, or pavement patching)?		
16. Does the soil encountered at the GD location appear to be native material? (Non-native materials would include materials free of gravel, clean sand, aggregate base, etc.)		
17. Have all expected utilities been identified and all missing utilities explained?		
18. Has a pre-job tailgate safety meeting been conducted for site personnel?		
19. Has a pre-job tailgate safety meeting been conducted for site personnel?		

Attachment 10B: Ground Disturbance Checklist

(Page 2)

Document any "no" answers from the Ground Disturbance Checklist below and the conclusions from the discussions held with the Project Manager for mitigating the identified concerns.

NOTE: This form can be used if you do not have access to SLR's IEX reporting system.

Attachment 5A: Safety Observation/Conversation Form

Event Classification(s) – Mark all that apply

☐ Safety Observation ☐ Safety Conversation

Date _____ Time _____

Location _____

Client name _____ Project # _____

Safety Observations					
At Risk	Human Behaviors	Safe	At Risk	Working Conditions	Safe
☐	Attention to Work	☐	☐	Ambient Conditions	☐
☐	Communications	☐	☐	Condition of Tools and Equipment	☐
☐	Housekeeping Behavior	☐	☐	Housekeeping Conditions	☐
☐	Job Setup/Sequence	☐	☐	Guards and Barriers	☐
☐	Use of PPE	☐	☐	Workplace Design	☐
☐	Following HSEP/JSA/HSE Manual	☐	☐	Walking/Working Surfaces	☐
☐	Proper use of Tools/Equipment	☐	☐	Working at Heights	☐
☐	Recognition of Change of Conditions	☐	☐	Chemical Exposures	☐
☐	Body Position/Mechanics	☐	☐	Biological Exposures	☐
☐	Other:	☐	☐	Other:	☐
Comments					

Safety Conversations
What topic(s) were discussed? Employee behaviors? Working Conditions? LMRA? JSA?
Follow up action – Any corrective actions needed? HSEP or JSA revision needed? Positive feedback?

Any new hazards identified? ☐ Yes ☐ No If Yes, complete and submit Incident/Near Miss/Hazard ID form

Completed By: _____ _____ _____
(Print) (Signature) (Date)

Project Manager/Supervisor: _____ _____ _____
(Print) (Signature) (Date)

NOTE: This form can be used if you do not have access to SLR's IEX reporting system.

Attachment 5B: Incident/Near Miss Hazard Identification Report Form

Event Classification

- ☐ Incident – Injury or Illness
- ☐ Near Miss
- ☐ First Aid Case
- ☐ Incident – Significant Property Damage
- ☐ Hazard Identification
- ☐ Stop Work Action
- ☐ Incident – Environmental Damage
- ☐ Vehicle Accident (complete Vehicle Accident Form)

Date _____ Time _____

Location _____

Client name _____ Project # _____

Names of Known Witnesses _____

Notifications: Verbal notification within 1 hour for Incidents (if possible) / Provide written report within 24 hours

Function	Time	Contact Name	Contact number
☐ Emergency Responders			
☐ Medical Facility			
☐ PM or Supervisor			
☐ HSE Director			
☐ Office HSC or Manager			
☐ Regional Ops Manager			
☐ Client			
☐ Government agency(ies)			

Event Description (what happened, how, who was involved; provide diagram on back or photos.)
Immediate Response to the Event (Response on site and within next 8 hrs):
Recommendations for further actions:

Completed By: _____ _____ _____
(Print) (Signature) (Date)

Project Manager/Supervisor: _____ _____ _____
(Print) (Signature) (Date)

This report must be completed by the employee's supervisor or Site Safety Officer immediately upon learning of the incident. The completed report must be reviewed and signed by the Project Manager and e-mailed within 24 hours of the incident to Area HSE Manager e-mail: pmoore@slrconsulting.com

ATTACHMENT 16-C: Vehicle Accident Reporting Form

This report is to be initiated by the employee involved in the accident or his/her direct supervisor. Please answer all questions completely. This report must be forwarded to the appropriate HSE Director within **24 hours** of the accident. **Attach Police Report**.

Accident Description

Accident Date: Time: ☐ A.M. or ☐ P.M.

Location of Accident (City, State):

Description of Accident:

Witness: Phone No.

Address: City: State: ZIP:

Police Officer's Name and Badge #: Department:

Work Vehicle Description

Driver: Drivers' License No. State:

Address: City: State: ZIP:

Work Phone No. Project Name: Project No.

Vehicle No. Year: Make: Model: License Plate No.

State: Vehicle Owner: ☐ Company ☐ Rented/Leased ☐ Private Vehicle

Vehicle Type: ☐ Commercial Motor Vehicle ☐ Non-Commercial

If not Company-owned: Owner: Phone No.

Address: City: State: ZIP:

Vehicle Damage Description:

No. of vehicles towed from scene: Number of Injuries: Number of Fatalities:

Were hazardous materials released? ☐ No ☐ Yes If Yes, describe materials:

Other Vehicle(s)

Driver: Drivers' License No. State:

Address: City: State: ZIP:

Phone No. Owner's Name (☐Check if same as Driver):

Address: City: State: ZIP:

Insurance Company: Policy Number:

Agent's Name: Phone Number:

Address: City: State: ZIP:

Vehicle Year: Make: Model: Plate No. State:

Vehicle ID No.

Vehicle Damage Description:

Passengers: ☐ No ☐ Yes Injuries: ☐ No ☐ Yes (if Yes, list names and telephones numbers below)

Attachment 16-C: Vehicle Accident Report (continued)

Weather:	☐ Clear	☐ Cloudy	☐ Fog	☐ Rain	☐ Sleet	☐ Snow	Other:
Pavement:	☐ Asphalt	☐ Steel	☐ Concrete	☐ Wood	☐ Gravel/Dirt	☐ Brick/Stone	Other:
Condition:	☐ Dry	☐ Wet	☐ Icy	☐ Pot Holes	Other:		
Traffic Control:	☐ Traffic Light		☐ Stop Sign	☐ Railroad	☐ No Intersection	☐ No Control	
Roadway:	No. of Lanes each direction:			☐ Residential	☐ Divided Hwy	☐ Undivided Hwy	

Draw and name roadways showing each vehicle, direction of travel, and point of impact. Indicate travel before the accident with a solid line, and post-accident movement with a broke line.

SYMBOLS:

Your Vehicle: ①

Other Vehicle(s): ②, ③

Pedestrian:

Stop Sign:

Yield Sign:

Railroad track:

Additional Information: _____

_____

_____

_____

Employee _____ _____ _____

(Print) (Signature) (Date)

Supervisor _____ _____ _____

(Print) (Signature) (Date)

HSE Representative _____ _____ _____

(Print) (Signature) (Date)

ATTACH POLICE REPORT TO VEHICLE ACCIDENT REPCRT FORM

NOTE: This form can be used if you do not have access to SLR's IEX reporting system.

ATTACHMENT 17-C: Witness Statement Form

Witness Statement Form

This information is being solicited from you so that the company can accurately assess the reported incident to avoid similar occurrences in the future. Describe only the facts you have personal knowledge of.

Exact Location of Incident:

Date of Incident: Time: ☐ a.m. ☐ p.m.

Date of this Statement: Time: ☐ a.m. ☐ p.m.

Witness Information

Name: Phone No.

Company:

Did you see the Incident? ☐ Yes ☐ No

How Far From You (approx., in feet) Did the Incident Occur?

Stating only factual information, describe in detail what happened and include any applicable events leading to the incident.

Witness Signature / Date

Print Name

Appendix C Inadvertant Discovery Plan (IDP)

Inadvertent Discovery Plan

Plan And Procedures for the Discovery of Cultural Resources and Human Skeletal Remains

To request materials in an alternative format, call the Washington State Pollution Liability Insurance Agency (PLIA) at 800-822-3905. People with impaired hearing may call Washington Relay Service at 711. People with a speech disability may call TTY at 877-833-6341.

Project Name:	Location:
Project Primary Contact:	County:

If this Inadvertent Discovery Plan (IDP) is for multiple (batched) projects, ensure the location information covers all project areas.

1.0 Introduction

The IDP outlines procedures to perform in the event of a discovery of archaeological materials or human remains, in accordance with applicable state and federal laws. An IDP is required, for all grants and loans, for any project that creates disturbance above or below the ground. An IDP is not a substitute for a formal cultural resource review (Executive Order 21-02 or Section 106 of the National Historic Preservation Act of 1966).

Once completed**, the IDP shall always be kept at the project site** during all project activities. All staff, contractors, and volunteers shall be familiar with its contents and know where to find it.

2.0 Cultural Resource Discoveries

A cultural resource discovery could be prehistoric or historic artifacts. Examples include (see images for further examples):

- An accumulation of shell, burned rocks, or other food related materials.
- Bones, intact or in small pieces.
- An area of charcoal or very dark stained soil with artifacts.
- Stone tools or waste flakes (for example, an arrowhead or stone chips).
- Modified or stripped trees, often cedar or aspen, or other modified natural features, such as rock drawings.
- Agricultural or logging materials that appear older than 50 years. These could include equipment, fencing, canals, spillways, chutes, derelict sawmills, tools, and many other items.
- Clusters of tin cans or bottles, or other debris that appear older than 50 years.
- Old munitions casings. **Always assume these are live and never touch or move.**

- Buried railroad tracks, decking, foundations, or other industrial materials.
- Remnants of homesteading. These could include bricks, nails, household items, toys, food containers, and other items associated with homes or farming sites.

The above list does not cover every possible cultural resource. When in doubt, assume the material is a cultural resource.

3.0 On-Site Responsibilities

If any employee, contractor, or subcontractor believes that they have uncovered cultural resources or human remains at any point in the project, take the following steps to ***Stop-Protect-Notify*. If you suspect that the discovery includes human remains, also follow Sections 5 and 6.**

STEP A: Stop Work.

All work must stop immediately in the vicinity of the discovery.

STEP B: Protect the Discovery.

Leave the discovery and the surrounding area untouched and create a clear, identifiable, and wide boundary (30 feet or larger) with temporary fencing, flagging, stakes, or other clear markings. Provide protection and ensure integrity of the discovery until cleared by the Department of Archaeological and Historical Preservation (DAHP) or a licensed, professional archaeologist.

Do not permit vehicles, equipment, or unauthorized personnel to traverse the discovery site. Do not allow work to resume within the boundary until the requirements of this IDP are met.

STEP C: Notify Project Archaeologist (if applicable).

If the project has an archaeologist, notify that person. If there is a monitoring plan in place, the archaeologist will follow the outlined procedure.

STEP D: Notify PLIA contacts.

PLIA Contacts are provided in **Appendix A**. Once notified, the PLIA contact will contact DAHP to report and confirm the discovery. To avoid delay, the Project Primary Contact will contact DAHP if they are not able to reach PLIA. DAHP contacts are also provided in **Appendix A**.

DAHP will provide the steps to assist with identification. DAHP, PLIA, and Tribal representatives may coordinate a site visit following any necessary safety protocols. DAHP may also inform the Project Primary Contact and PLIA of additional steps to further protect the site.

Do not continue work until DAHP has issued an approval for work to proceed in the area of, or near, the discovery.

4.0 Tribal Contacts

In the event cultural resources are discovered, the tribes identified in **Appendix A** will be contacted. See Section 10 for Additional Resources.

Please provide contact information for additional tribes within your project area, if needed, in **Appendix A**.

5.0 Special Procedures for the Discovery of Human Skeletal Remains

Any human skeletal remains, regardless of antiquity or ethnic origin, will at all times be treated with dignity and respect. Follow the steps under Stop-Protect-Notify. For specific instructions on how to handle a human remains discovery, see: RCW 68.50.645: Skeletal human remains—Duty to notify—Ground disturbing activities—Coroner determination—Definitions.

Suggestion: If you are unsure whether the discovery is human bone or not, contact Guy Tasa with DAHP, for identification and next steps. Do not pick up the discovery.

Guy Tasa, PhD State Physical Anthropologist

Guy.Tasa@dahp.wa.gov

(360) 790-1633 (Cell/Office)

For discoveries that are confirmed or suspected human remains, follow these steps:

1. Notify law enforcement and the Medical Examiner/Coroner using the contacts in **Appendix A**. Do not call 911 unless it is the only number available to you.
2. The Medical Examiner/Coroner (with assistance of law enforcement personnel) will determine if the remains are human or if the discovery site constitutes a crime scene and will notify DAHP.
3. **DO NOT speak with the media, allow photography or disturbance of the remains, or release any information about the discovery on social media.**
4. If the remains are determined to be non-forensic, cover the remains with a tarp or other materials (not soil or rocks) for temporary protection and to shield them from being photographed by others or disturbed.

Further activities:

- Per RCW 27.44.055, Chapter 68.50 RCW, and Chapter 68.60 RCW, DAHP will have jurisdiction over non-forensic human remains. PLIA staff will participate in consultation. The Project Primary Contact may also participate in consultation.
- Documentation of human skeletal remains and funerary objects will be agreed upon through the consultation process described in RCW 27.44.055, Chapter 68.50 RCW, and Chapter 68.60 RCW.
- When consultation and documentation activities are complete, work in the discovery area may resume as described in Section 8.

If the project occurs on federal lands (such as a national forest or park or a military reservation) the provisions of the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA) apply and the responsible federal agency will follow its provisions. Note that state highways that cross federal lands are on an easement and are not owned by the state.

If the project occurs on non-federal lands, the Project Primary Contact will comply with applicable state and federal laws, and the above protocol.

6.0 Documentation of Archaeological Materials

Archaeological resources discovered during construction are protected by state law Chapter 27.53 RCW and assumed eligible for inclusion in the National Register of Historic Places under Criterion D until a formal Determination of Eligibility is made.

The Project Lead/Organization must ensure that proper documentation and field assessments are made of all discovered cultural resources in cooperation with all parties: the federal agencies (if any), DAHP, PLIA, affected tribes, and the archaeologist.

An archaeologist will record all prehistoric and historic cultural material discovered during project construction on a standard DAHP archaeological site or isolate inventory form. They will photograph site overviews, features, and artifacts and prepare stratigraphic profiles and soil/sediment descriptions for minimal subsurface exposures. They will document discovery locations on scaled site plans and site location maps.

Cultural features, horizons, and artifacts detected in buried sediments may require the archaeologist to conduct further evaluation using hand-dug test units. They will excavate units in a controlled fashion to expose features, collect samples from undisturbed contexts, or to interpret complex stratigraphy. They may also use a test unit or trench excavation to determine if an intact occupation surface is present. They will only use test units when necessary to gather information on the nature, extent, and integrity of subsurface cultural deposits to evaluate the site's significance. They will conduct excavations using standard archaeological techniques to precisely document the location of cultural deposits, artifacts, and features.

The archaeologist will record spatial information, depth of excavation levels, natural and cultural stratigraphy, presence or absence of cultural material, and depth to sterile soil, regolith, or bedrock for each unit on a standard form. They will complete test excavation unit level forms, which will include plan maps for each excavation level and artifact counts and material types, number, and vertical provenience (depth below surface and stratum association where applicable) for all recovered artifacts. They will draw a stratigraphic profile for at least one wall of each test excavation unit.

The archaeologist will screen sediments excavated for purposes of cultural resources investigation through 1/8-inch mesh, unless soil conditions warrant 1/4-inch mesh.

The archaeologist will analyze, catalogue, and temporarily curate all prehistoric and historic artifacts collected from the surface and from probes and excavation units. The ultimate disposition of cultural materials will be determined in consultation with the federal agencies (if any), DAHP, PLIA, and the affected tribe(s).

Within 90 days of concluding fieldwork, the archaeologist will provide a technical report describing any and all monitoring and resultant archaeological excavations to the Project Lead/Organization, who will forward the report to PLIA, the federal agencies (if any), DAHP, and the affected tribe(s) for review and comment.

If assessment activities expose human remains (burials, isolated teeth, or bones), the archaeologist and Project Lead/Organization will follow the process described in **Section 6**.

7.0 Proceeding with Work

The Project Lead/Organization shall work with the archaeologist, DAHP, and affected tribe(s) to determine the appropriate discovery boundary and where work can continue.

Work may continue at the discovery location only after the process outlined in this plan is followed and the Project Lead/Organization, DAHP, any affected tribe(s), PLIA, and the federal agencies (if any) determine that compliance with state and federal laws is complete.

8.0 Organization Responsibility

The Project Lead/Organization is responsible for ensuring:

- This IDP has complete and accurate information.
- This IDP is immediately available to all field staff at the site and available by request to any party.
- This IDP is implemented to address any discovery at the site.
- That all field staff, contractors, and volunteers are instructed on how to implement this IDP.

9.0 Additional Resources

Informative Video

PLIA recommends that all project staff, contractors, and volunteers view this informative video, created by the Department of Ecology, explaining the value of IDP protocol and what to do in the event of a discovery. The target audience is anyone working on the project who could unexpectedly find cultural resources or human remains while excavating or digging. The video is also posted on DAHP's inadvertent discovery language website.

Ecology's IDP Video (https://www.youtube.com/watch?v=ioX-4cXfbDY)

Informational Resources

DAHP (https://dahp.wa.gov)

Washington State Archeology (DAHP 2003) (https://dahp.wa.gov/sites/default/files/Field%20Guide%20to%20WA%20Arch_0.pdf)

Association of Washington Archaeologists (https://www.archaeologyinwashington.com)

Potentially Interested Tribes

Tribal Contacts: Interactive Map of Tribes by Area (https://dahp.wa.gov/archaeology/tribal-consultation-information)

Tribal Contacts - WSDOT Tribal Contact Website (https://wsdot.wa.gov/tribal/TribalContacts.htm)

10.0 Additional Information

Please add any additional contact information or other information needed within this IDP.

Appendix A – Contact Information

PLIA Contacts:

Primary Contact:	Alternate Contact:
Name:	Name:
Phone:	Phone:
Email:	Email:

DAHP Contacts:

Name:	**Human Remains/Bones:**
Title:	Name:
Cell:	Title:
Email:	Cell:
Main Office	Email:

Tribe Contact Information:

Tribe:	Tribe:
Name:	Name:
Title:	Title:
Phone:	Phone:
Email	Email
Tribe:	Tribe:
Name:	Name:
Title:	Title:
Phone:	Phone:
Email	Email

Law Enforcement and the Medical Examiner/Coroner Contacts:

Local Medical Examiner or Coroner	Local Law Enforcement	Local Non-Emergency
Name:	Main Name:	Phone Number:
Phone:	Phone:	(911 if without a non-emergency number)

Implement the IDP if you see…

Chipped stone artifacts.

Examples are:

- Glass-like material.
- Angular material.
- “Unusual” material or shape for the area.
- Regularity of flaking.
- Variability of size.

Stone artifacts from Oregon.

Stone artifacts from Washington.

Biface-knife, scraper, or pre-form found in NE Washington. Thought to be a well knapped object of great antiquity. Courtesy of Methow Salmon Rec. Foundation.

Implement the IDP if you see…

Ground stone artifacts.

Examples are:

- Unusual or unnatural shapes or unusual stone.
- Striations or scratching.
- Etching, perforations, or pecking.
- Regularity in modifications.
- Variability of size, function, or complexity.

Above: Fishing Weight - credit CRITFC Treaty Fishing Rights website.

Artifacts from unknown locations (left and right images).

Implement the IDP if you see…

Bone or shell artifacts, tools, or beads.

Examples are:

- Smooth or carved materials.
- Unusual shape.
- Pointed as if used as a tool.
- Wedge shaped like a “shoehorn”.
- Variability of size.
- Beads from shell (dentalium) or tusk.

Upper Left: Bone Awls from Oregon.

Upper Center: Bone Wedge from California.

Upper Right: Plateau dentalium choker and bracelet, from Nez Perce National Historical Park, 19th century, made using Antalis pretiosa shells Credit: Nez Perce - Nez Perce National Historical Park, NEPE 8762, Public Domain.

Above: Tooth Pendants.

Right: Bone Pendants. Both from Oregon and Washington.

Implement the IDP if you see…

Culturally modified trees, fiber, or wood artifacts.

Examples are:

- Trees with bark stripped or peeled, carvings, axe cuts, de-limbing, wood removal, and other human modifications.
- Fiber or wood artifacts in a wet environment.
- Variability of size, function, and complexity.

Left and Below: Culturally modified tree and an old carving on an aspen (Courtesy of DAHP). These are examples of above ground cultural resources.

Right, Top to Bottom: Artifacts from Mud Bay, Olympia: Toy war club, two strand cedar rope, wet basketry.

Implement the IDP if you see…

Strange, different, or interesting looking dirt, rocks, or shells.

Human activities leave traces in the ground that may or may not have artifacts associated with them. Examples are:

- "Unusual" accumulations of rock (especially fire-cracked rock).
- "Unusual" shaped accumulations of rock (such as a shape similar to a fire ring).
- Charcoal or charcoal-stained soils, burnt-looking soils, or soil that has a "layer cake" appearance.
- Accumulations of shell, bones, or artifacts. Shells may be crushed.
- Look for the "unusual" or out of place (for example, rock piles in areas with otherwise few rocks).

Shell Midden pocket in modern fill discovered in sewer trench.

Underground oven. Courtesy of DAHP.

Shell Midden with fire cracked rock.

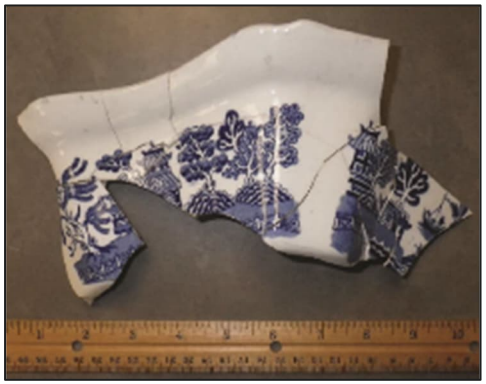
Hearth excavated near Hamilton, WA.

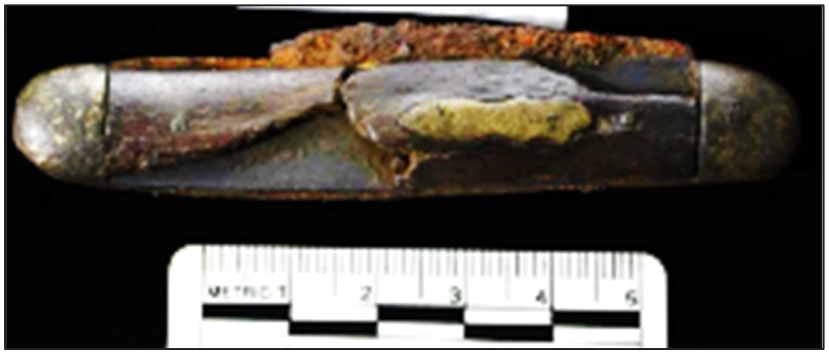
Implement the IDP if you see…

Historic period artifacts (historic archaeology considered older than 50 years).

Examples are:

- Agricultural or logging equipment. May include equipment, fencing, canals, spillways, chutes, derelict sawmills, tools, etc.
- Domestic items including square or wire nails, amethyst colored glass, or painted stoneware.





Left: Top to Bottom: Willow pattern serving bowl and slip joint pocket knife discovered during Seattle Smith Cove shantytown (45-KI-1200) excavation.

Right: Collections of historic artifacts discovered during excavations in eastern Washington cities.

Implement the IDP if you see…

Historic period artifacts (historic archaeology considered older than 50 years).

Examples are:

- Railway tokens, coins, and buttons.
- Spectacles, toys, clothing, and personal items.
- Items helping to understand a culture or identity.
- Food containers and dishware.

Main Image: Dishes, bottles, work boot found at the North Shore Japanese bath house (ofuro) site, Courtesy Bob Muckle, Archaeologist, Capilano University, B.C. This is an example of an above ground resource.

Right, from Top to Bottom: Coins, token, spectacles and Montgomery Ward pitchfork toy discovered during Seattle Smith Cove shantytown (45-KI-1200) excavation.

Implement the IDP if you see…

- Old munition casings – if you see ammunition of any type – **always assume they are live and never touch or move!**
- Tin cans or glass bottles with an older manufacturer's technique – maker's mark, distinct colors such as turquoise, or an older method of opening the container.

Far Left: .303 British cartridge found by a WCC planting crew on Skagit River. Don't ever touch something like this!

Left: Maker's mark on bottom of old bottle.

Right: Old beer can found in Oregon. ACME was owned by Olympia Brewery. Courtesy of Heather Simmons.

Logo employed by Whithall Tatum & Co. between 1924 to 1938 (Lockhart et al. 2016).

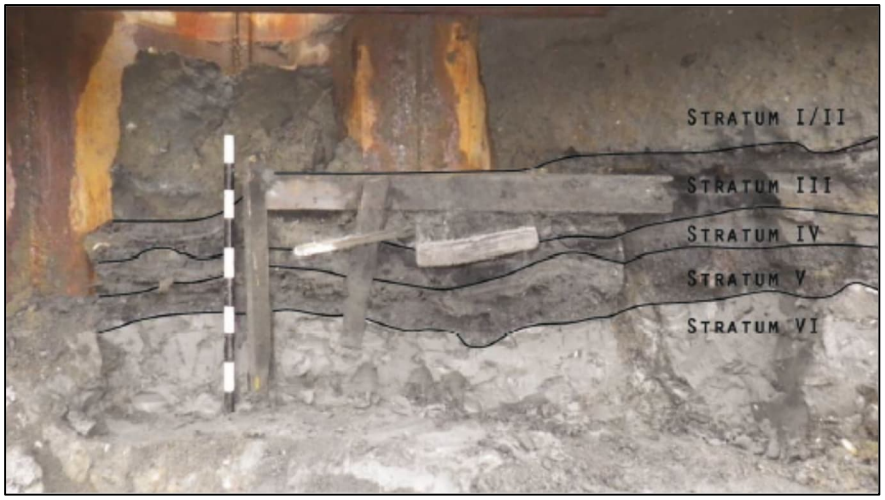
Can opening dates, courtesy of W.M. Schroeder.

Implement the IDP if you see…

Historic foundations or buried structures.

Examples are:

- Foundations.
- Railroad and trolley tracks.
- Remnants of structures.



Counter Clockwise, Left to Right:
Historic structure 45KI924, in WSDOT right of way for SR99 tunnel. Remnants of Smith Cove shantytown (45-KI-1200) discovered during Ecology CSO excavation, City of Spokane historic trolley tracks (above ground historic resources) uncovered during stormwater project, intact foundation of historic home that survived the Great Ellensburg Fire of July 4, 1889, uncovered beneath parking lot in Ellensburg.

Implement the IDP if you see…

Potential human remains.

Examples are:

- Grave headstones that appear to be older than 50 years.
- Bones or bone tools--intact or in small pieces. It can be difficult to differentiate animal from human so they must be identified by an expert.
- These are all examples of animal bones and are not human.

Directly Above: This is a real discovery at an Ecology sewer project site.

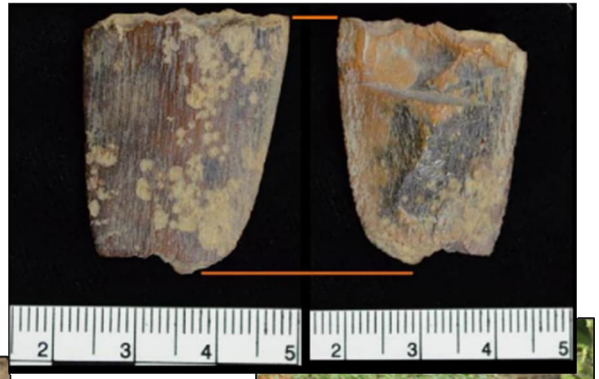
What would you do if you found these items at a site? Who would be the first person you would call?

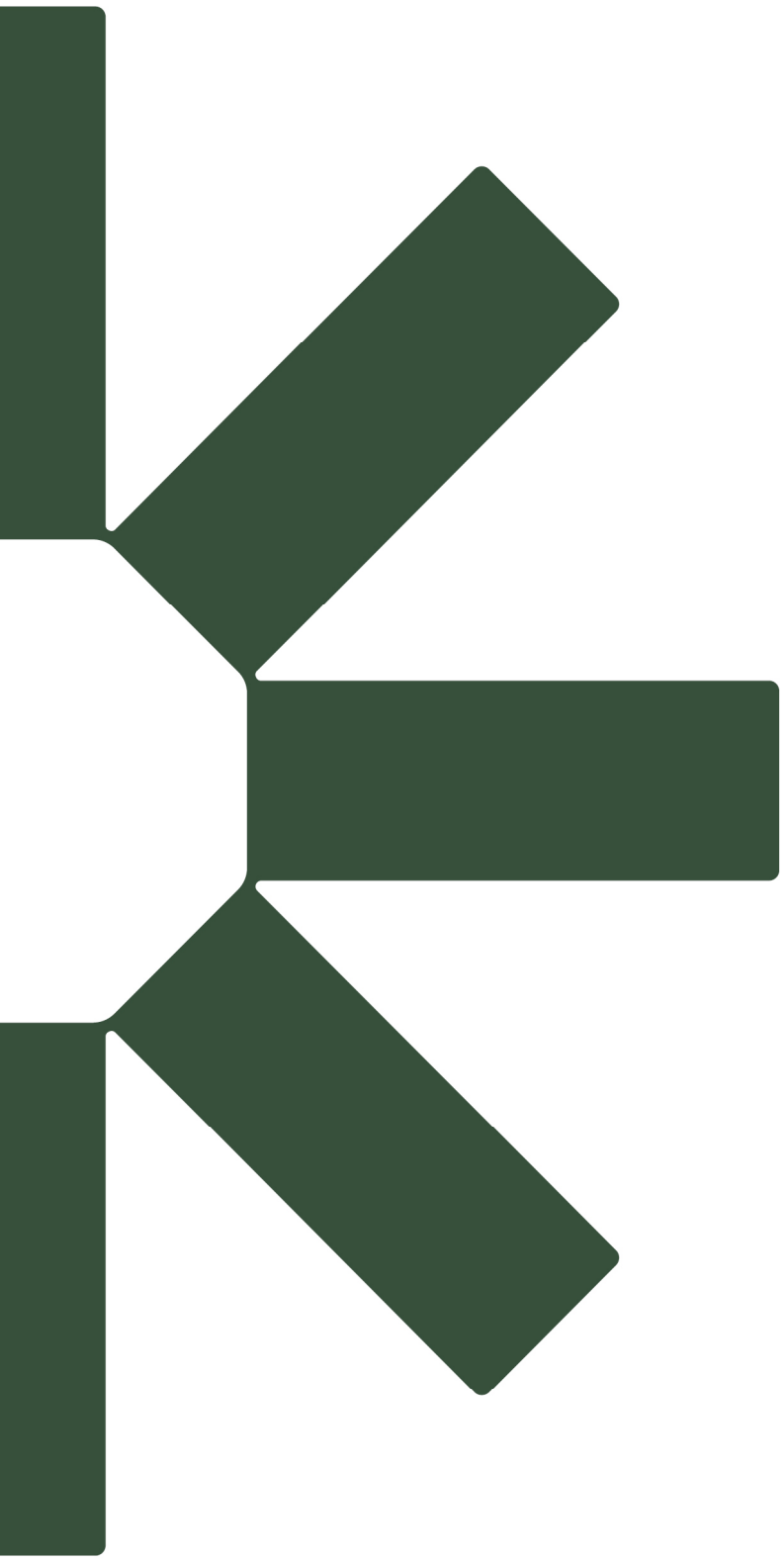
Hint: Read the plan!

Center: Bone wedge tool, courtesy of Smith Cove Shantytown excavation (45KI1200).

Other images (Top Right, Bottom Left, and Bottom)

Center: Courtesy of DAHP.





Making Sustainability Happen