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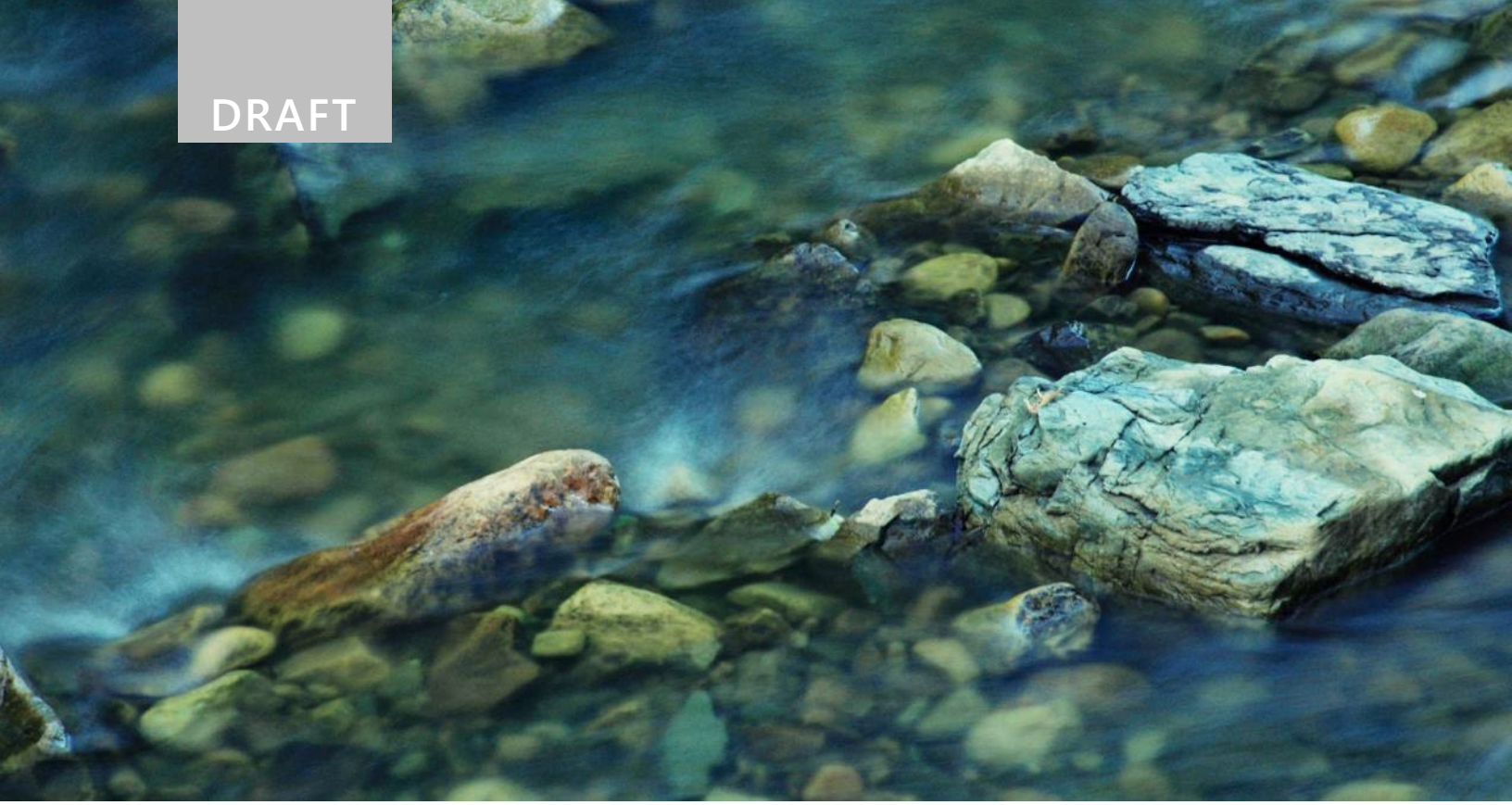

January 2024
Jeld Wen Site, Everett

ANCHOR QEA

Step 2 Pre-Remedial Design Investigation Work Plan – Marine Areas of Jeld Wen Site

Prepared for JELD-WEN, Inc., and Washington State Department of Ecology

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January 2024
Jeld Wen Site, Everett

Step 2 Pre-Remedial Design Investigation Work Plan – Marine Areas of Jeld Wen Site

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ABBREVIATIONS

µg/kg	microgram per kilogram
AO	Agreed Order
CAP	Cleanup Action Plan
COC	U.S. Army Corps of Engineers
cPAH	carcinogenic polycyclic aromatic hydrocarbon
CSGP	Construction Stormwater General Permit
CSL	Cleanup Screening Level
D/F	dioxin/furan
dw	dry weight
Ecology	Washington State Department of Ecology
EMNR	Enhanced Monitored Natural Recovery
IDW	inverse-distance-weighting
IHA	Incidental Harassment Authorization
IHS	indicator hazardous substance
MNR	Monitored Natural Recovery
MTCA	Model Toxics Control Act
ng/kg	nanogram per kilogram
NPDES	National Pollutant Discharge Elimination System
NWP	Nationwide Permit
PCB	polychlorinated biphenyl
PRDI	Pre-Remedial Design Investigation
POC	point of compliance
Port	Port of Everett
PQL	practical quantitation limit
RCW	Revised Code of Washington
REL	Remediation Level
RI/FS	Remedial Investigation/Feasibility Study
SAP	Sampling and Analysis Plan
SCL	Sediment Cleanup Level
SCO	Sediment Cleanup Objective
SEPA	State Environmental Policy Act
Site	Jeld Wen Site
SMA	Sediment Management Area
SMS	Sediment Management Standards
SPME	solid phase microextraction
SWAC	surface weighted average concentration

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TEQ	toxicity equivalence
TOC	total organic carbon
TVS	total volatile solid
WAC	Washington Administrative Code
WP	WP

1 Introduction

This Step 2 Pre-Remedial Design Investigation (PRDI) Work Plan (WP) has been prepared in accordance with Agreed Order (AO) No. 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., located at 300 West Marine View Drive, Everett, Washington, 98201 (Jeld Wen Site, or Site). The AO was executed between JELD-WEN and the Washington State Department of Ecology (Ecology). The Step 2 PRDI WP has been prepared based on the implementation of the Step 1 PRDI Work Plan that was approved by the Washington State Department of Ecology (Ecology) on July 28, 2023. This Step 2 PRDI WP is specifically described in the Second Amendment to the AO (Effective July 28, 2023), Exhibit G – Scope of Work and Schedule, Task 1: Development of PRDI project plan and implementation. This Step 2 PRDI WP identifies key milestones, work products, sampling and analyses procedures, and schedules to complete surficial marine sediment sampling, subsurface marine sediment sampling, geotechnical soil sampling, and marine porewater sampling (Step 2) to refine the remedial actions for the in-water portion of the cleanup of the Site (Figure 1). This WP has been informed by the preliminary Step 1 results, to further delineate lateral extents of contamination and delineate the depth of contamination within the Sediment Management Areas (SMA).

This PRDI WP has been prepared to meet the requirements of the Model Toxics Control Act (MTCA) and Sediment Management Standards (SMS) administered by Ecology under Chapter 173-340 and 173-204, respectively, 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 owned by the Port of Everett (Port) and Baywood Industrial LLC to the east and northeast; tidal mudflats owned by the Port and Foss Maritime Company LLC to the west; West Marine View Drive 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 *Final Cleanup Action Plan, Jeld Wen Site* (CAP; Ecology 2023).

The upland area of the Site is built upon fill material placed in various stages beginning in the late 1800s. Areas on the eastern, northern, and southern sides of the Site were filled in various stages beginning in the late 1800s or early 1900s when the adjacent Burlington Northern Sante Fe's predecessor, formerly Great Northern Railroad, was laying tracks along Port Gardner Bay. Historical activities at the Site have included casket manufacturing, pole treating, wood door and sash manufacturing, and fish net storage. The Knoll Area (Figure 1) was initially filled in the early to mid-1960s.

Prior to JELD-WEN's ownership, the Site had been in use as a stile and rail door plant since the mid-1940s by Nord Door. Prior to the 1940s, National Pole Company operated a pole treating plant on the eastern portion of the Site. Sound Casket Manufacturing operated a wood casket factory on the southern portion of the Site from at least 1936 until sometime prior to 1947, at which time the casket facility was operated by Northwestern Lumber & Manufacturing Co., Inc. By 1976 some of the structures associated with the former wood casket plant had been incorporated into the Nord Door facility. A rectangular fish net storage building, and several smaller structures were present on the far southern portion of the Site (current Knoll Area), south of the casket facility, from at least 1947 through 1955. The structures were no longer present in 1967, by which time the area had been further filled creating the "knoll" feature (SLR and Anchor QEA 2021*; Final Remedial Investigation and Feasibility Study* [RI/FS)]; Appendix A).

Based on a review of historical aerial photographs and Sanborn maps, it appears that the original boiler for the Nord Door facility was an oil-fired boiler located near Norton Avenue (now West Marine View Drive). A 1955 aerial photograph and the 1957 Sanborn Map (SLR and Anchor QEA 2021; Appendix A) show that the former pole treating plant had been removed from the property and the boiler for the Nord Door facility was a wood-fired boiler. Sometime prior to 1968, the wood-fired boiler was moved to its current location in the center of the upland property adjacent to the main manufacturing building.

JELD-WEN acquired certain assets, including the real property of the Nord Door plant, in May 1986 through the E.A. Nord bankruptcy proceeding. Continued operations associated with the Nord Door plant by JELD-WEN included buying rough green wood, sorting, stacking, drying, planing, and cutting the lumber. The finished wooden doors, rails, posts, columns, and spindles were assembled on-Site.

JELD-WEN ceased operations at the Nord Door plant in 2005. Various asphalt companies (Cadman [current], Cemex, Rinkers Materials and Sterling Asphalt) have leased and operated the northwest portion of the upland property as an asphalt batch plant since the mid-1990s.

1.2 Cleanup Standards for Marine Sediment

The cleanup standards for marine sediment at the Site were established in the CAP. This section summarizes the contaminants of concern (COC) and cleanup standards for marine sediment. Cleanup standards consist of the following: 1) Sediment Cleanup Levels (SCL) that are defined by the concentration of hazardous substances protective of human health and the environment; 2) pathway-specific point of compliance (POC) that designates the location at the Site where the SCLs must be met; and 3) additional regulatory requirements that apply to the cleanup action, e.g., ARAR (Applicable or Relevant and Appropriate Requirements).

This section also includes a description of selected sediment SCLs for the Site; the proposed POCs for sediment; and Remediation Levels (RELs) from the CAP. RELs are used to identify the concentrations of hazardous substances at which different cleanup action components will be implemented. RELs are used at this Site as a combination of cleanup action components are used to achieve the SCL at the POC.

1.2.1 Contaminants of Concern in Marine Sediment

The following chemicals were identified as COCs for sediment in the CAP based on exceedances of the applicable SMS Sediment Cleanup Objective (SCO) criteria.

- **Total polychlorinated biphenyls (PCBs; Aroclors or congeners):** Concentrations exceed the SCO criterion of 130 micrograms per kilogram (µg/kg) dry weight (dw) based on benthic protection and the SCO criterion of 30 µg/kg dw (based on protection of human health).
- **Total dioxin/furan (D/F) toxicity equivalence (TEQ):** Concentrations exceed the SCO criterion of 5 nanograms per kilogram (ng/kg) dw (based on the practical quantitation limit [PQL]).
- **Total coplanar PCB congener TEQ:** Concentrations do not exceed the site-specific SCO of 1.5 ng/kg dw (based on the PQL); however, the risk from D/F and coplanar PCB congener TEQ levels are additive. Areas with elevated PCB congener TEQ are spatially delineated within the extent total PCB and D/F TEQ exceedance area; therefore, coplanar PCB congener TEQ are COCs but not are not considered an indicator hazardous substance (IHS).
- **Carcinogenic polycyclic aromatic hydrocarbon (cPAH) TEQ:** Concentrations exceed the SCO criterion of 21 µg/kg dw (based on natural background[1]). Areas where sediment exceeds the SCO are spatially delineated within the extent of the total PCB and D/F TEQ exceedance area; therefore, cPAH TEQ is a COC but are not considered an IHS. However, PAH source control (creosote-treated pile/structure removal) is integrated into the selected remedial action.

1.2.2 Marine Sediment Cleanup Levels

The SCL is defined as the concentration or level of biological effects of a contaminant in sediment determined by Ecology to be protective of human health and the environment (WAC 173-204-560(2)). The lowest potentially applicable SCL is the SCO, which can be adjusted up to the Cleanup Screening Level (CSL) based on technical possibility to achieve sediment cleanup levels and whether the sediment cleanup level will have a net adverse environmental impact on the aquatic environment (WAC 173-204-560(2)). Both the SCO and the CSL must be set as the highest of the following: Natural Background (SCO) or Regional Background (CSL), Risk-Based Concentration and the PQL (WAC 173-204-560(3), (4)). If the SCL is set from the Risk-Based Concentration, the concentration must be the lowest level to satisfy each of these considerations: protective of human health,

[1] Regional background for cPAH TEQ in Port Gardner Bay has been established as 56 µg/kg in the Washington State Department of Ecology Sediment Cleanup User's Manual (SCUM) Table 10-2 based on the Port Gardner Bay Regional Background: Data Evaluation and Summary Report (Ecology 2014).

protective of the benthic community, causing no adverse effects on higher trophic-level species, and meets requirements in other applicable laws (WAC 173-204-560(3), (4)). Because Risk-Based Concentrations were used at the Site, Ecology considered the following exposure pathways and receptors for the establishment of SCLs at the Site:

- Protection of benthic species in Site sediments
- Upper trophic-level species:
  - Site tissue data with ecological risk benchmarks reveal that there is unlikely to be any potential risk to wildlife exposed to Site COCs, including foraging for clams adjacent to the Site.
- Human health:
  - Protection of human health via direct contact by site workers and incidental ingestion of intertidal sediment
  - Protection of human health via direct contact and incidental ingestion of marine sediment during clam digging, net fishing, and child beach play
  - Protection of humans (recreational and/or tribal subsistence fishers) via dietary ingestion of fish and shellfish

Applicable sediment SCLs[2] for the Site are summarized in Table 1.

Table 1
Marine Sediment Cleanup Levels

Parameter	Units	SCL	Basis	Compliance Evaluation
Total PCBs [a]	µg/kg dw	130	Benthic Protection	Point-by-point
Total Dioxin/Furan TEQ [a]	ng/kg dw	5	Human Health	SWAC
Total PCB Congeners [a]	µg/kg dw	30	Human Health	SWAC
Coplanar PCB congener TEQ [b]	ng/kg dw	1.5	Human Health	SWAC
cPAH TEQ [b]	µg/kg dw	21	Human Health	SWAC

Notes:

a. Site IHS chemicals
b. Sediment areas exceeding the SCO for coplanar PCB congener TEQ and cPAH TEQ are within areas already defined by D/F TEQ and total PCBs; thus, these chemicals are not indicator hazardous substances for the Site.

1.2.3 Marine Sediment Point of Compliance

For marine sediments, the vertical POC is surface sediments within the biologically active zone. The biologically active zone is the depth in surface sediments where the species critical to the function, diversity, and integrity of the benthic community are located. As described in the CAP the vertical

[2] The applicable SCL refers to the sediment cleanup level specified in WAC 173-204-560(2)(a).

POC at the Site is 30 cm (approximately 1 foot). Benthic protection is required on a point-by-point SCL basis (benthic protection criteria in accordance with the SMS).

For bioaccumulative contaminants of potential concern, such as total PCBs and D/F TEQ, the horizontal POC defined under SMS is based on the surface weighted average concentration (SWAC). SWACs are applied to the entire Site area that exceeds the site-specific SCL. In accordance with the CAP, the SWAC compliance area encompasses all surface and near-surface sediment areas (i.e., to a depth of 1 foot below mudline) with concentrations of total PCBs and/or D/F TEQ exceeding preliminary SCO chemical criteria.

1.2.4 Marine Sediment Remediation Levels

As described in WAC 173-340-355, a cleanup action selected for a site will often involve a combination of cleanup action components and RELs may be used to identify the concentrations (or other methods of identification) of hazardous substances at which different cleanup action components will be implemented. RELs are not cleanup levels and, by definition, these exceed cleanup levels. RELs must meet each of the minimum requirements of cleanup as specified in WAC 173-340-360.

To assist in the development of marine sediment remediation alternatives, preliminary sediment RELs were derived during the FS, using benthic SCOs and site-specific human health-based sediment SCOs. A "hill-topping" analysis was used in the FS to evaluate the relationship between the REL and the resulting total PCB and D/F TEQ SWAC at the Site following remediation, assuming natural background replacement values for remediated areas (1.6 µg/kg dw and 1.8 ng/kg dw for total PCBs and D/F TEQ, respectively).

Higher concentration break points were determined by applying SMS benthic protection levels for total PCBs. Best professional judgment was used for higher concentration break point for D/F TEQ at 15 ng/kg, based on direct contact levels presented in SCUM.

The following concentration break points were used to establish REL values in the FS:

- Total PCBs:
  - Monitored Natural Recovery (MNR) REL: 30 µg/kg dw (human health protection-based SCO)
  - Enhanced Monitored Natural Recovery (EMNR) REL: 117 µg/kg (hill-topping-based REL to achieve a 30 µg/kg dw SWAC)
  - Removal REL: 130 µg/kg dw (benthic protection SCO)
- D/F TEQ:
  - MNR REL: 5 ng/kg dw (PQL based SCO)
  - EMNR REL: 8 ng/kg dw (hill-topping-based REL to achieve a 5 ng/kg dw SWAC)

  - Removal REL: 15 ng/kg dw (best professional judgment direct contact [Ecology 2019])

While areas identified as high concentration in the "hill-topping" analysis will be removed during remedial action, other areas have contamination above CUL values. WAC 173-204-500(4) states that for sites with sediment contamination, EMNR and/or MNR may be appropriate following the active remediation of areas with higher contamination. These technologies may be used at the Site for these scenarios.

Available data indicate limited presence of wood in marine sediments, characterized as total volatile solids (TVS) and by visual observation of sediment cores. However, because of extensive historical in-water log rafting, log rafting storage on the tide flat, and lumber processing operations in the Logway area at the Site, accumulations of wood waste may be present but not yet identified[3].

Additional data will be collected within the Site footprint as a component of the Step 2 PRDI implementation by sieving the 0- to 1-foot surface interval at select locations for total wood debris by volume. Locations with less than 25% wood debris by volume are unlikely to cause adverse effects to the benthic community and have been selected as an SCL for other remediation sites managed by Ecology (Ecology 2013).

1.3 Summary of the Selected Cleanup Action

As described in the CAP, marine sediment cleanup actions at the Site will include the following (Figure 2):

- Remove and dispose of accumulated sediment or debris from the stormwater system in the upland portion of the Site.
- Remove and dispose of piling and other creosote-treated wood debris in SMAs 1, 2, and 3.
- Demolish and dispose of two shoreline bulkheads and the remnant barge structure.
- Construct shoreline erosion protection along the top of the bank adjacent to the marine SMA-3 (as needed).
- Monitor the natural recovery of surface sediments in SMA-1 (areas with sediment concentrations between 5 and 8 ng/kg dw D/F TEQ and areas with sediment concentrations between 30 and 117 µg/kg dw total PCBs).
- Place an EMNR layer in areas with sediment concentrations between 8 and 15 ng/kg dw D/F TEQ and in areas with sediment concentrations between 117 and 130 µg/kg dw total PCBs as follows:
  - Procure clean silty sand from a commercial upland or beneficial reuse source (dredged silty sand materials from the Snohomish River, for example).

[3] Historical operations related to log rafting, log storage, and lumber processing in the Logway are not associated with the former Nord Door Facility operations.

  - Place a nominal 6-inch-thick layer of clean silty sand over SMA-2.
  - Monitor the effectiveness of EMNR actions upon completion of construction.
- Excavate sediments in SMA-3 (and portions of SMA-2[4]) in areas with sediment concentrations above 15 ng/kg dw D/F TEQ, and in areas with sediment concentrations above 130 µg/kg dw total PCBs as follows:
  - Remove sediments from the top 2 to 4 feet of SMA-3 and a portion of SMA-2 using land-based low ground pressure equipment and placement methods as appropriate.
  - Excavation in the north inlet area will also require shoring to protect the adjacent upland area where an access road and underground utilities are located at the top of the slope.
  - Removal volumes will include an assumed over-depth allowance of 0.25 foot and will include volume to account for engineering factors (e.g., side slopes, level cuts, etc.) as part of the remedial design.
  - Place clean backfill in areas of SMAs 2 and 3 where excavation depths are sufficient to remove sediment with concentrations above 8 ng/kg dw D/F TEQ and 117 µg/kg dw total PCBs (these areas will be considered EMNR areas post-removal).
  - Remove temporary shoring used to protect the slope adjacent to the upland side of the excavation.
- Manage excavated material as follows:
  - Temporarily stockpile excavated material in an upland stockpile area constructed to contain water generated from sediment dewatering and precipitation.
  - Treat water generated from temporary stockpiles for discharge as required by permits.
  - Dispose of the dewatered excavated material in an off-site Subtitle D landfill.
- Construct an engineered cap over a portion of SMA-3 if needed (Logway area), following a 2-foot excavation, as follows:
  - Procure clean cap material from a commercial upland source.
  - Construct a 2-foot-thick cap over the excavated area using land-based low ground pressure equipment and placement methods as appropriate.
  - Monitor the physical integrity of the engineered cap upon completion of construction.
  - Areas where excavation depths are sufficient to remove sediment with concentrations above 8 ng/kg dw D/F TEQ and 117 µg/kg 7 dw total PCBs will be backfilled and not require an engineered cap.
- Ecology will determine which institutional controls and appropriate requirements the performing potentially liable persons must implement to protect and maintain engineered caps during design, and that may include health and safety requirements for future Site

[4] Ecology has required removal of additional PCB-impacted sediment in the SMA-2 Knoll Area. This removal area will be determined during design.

workers potentially exposed to intertidal sediments, restrictions on activities that could impact engineered caps, or other appropriate controls.

- The selected cleanup will include periodic post-construction sampling and testing of sediments within the biologically active zone to verify that cleanup standards are met and continue to be met. The scope and details of the long-term monitoring will be refined during remedial design. Long-term monitoring will continue as long as contamination remains contained on the Site in excess of cleanup standards.

Removal of contaminated sediment and creosote-treated wood will likely entail accessing excavation areas from the shoreline at low tide using land-based equipment. Removal in SMA-3 and portions of SMA-2 adjacent to the Knoll Area will address sediments that are potentially a source of PCBs in upland groundwater. Remaining contaminated sediment will be managed by capping or backfilling excavated areas. Placement of EMNR material and engineered caps using land-based equipment and working in the dry will allow for more accurate placement and verification than through water column subtidal placement methods.

The SMA-3 Logway area engineered cap monitoring and maintenance will be conducted in accordance with an approved, long-term operations monitoring and maintenance plan, which will be developed as part of remedial design. The estimated construction duration for this alternative would span multiple in-water construction seasons (approximately 7 to 8 months).

The extent of engineered caps and removal areas will be refined by the potentially liable persons and provided to Ecology for review and approval during remedial design. Requirements for shoreline protection and slope stabilization in demolition and piling removal areas, and in areas adjacent to engineered caps or excavations will also be refined during remedial design, including considerations for climate change and seismic stability.

1.4 Pre-Remedial Design Investigation (Step 2) Work Plan Objectives

Following review of the data collected under the Step 1 PRDI WP, the Step 1 results improved the lateral delineation of the Site. However, additional surface sampling is required to complete the delineation. This Step 2 PRDI WP will do the following:

- Describe the data needs and process for collecting additional surface sediment chemical concentration data to inform the lateral extent of contamination for remedial design.
- Describe the data needs and process for collecting additional subsurface sediment chemical concentration data to inform the vertical extent of contamination for remedial design of dredge/excavation prisms within the refined SMAs to achieve complete removal of areas exceeding RELs within SMA-3 and a small portion of SMA-2 within the Knoll Area, or to inform engineered cap design.

- Describe the data needs and process for collecting additional upland soil geotechnical data to inform remedial excavation design and potential shoring requirements.
- Describe the data needs and process for collecting marine porewater chemical concentration data to inform potential capping design in portions of SMA-3 (and a small portion of SMA-2 in the Knoll Area, pending remedial design).

The remedial design will include SMAs designated for MNR (SMA-1), EMNR (SMA-2), removal and backfill (portions of SMA-3), and removal with follow-on engineered capping as needed (portions of SMA-3). The remedial design for the required marine sediment cleanup action at the Site will comply with the SMS SCL as described in Section 1.2.

1.5 Pre-Remedial Design Investigation Work Plan Organization

This PRDI WP document is organized as follows:

- Section 2 provides an overview of the existing information available from prior RI/FS and Step 1 PRDI sampling and analysis.
- Section 3 presents a summary of data gaps to complete the remedial design and outlines PRDI components.
- Section 4 identifies the applicable permitting and regulatory requirements.
- Section 5 presents the preliminary PRDI WP and implementation schedule.
- Section 6 lists references cited in this PRDI WP.
- Appendix A presents the Sampling and Analysis Plan (SAP) that describes detailed sampling methodologies to be used during the PRDI.
- Appendix B presents the Quality Assurance Project Plan that describes the analytical methodology and quality assurance protocols to be used during the PRDI.
- Appendix C presents the Health and Safety Plan that describes the health and safety procedures that will be followed during field activities conducted at the Site.

2 Existing Data

This section and Tables 2a, 2b, and 2c provide an overview of existing information available from prior RI/FS investigations and the Step 1 PRDI sampling and analysis of marine sediment.

2.1 Summary of Remedial Investigation and Step 1 PRDI Data

Multiple investigations were completed at the Site between 1991 and 2021. The results of these studies are described in the RI/FS (SLR and Anchor QEA 2021). The subsections below summarize the current marine sediment data from the RI/FS, as well as surface sediment results from the 2023 Step 1 PRDI implementation. Unvalidated Step 1 data have also been utilized to update lateral interpolations for surface sediment (0 to 1-foot) chemical concentrations at the Site.

2.1.1 Wood Debris (Total Organic Carbon and Total Volatile Solids)

Surface sediment samples collected previously and tested at the Site (i.e., during the RI and during the Step 1 PRDI) resulted in TVS concentrations that ranged from 1.34% to 10.53%, with an average of 4.5%. These concentrations are below wood waste cleanup standards at other Puget Sound sediment cleanup sites.

Site total organic carbon (TOC) testing ranged results ranged from 0.29% to 6.7% with an average of 2.28%. Six locations resulted in TOC concentrations greater than 3.5%. The locations where TOC is greater than 3.5% are near the shoreline and within areas where the planned remedial technology is removal or removal and capping.

Figure 3 depicts the TOC and TVS data; locations where TOC was greater than 3.5% are shown as orange circles, and TVS results are shown as squares (locations with full 1-foot recovery) or triangles (locations with less than 1-foot recovery due to refusal).

The TVS and TOC results provide two lines of evidence that there are no wood waste exceedances anticipated at the Site. However, given the historical uses of the Site, wood waste exceedances as defined in the CAP (i.e., a nominal 1-foot or greater thickness containing >25% wood by volume) may still exist. There remains some uncertainty regarding TVS and the presence of wood in locations where Step 1 PRDI TVS could not be advanced to a full 1-foot depth in the field, as depicted in Figure 3. In some of these locations, it is possible that wood caused the refusal. Therefore, additional characterization of wood volume in these locations is proposed (Section 3.1).

2.1.2 Carcinogenic Polycyclic Aromatic Hydrocarbons

In accordance with the RI/FS and CAP, compliance with background based cPAH TEQ is integrated into the Step 1 PRDI. Prior to the Step 1 PRDI, very few surface sediment results were available to establish an accurate SWAC estimate. However, the CAP established a post-construction SCL for

cPAH TEQ at equal to or less than 21 µg/kg. Figure 4 depicts an updated inverse-distance-weighting (IDW) interpolation of the cPAH TEQ results allowing for more detailed estimate of the SWAC within the marine site boundary. For Step 2, the interpolation is used to inform where additional resolution and sampling is required to enhance the standard IDW spatial model. In design, the combined extents of EMNR and removal/capping will be evaluated to calculate a post-construction cPAH TEQ SWAC. If the resulting SWAC is greater than 21 µg/kg, additional EMNR placement may be required in design to achieve compliance.

2.1.3 Dioxin/Furan Toxicity Equivalence

The marine areas of the Site were delineated in the CAP based on exceedances of the D/F cleanup level (5 ng/kg TEQ). As depicted in Figure 5, these IDW spatial models were updated with the Step 1 PRDI data and include all surface sediment D/F TEQ data collected to date, both within and immediately adjacent to the Site. Concentrations of D/F TEQ exceeding the REL for removal (15 ng/kg) were detected in all three areas. The D/F TEQ cleanup and remediation levels, for sediment at the Site, are summarized in Section 1.2.

2.1.4 Total Polychlorinated Biphenyls

The marine areas of the Site were delineated in the CAP based on exceedance of the total PCB cleanup level for protection of human health (30 µg/kg). As depicted in Figure 6, the IDW spatial model was updated with Step 1 PRDI data and includes all surface sediment total PCB data collected to date, both within and immediately adjacent to the Site. Concentrations of PCBs exceeding the REL for removal (130 µg/kg) were only detected in Knoll Area. PCB cleanup and remediation levels, for sediment at the Site, are summarized in Section 1.2.

2.2 Groundwater and Porewater Considerations

As discussed in the RI/FS, the Knoll Area conceptual site model indicates that PCB groundwater contamination in the Knoll Area groundwater is the result of sediment chemical partitioning and tidal inundation as a source. As such, the selected remedial action (removal) should decrease PCB concentrations in Knoll Area groundwater over time. If groundwater remains contaminated post-remedial actions, additional actions protective of human and environmental health may be needed. Upon review of the PRDI data, additional measures to address groundwater (e.g., amendments in backfill) may be considered during remedial design to address groundwater in the Knoll Area.

As described in the CAP, the selected cleanup remedy for the Logway is 2-foot removal with an engineered cap. Alternatively, if complete removal can be achieved in the Logway (or in portions of the Logway) then complete removal may be preferable over partial removal and capping (pending further evaluation during remedial design).

To evaluate capping for the Logway and Knoll Area during design, data are needed to confirm that porewater will not contaminate overlying cap material. Ex situ solid phase microextraction (SPME) samples will be taken during the Step 2 PRDI field event to inform capping design and ensure sufficient chemical and physical isolation of contamination remaining under capped areas post-remedial action.

2.3 Enhanced Monitored Natural Recovery and Excavation/Capping Areas

To enable identification of spatial data gaps to be addressed in Step 2, EMNR and excavation/capping remedial action areas within the Site boundary have been preliminarily updated and are depicted in Figure 7:

- EMNR: EMNR area by acreage has remained fairly unchanged since considering Step 1 data, but areas have decreased in the Logway.
- Excavation/capping: Excavation/capping may extend into the EMNR areas subject to remedial design. Areas have decreased in the Logway and South Shoreline and increased in the Knoll Area following Step 1.

Updated EMNR and excavation/capping boundaries utilized all data collected during the Step 1 field effort, even when refusal was met prior to achieving a 1-foot depth. However, when evaluating data gaps for this Step 2 PRDI WP, updated D/F TEQ interpolations in the Logway and South Shoreline were prepared using both the complete Step 1 data set, including samples where refusal was met prior to achieving the 1-foot depth, and the data set excluding those data, where refusal was met prior to achieving the 1-foot depth (Section 3).

3 Remedial Design Data Gaps and Pre-Design Investigation

This section provides a summary of remaining data gaps that will be addressed by the PRDI.

3.1 Remedial Design Data Gaps

The existing data summarized in Section 2 were used to iteratively update the characterization of the nature and extent of COC contamination in the marine portions of the Site to evaluate data needs for this Step 2 PRDI WP. As described in Section 1.3 and in the CAP, sediment removal (i.e., excavation) will occur in SMAs 2 and 3, engineered sediment caps will be constructed in areas where complete removal (i.e., concentrations above; 15 ng/kg dw D/F TEQ and 130 µg/kg dw total PCBs) cannot be achieved. An EMNR layer will be placed in areas with sediment concentrations between 8 and 15 ng/kg dw D/F TEQ and in areas with sediment concentrations between 117 and 130 µg/kg dw total PCBs.

Based on review of the unvalidated Step 1 PRDI data, the following data gaps remain:

- TOC and TVS data collected to date have not indicated the potential for wood exceedances at the Site (Section 2.1.1). During the Step 1 PRDI, many of the surface sediment samples hit refusal before reaching the 0- to 1-foot POC. To address the remaining uncertainty regarding the presence of wood, additional evaluation of wood volume from the 0- to 1-foot interval and potentially deeper 1-foot intervals is needed.
- The remedial action needs to result in a post-cleanup cPAH TEQ SWAC that meets cPAH TEQ background concentrations. The reduction will be achieved when replacing surface sediment cPAH TEQ concentrations in removal and EMNR areas with clean backfill, capping, or EMNR material. To conduct this evaluation, additional cPAH data are needed from within the Site boundary outside of areas where removal or EMNR are likely occur. These additional cPAH data should also target areas where the current IDW interpolation indicates higher concentrations (Figure 4).
- Further lateral delineation of surface sediment D/F TEQ and PCB chemical concentrations in EMNR and removal and/or capping areas is needed to refine these areas for the remedial design and to ensure actions are protective of human health. Defining the lateral extent of contamination was the primary objective of the Step 1 PRDI; however, as anticipated, additional surface sediment testing would be needed during the Step 2 PRDI. Additionally, chemical characterization data for D/F TEQ and PCBs are needed for sediment behind the bulkheads in the Logway that will be removed as part of the cleanup action. These surface sediment chemical characterization data are needed to inform disposal/material management and evaluate recontamination potential, during remedial design and construction.
- This Step 2 PRDI will address subsurface chemical concentration data needs to inform the remedial design of dredge/excavation prisms (i.e., depth of contamination within the laterally

refined removal and EMNR areas) and achieve complete removal of areas within SMA-3 and portions of SMA-2 within the Knoll Area, or to inform engineered cap design in areas where complete removal of sediment is not feasible.

- Geotechnical data to characterize material physical properties within the immediately adjacent shoreline slopes, to support remedial excavation design and potential shoring requirements, will also be addressed in the Step 2 PRDI.
- Porewater data in SMA-3 (and a small portion of SMA-2 in the Knoll Area, subject to remedial design), to ensure capping will remain protective and will not be subject to recontamination, will also be addressed in the Step 2 PRDI.

Section 3.2 discusses the scope of work required to address these data gaps for each area.

3.2 Step 2 Pre-Remedial Design Investigation Scope of Work

This section presents the Step 2 PRDI scope of work to address data gaps presented in Section 3.1. A total of 22 additional surface sediment grabs or short cores[5], 31 sediment cores for surface and subsurface delineation data, 13 sediment cores for sieving and wood volume measurements, 8 upland geotechnical boring locations, 6 ex situ porewater SPMEs, and 2 surface sediment composite samples behind the Logway bulkheads will be collected during the Step 2 PRDI to address remaining data gaps (Figures 3, 4, 8a, 8b, 9a, 9b, 10a, and 10b). All samples will be collected using sampling and coring procedures and techniques described in the SAP (Appendix A). The analytical methodology and quality assurance protocols to be used during the PRDI are described in the Quality Assurance Project Plan (Appendix B). The Site has been divided into three areas (Figure 1) based on previous investigations.

Each station will collect sufficient sample mass for testing for the given analytical program outlined in Sections 3.2.1 to 3.2.3. Chemistry samples will initially be tested for select parameters depending on the location and remedial technology.

3.2.1 Knoll Area

The removal, EMNR, and MNR boundaries in the Knoll Area were controlled by PCB exceedances following the RI/FS. However, during the Step 1 PRDI, areas of potential D/F TEQ exceedances were also identified in the Knoll Area (Figure 5). It is also possible that previously unidentified wood may be present in this area based on historical log rafting use. As described in the RI/FS, possible PCB contamination sources include fill that comprises the Knoll upland and potential surficial releases to sediment.

[5] If a sediment grab cannot be successfully collected at a location due to site conditions (coarse material or debris preventing jaws from closing, etc.), a 3-foot short core will be taken at the target location to ensure a full 1-foot of recovery. Only the top 1 foot of the core would be processed for chemical sampling, and the remaining core disposed of.

Sampling in this area will focus on further delineating and confirming the lateral and vertical extent of PCB and D/F TEQ contamination, further verifying that in situ wood volume does not exceed 25% and collecting additional cPAH TEQ data to evaluate post-cleanup cPAH SWACs for compliance with cleanup requirements. Additional cPAH data will be collected from outside of areas where removal will likely occur, and in areas where the current IDW interpolation indicates higher concentrations (Figure 4).

The sampling design includes collection of samples at targeted locations, based on the preliminary updated D/F TEQ and PCB interpolations, as well as previous TOC and TVS results. Samples will be analyzed for D/F TEQ and/or PCBs, and wood volume measurements will be made in the field by sieving as described in the SAP (Appendix A). Additional sample volume will be archived for potential future analysis of D/F TEQ or PCBs as described in the following sections. Sampling in the Knoll Area will include 22 locations.

3.2.1.1 Surface Sediment D/F and PCB Delineation

Surface sediment (0- to 1-foot) samples for additional lateral delineation of D/F TEQ and PCB concentrations at the Knoll Area will be collected based on the updated preliminary interpolations incorporating the Step 1 D/F TEQ and PCB data. Samples will include the following:

- Four sediment short cores (3-foot) for D/F TEQ analysis to further delineate the D/F TEQ removal area (greater than 15 ng/kg), as depicted in Figure 8a
- Five sediment short cores (3-foot) or surface (1-foot) power grabs for D/F TEQ analysis to further delineate the D/F TEQ EMNR area (8 to 15 ng/kg), as depicted in Figure 8a
- Five sediment short cores (3-foot) for PCB analysis to further delineate the PCB removal area (greater than 130 µg/kg), as depicted in Figure 8b
- A total of 11 sediment short cores (3-foot) or surface (1-foot) power grabs for archiving only to further delineate removal or EMNR areas, as needed, based on initial Step 2 results, as depicted in Figures 8a and 8b

3.2.1.2 Surface Sediment cPAH Evaluations

As described in Section 3.1, additional cPAH TEQ data will be collected to evaluate post-cleanup cPAH TEQ SWACs for compliance with cleanup requirements. Six sediment short cores (3-foot) or surface (1-foot) power grabs for cPAH TEQ analysis will be collected to provide additional surface sediment (0- to 1-foot) cPAH data from outside of areas where removal will likely occur, and in areas where the current IDW interpolation indicates higher concentrations (Figure 4). These cPAH TEQ data will be used during remedial design to calculate the post-cleanup cPAH SWAC at the Site (including removal, EMNR, and MNR areas) based on replacing the surface sediment cPAH TEQ concentrations from removal and EMNR areas with clean backfill, capping, or EMNR material that will be below cPAH background concentrations. Based on the current IDW interpolation in Figure 4, elevated cPAH

TEQ sediment concentrations, outside of areas where removal will likely occur, are mainly in the Knoll Area. As such, additional cPAH data collection is not planned for the South Shoreline or Logway.

3.2.1.3 Subsurface Sediment D/F and PCB Delineation

Nine subsurface cores (0- to 3-foot) will be collected for vertical delineation of D/F TEQ (four cores; Figure 8a) and PCB (five cores; Figure 8b) concentrations at the Knoll Area. Cores will be advanced and sampled in discreet 1-foot intervals. At each core location, samples from the 0- to 1-foot interval will be analyzed for D/F TEQ or PCBs, for additional lateral delineations (as described in Section 3.2.1.2) and the 1- to 2-foot interval will be analyzed for D/F TEQ or PCBs to evaluate depth of contamination and a 1-foot removal depth. Remaining sample volumes for the 0- to 1-foot and 1- to 2-foot intervals, and all sample volume for the 2- to 3-foot interval will be archived for potential future analyses based on initial results. If the 1- to 2-foot interval exceeds the 15 ng/kg D/F TEQ REL for removal or the 130 µg/kg PCB REL for removal, the 2- to 3-foot interval will be analyzed for the parameter(s) that exceeded the REL.

3.2.1.4 Wood Volume Measurements

Four subsurface short cores (0- to 3-foot) for wood volume measurements will be advanced at the locations in the Knoll Area, as depicted in Figure 3. The locations of these sieving and wood volume measurement cores were selected to provide spatial coverage throughout the area, outside of locations where removal will likely occur, to evaluate the post-cleanup conditions. Additionally, wood volume measurement locations were selected to coincide with previous Step 1 PRDI locations where refusal was encountered (all four locations encountered refusal in Step 1). By re-occupying these locations, uncertainties regarding the potential presence of wood and the cause of Step 1 PRDI refusals will be directly addressed. The 0- to 1-foot interval in each core will be sieved for wood volume measurements, while the 1- to 2-foot and 2- to 3-foot intervals may be subsequently sieved for wood volume measurements based on visual observations of the 0- to 1-foot interval. Detailed procedures for sieving, wood volume measurements, and criteria/rationale for whether deeper intervals will be sieved for wood volume measurements are included in the SAP (Appendix A).

3.2.1.5 Porewater D/F TEQ and PCB Capping Evaluation

Two porewater evaluation samples will be collected from subsurface sediment core locations. These will require advancing a second core at the noted locations. One sample will be analyzed for D/F TEQ (Figure 8a) and the other sample will be analyzed for PCBs (Figure 8b), using the ex situ SPME methodology detailed in the SAP (Appendix A). Based on the depth of contamination data in the RI/FS, capping is not anticipated in the Knoll Area. Complete removal with an assumed depth of 2 feet is the selected cleanup action in the CAP. However, porewater SPME samples will be collected, from the 2- to 3-foot interval, to inform potential capping design and additional measures to address groundwater (e.g., amendments in backfill) that will be evaluated in remedial design to address groundwater in the Knoll Area.

3.2.1.6 Geotechnical

One geotechnical boring will be sampled from an upland shoreline location immediately adjacent to the intertidal cleanup areas, as depicted in Figures 8a and 8b. The geotechnical boring will be advanced to and sampled at each unique lithology, for moisture content,, specific gravity, , grain size, Atterberg limits, and bulk density, as further detailed in the SAP (Appendix A).

3.2.2 South Shoreline

As described in the RI/FS and further verified during the Step 1 PRDI, removal, EMNR, and MNR boundaries for this area are controlled by D/F TEQ concentrations. It is also possible that previously unidentified wood may be present in this area based on historical uses. Sampling in this area will focus on further delineating and confirming the lateral and vertical extent of D/F TEQ contamination and further verifying that in situ wood volume does not exceed 25%.

The sampling design includes collection of samples at targeted locations, based on the updated D/F interpolation and previous TOC and TVS results. Samples will be analyzed for D/F TEQ, and wood volume measurements will be made in the field as described in the SAP (Appendix A). Additional sample volume will be archived for potential future analysis of D/F TEQ as described in the following sections. Sampling in the South Shoreline will include 25 locations.

3.2.2.1 Surface Sediment D/F Delineation

A total of 16 surface sediment (0- to 1-foot) samples for additional lateral delineation of D/F TEQ concentrations at the South Shoreline will be collected from sediment cores located along the edge of, and within, the current removal area (greater than 15 ng/kg), based on the updated interpolations incorporating the Step 1 D/F TEQ data. These proposed sample locations are shown in Figure 9a (updated interpolation with all Step 1 PRDI data) and in Figure 9b (updated interpolation excluding data with less than 1 foot of recovery based on refusal). Although the two interpolations are not substantively different, the proposed locations were selected, using both interpolations, to demonstrate that Step 2 data gaps consider both potential scenarios.

3.2.2.2 Subsurface Sediment D/F Delineation

A total of 16 subsurface cores (0- to 6-foot) will be collected for vertical delineation of D/F TEQ concentrations at the South Shoreline, sampled in discreet 1-foot intervals (Figures 9a and 9b). At each core location, samples from the 0- to 1-foot interval will be analyzed for D/F TEQ, for additional lateral delineations (as described in Section 3.2.2.1) and the 3- to 4-foot interval will be analyzed for D/F TEQ to evaluate depth of contamination and a 3-foot removal depth. Remaining sample volumes for the 0- to 1-foot and 3- to 4-foot intervals, and all sample volumes for the 1- to 2-foot, 2- to 3-foot, 4- to 5-foot, and 5- to 6-foot intervals will be archived for potential future analyses based on initial results. If the 3- to 4-foot interval exceeds the 15 ng/kg REL for removal, deeper intervals will be analyzed until a depth interval with a concentration less than the 15 ng/kg REL for removal is

identified. Conversely, if the 3- to 4-foot interval is less than the 15 ng/kg REL for removal, the 2- to 3-foot interval will be analyzed for D/F TEQ to evaluate depth of contamination and a 2-foot removal depth, as appropriate.

3.2.2.3 Wood Volume Measurements

Six subsurface short cores (0- to 3-foot) for wood volume measurements will be advanced at the locations along the South Shoreline, as depicted in Figure 3. The locations of these sieving and wood volume measurement cores were selected to provide spatial coverage throughout the area, outside of locations where removal will likely occur, to evaluate the post-cleanup conditions. Additionally, wood volume measurement locations were selected to coincide with previous Step 1 PRDI locations where refusal was encountered (five out of the six locations encountered refusal during the Step 1 PRDI). By re-occupying these locations, uncertainties regarding the potential presence of wood and the cause of Step 1 PRDI refusals will be directly addressed. The 0- to 1-foot interval in each core will be sieved for wood volume measurements, while the 1- to 2-foot and 2- to 3-foot intervals may be subsequently sieved for wood volume measurements based on visual observations of the 0- to 1-foot interval. Detailed procedures for sieving, wood volume measurements, and criteria/rationale for whether deeper intervals will be sieved for wood volume measurements is included in the SAP (Appendix A).

3.2.2.4 Porewater D/F Capping Evaluation

Two porewater evaluation samples will be collected and analyzed for D/F TEQ using the ex situ SPME methodology detailed in the SAP (Appendix A). These will require advancing a second core at the noted locations. Based on the depth of contamination data in the RI/FS, capping is not anticipated in the South Shoreline. Complete removal with an assumed depth of 4 feet is the selected cleanup action in the CAP. However, porewater SPME samples will be collected, from the 2- to 3-foot interval, to inform potential capping design if deeper REL exceedances are identified during Step 2 PRDI and deeper removal is determined to be infeasible during design. The locations of the proposed porewater SPME samples are depicted in Figures 9a and 9b.

3.2.2.5 Geotechnical

Three geotechnical borings will be sampled from upland shoreline locations immediately adjacent to the intertidal cleanup areas, as depicted in Figures 9a and 9b. Geotechnical borings will be advanced and sampled at each unique lithology, for moisture content, standard penetration testing, specific gravity, organic content, grain size, Atterberg limits, and bulk density, as further detailed in the SAP (Appendix A).

3.2.3 Logway

As described in the RI/FS and further verified in the Step 1 PRDI, the Logway removal, EMNR, and MNR boundaries are controlled by D/F TEQ exceedances. It is also possible that previously unidentified wood waste may be present in this area based on historical uses. Sampling in this area will focus on further delineating and confirming the lateral and vertical extent of D/F TEQ contamination, and further verifying that in situ wood volume does not exceed 25%.

The sampling design includes collection of samples at targeted sampling locations, based on the updated D/F interpolation and previous TOC and TVS results. Samples will be analyzed for D/F TEQ, and wood volume measurements will be made in the field as described in the SAP (Appendix A). Additional sample volume will be archived for potential future analysis of D/F TEQ as described in the following sections. Sampling in the Logway will include 13 discrete core locations and 2 bank sediment composite samples (1 made up of 6 subsamples and one made up of 3 subsamples).

3.2.3.1 Surface Sediment D/F Delineation:

Six surface sediment (0- to 1-foot) samples for additional lateral delineation of D/F TEQ concentrations at the Logway will be collected from sediment cores located along the edge of, and within, the current removal areas (greater than 15 ng/kg) based on the updated interpolations incorporating the Step 1 D/F TEQ data. These proposed sample locations are shown in Figure 10a (updated interpolation with all Step 1 PRDI data) and in Figure 10b (updated interpolation excluding data with less than 1-foot of recovery based on refusal). Although the two interpolations are not substantively different, the proposed locations were selected, using both interpolations, to demonstrate that Step 2 data gaps consider both potential scenarios.

3.2.3.2 Characterization of Surface Sediment Behind Bulkheads

As discussed in Section 3.1, chemical characterization data are needed for sediment behind the bulkheads in the Logway that will be removed as part of the cleanup action. Composite surface sediment (0- to 0.5-foot) samples will be collected from behind each of the two bulkheads. The composite sample behind the longer bulkhead (furthest to the southeast) will be composed of six subsamples, and the composite sample behind the shorter bulkhead (to the northwest) will be composed of three subsamples. The subsample aliquots will be collected by hand and composited following the procedures specified in the SAP (Appendix A). Locations of these subsamples may be adjusted in the field based on access and visual observations of material variability (i.e., distinct material type will be sampled as part of the composite to ensure the composite is representative of the area).

3.2.3.3 Subsurface Sediment D/F Delineation

Six subsurface cores (0- to 8-foot) for vertical delineation of D/F TEQ concentrations at the Logway, will be sampled in discreet 1-foot intervals (Figures 10a and 10b). At each core location, samples

from the 0- to 1-foot interval will be analyzed for D/F TEQ, for additional lateral delineations (as described in Section 3.2.3.1) and the 3- to 4-foot interval will be analyzed for D/F TEQ to evaluate depth of contamination and a 3-foot removal depth. Remaining sample volumes for the 0- to 1-foot and 3- to 4-foot intervals, and all sample volumes for the 1- to 2-foot, 2- to 3-foot, 4- to 5-foot, and 5- to 6-foot intervals will be archived for potential future analyses based on initial results. If the 3- to 4-foot interval exceeds the 15 ng/kg D/F TEQ REL for removal, deeper intervals will be analyzed until a depth interval with a concentration less than the 15 ng/kg REL for removal is identified. Conversely, if the 3- to 4-foot interval is less than the 15 ng/kg REL for removal, the 2- to 3-foot interval will be analyzed for D/F TEQ to evaluate depth of contamination and a 2-foot removal depth, as appropriate.

3.2.3.4 Wood Volume Measurements

Three subsurface short cores (0- to 3-foot) for wood volume measurements will be advanced at the locations in the Logway, as depicted in Figure 3. The locations of these sieving and wood volume measurement cores were selected to provide spatial coverage throughout the area, outside of locations where removal will likely occur, to evaluate the post-cleanup conditions. Additionally, wood volume measurement locations were selected to coincide with previous Step 1 PRDI locations where refusal was encountered (two out of the three locations encountered refusal during the Step 1 PRDI). By re-occupying these locations, uncertainties regarding the potential presence of wood and the cause of Step 1 PRDI refusals will be directly addressed. The 0- to 1-foot interval in each core will be sieved for wood volume measurements, while the 1- to 2-foot and 2- to 3-foot intervals may be subsequently sieved for wood volume measurements based on visual observations of the 0- to 1-foot interval. Detailed procedures for sieving, wood volume measurements, and criteria/rationale for whether deeper intervals will be sieved for wood volume measurements is included in the SAP (Appendix A).

3.2.3.5 Porewater D/F Capping Evaluation

Two porewater evaluation samples will be collected and analyzing for D/F TEQ using the ex situ SPME methodology detailed in the SAP (Appendix A). These will require advancing a second core at the noted locations. Based on the depth of contamination data in the RI/FS, capping is anticipated in portions of the Logway. Partial (2-foot) removal and engineered capping is the selected cleanup action for the Logway in the CAP. Porewater SPME samples will be collected, from the 2- to 3-foot interval, to inform the capping design, assuming REL exceedances are identified during the Step 2 PRDI, and deeper removal is determined to be infeasible[6] during design. The preferred cleanup action in the Logway is to remove all, and it will be evaluated further during remedial design. The locations of the proposed porewater SPME samples are depicted in Figures 9a and 9b.

[6] Over-steepened shoreline slopes adjacent to the Logway removal areas will likely limit the extraction depths that can feasibly be achieved in the Logway.

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3.2.3.6 Geotechnical

Four geotechnical borings will be sampled from upland shoreline locations immediately adjacent to the intertidal cleanup areas, as depicted in Figures 10a and 10b. Geotechnical borings will be advanced and sampled at each unique lithology, for moisture content, standard penetration testing, specific gravity, organic content, grain size, Atterberg limits, and bulk density as described in the SAP (Appendix A).

4 Permitting and Regulatory Requirements

This section summarizes anticipated permit requirements and approximate timelines for the project. The remedial action is subject to several federal regulations intended to protect water quality, wildlife, cultural and tribal resources, and navigation. However, MTCA remedial actions conducted under a consent decree or AO are exempt from the procedural requirements of certain state laws, including the following (WAC 173-340-710(9)):

- Chapter 70A.15 Revised Code of Washington (RCW; Washington Clean Air Act)
- Chapter 70A.205 RCW (Solid Waste Management Reduction and Recycling)
- Chapter 70A.300 RCW (Hazardous Waste Management)
- Chapter 77.55 RCW (Construction Projects in State Waters)
- Chapter 90.48 RCW (Water Pollution Control)
- Chapter 90.58 RCW (Shoreline Management Act)

This exemption also applies to local government permits or approvals (in this case, City of Everett requirements). Implementation of the cleanup action must still comply with the substantive requirements of any otherwise applicable permits. Also, these exemptions do not apply if they would result in loss of approval from a federal agency necessary for the state to administer any federal law.

4.1 Federal Review and Authorizations

In-water remedial action work will require authorization from the U.S. Army Corps of Engineers (Corps) under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act. The Corps permitting process incorporates consultation with several other agencies, including the following:

- National Marine Fisheries Service and U.S. Fish and Wildlife Service (the Services) for compliance with the Endangered Species Act (Section 7) and the Magnuson-Stevens Fishery Conservation and Management Act
- Native American Tribes and Washington State Department of Archaeology and Historic Preservation for compliance with the National Historic Preservation Act (Section 106)
- Ecology for Clean Water Act Section 401 compliance
- Ecology for Coastal Zone Management Act compliance
- U.S. Coast Guard for aids to navigation requirements

The Corps issues authorizations in the form of Nationwide Permits (NWPs) and Individual Permits. NWPs are issued for types of activities that are similar in nature and have minimal individual and cumulative adverse environmental effects. For some NWPs, Ecology water quality and coastal zone compliance has already been granted (provided the project meets specific conditions). NWPs are typically issued within 3 to 6 months after the Corps determines the application is complete. In

contrast, Individual Permits are issued by the Corps for larger, more complex projects with greater potential impacts. Processing of Corps Individual Permits typically requires 12 to 18 months after the agencies determine that the application is complete.

In November 2023, JELD-WEN submitted an application to the Corps requesting a Clean Water Act Section 404 permit for additional marine sediment sampling that is proposed to occur in early spring 2024

Separate federal permit applications will be submitted for the remedial action at approximately the 30% design stage, or sooner. It is possible that the Corps may determine the project can be authorized under one or more NWPs, such as NWP 38 for cleanup of hazardous and toxic waste. Project design would need to comply with numerous general conditions in order for NWPs to be applicable (for example, providing adequate erosion control and avoiding impacts to tribal rights and endangered species). If an Individual Permit is required instead, the application must include an alternatives analysis.

If the project has the potential to affect marine mammals, then a separate review and potentially an Incidental Harassment Authorization (IHA) from the Services is required under the Marine Mammal Protection Act. Processing of IHAs may require 12 to 18 months.

The federal Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act govern project impacts on bald eagles and migratory birds, respectively. Consultation with the U.S. Fish and Wildlife Service should occur during remedial design if it appears project construction may affect these species.

4.2 State Reviews and Authorizations

There are several state reviews and authorizations from which the remedial action is not exempt.

The Washington State Environmental Policy Act (SEPA) process provides for review and analysis of potential environmental impacts and opportunities for public comment. The SEPA process for the project has been conducted, and Ecology issued a SEPA mitigated determination of nonsignificance in June 2023.

Projects involving ground disturbance in contaminated soils, and projects exceeding 1 acre of ground disturbance, require a Construction Stormwater General Permit (CSGP) from Ecology under the National Pollutant Discharge Elimination System (NPDES) process. The NPDES process is a federal program that is administered by the states under the Clean Water Act. Obtaining a CSGP typically requires approximately 45 days after application submittal and it is anticipated that the selected in-water contract will obtain this permit.

4.3 Substantive Compliance with Other State and Local Requirements

As stated previously, several state and local authorizations that typically apply to construction projects are not applicable to MTCA remedial actions. The remedial design will address the following state and local programs to ensure substantive compliance with these requirements even though formal permit authorizations are not required:

- City of Everett reviews and permits (e.g., shorelines, stormwater management, grading, traffic control, critical areas)
- Washington State Hydraulic Project Approval, administered by the Washington Department of Fish and Wildlife

Ecology and the potentially liable persons will consult with the City of Everett and Washington Department of Fish and Wildlife during remedial design to address potential concerns these agencies may have about the project and provide any necessary documentation to demonstrate the project's substantive compliance with these requirements.

4.4 Archaeological and Historic Preservation Act Requirements

The Archaeological and Historic Preservation Act (16 United States Code § 496a-1) is applicable if any covered materials are discovered during excavation activities performed as a part of the selected Site cleanup action. Cultural resources were assessed by a professional archaeologist during the development of the 2022 SEPA Environmental Checklist for the Site (JELD-WEN 2022). It was determined that there is low potential to encounter archaeological/cultural resources during this sampling effort. Due to the proximity of the Site to culturally sensitive areas, an Inadvertent Discovery Plan is included in Appendix A of the SAP and will be kept on-Site during sampling activities.

5 Schedule

The project schedule is established in the Second Amendment to the AO. Once Ecology reviews and comments on this Draft Step 2 PRDI WP, the Revised Draft Step 2 PRDI WP, addressing Ecology comments, will be resubmitted within 45 days. Assuming Ecology approves the Revised Draft version as Final, mobilization for the Step 2 PRDI will begin within 60 days of that approval. Additional project milestones are included in the Second Amendment to the AO.

6 References

Ecology (Washington State Department of Ecology), 2013. Wood Waste Cleanup. Identifying, Assessing, and Remediating Wood Waste in Marine and Freshwater Environments. Guidance for Implementing the Cleanup Provisions of the Sediment Management Standards, Chapter 173-204 WAC. Publication No. 09-09-044. September 2013.

Ecology, 2014. Port Gardner Bay Regional Background: Data Evaluation and Summary Report. Olympia WA: Washington State Department of Ecology, Toxics Cleanup Program. Publication No. 14-09-339.

Ecology, 2019. Sediment Cleanup User's Manual (SCUM) Guidance for Implementing the Cleanup Provisions of the Sediment Management Standards, Chapter 173-204 WAC Toxics Cleanup Program Washington State Department of Ecology Olympia, Washington Publication No. 12-09-057. Second Revision December 2019.

Ecology, 2023. *Final Cleanup Action Plan, Jeld Wen Site*. Exhibit F to the Second Amendment to the Agreed Order No. 5095. August 2023.

JELD-WEN, 2022. SEPA Environmental Checklist. Prepared for Washington State Department of Ecology, October 2022.

SLR and Anchor QEA (SLR International Corporation and Anchor QEA), 2021. *Final Remedial Investigation and Feasibility Study*. Prepared for Washington State Department of Ecology. December 2021.

Tables

Table 2a

Summary of Previous Investigation Data – Knoll Area

Location ID	FS2757-3SED11	FS2757-3SED11	FS2757-3SED12	FS2757-3SED12	JW-DR-Composite	JW-EA09-Composite	JW-EA09-SS34	JW-EA09-SS35	JW-EA09-SS36
Sample ID	3SED11-A	3SED11-B	3SED12-A	3SED12-B	JW-DR-COMP-120508	JW-EA09-COMP-120507	JW-EA09-SS34-120507	JW-EA09-SS35-120507	JW-EA09-SS36-120507
Sample Date[1]	6/3/2009	6/3/2009	6/3/2009	6/3/2009	5/8/2012	5/7/2012	5/7/2012	5/7/2012	5/7/2012
Depth	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm
Sample Type	N	N	N	N	N	N	N	N	N
Conventional Parameters (%)									
Organic Content	--	--	--	--	--	--	--	--	--
Total Organic Carbon	1.12	1.03	0.814	1.45	2	1.8	1.8	2.1	2.5
Total Volatile Solids	3.23	4.08	2.91	4.44	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)									
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	0.16 J	29 J	0.15 J	17 J	1.4 J	2.2 J	--	--	--
Dioxin Furans (ng/kg)									
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	--	--	--	--	2.69 J	4.41 J	5.82 J	4.07 J	7.12 J
PCB Aroclors (µg/kg)									
Total PCB Aroclors (U = 0)	140	92	1,400	49	--	--	--	--	--
PCB Congeners (ng/kg)									
Total PCB Congener (U = 0)	--	--	--	--	9200 J	43,000 J	31,000 J	18,000 J	75,000 J

Table 2a

Summary of Previous Investigation Data – Knoll Area

Location ID	JW-EA09-SS37	JW-EA09-SS38	JW-EA10-Composite	JW-EA10-SS39	JW-EA10-SS40	JW-EA10-SS40	JW-EA10-SS41	JW-EA10-SS42	JW-EA10-SS43
Sample ID	JW-EA09-SS37-120507	JW-EA09-SS38-120507	JW-EA10-COMP-120507	JW-EA10-SS39-120507	JW-EA10-SS40-120507	JW-EA10-SS90-120507	JW-EA10-SS41-120507	JW-EA10-SS42-120507	JW-EA10-SS43-120507
Sample Date[1]	5/7/2012	5/7/2012	5/7/2012	5/7/2012	5/7/2012	5/7/2012	5/7/2012	5/7/2012	5/7/2012
Depth	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm
Sample Type	N	N	N	N	N	FD	N	N	N
Conventional Parameters (%)									
Organic Content	--	--	--	--	--	--	--	--	--
Total Organic Carbon	**0.86**	**2.7**	**2**	**2.4**	**2.5**	--	**2.8**	**1.6**	**2.3**
Total Volatile Solids	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)									
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	--	--	**15**	--	--	--	--	--	--
Dioxin Furans (ng/kg)									
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	**2.28 J**	**13.4 J**	**4.3 J**	**6.51 J**	**8.25 J**	--	**7.55 J**	**5.68 J**	**5.98 J**
PCB Aroclors (µg/kg)									
Total PCB Aroclors (U = 0)	--	--	--	--	--	--	--	--	--
PCB Congeners (ng/kg)									
Total PCB Congener (U = 0)	**11,000 J**	**130,000 J**	--	**140,000 J**	**58,000 J**	**41,000 J**	**51,000 J**	**86,000 J**	**66,000 J**

Table 2a

Summary of Previous Investigation Data – Knoll Area

Location ID	JW-PDI-SG-034	JW-PDI-SG-035	JW-PDI-SG-036	JW-PDI-SG-036	JW-PDI-SG-037	JW-PDI-SG-038	JW-PDI-SG-039	JW-PDI-SG-040	JW-PDI-SG-041
Sample ID	JW-PDI-034-SG-0-1-20230802	JW-PDI-035-SG-0-1-20230802	JW-PDI-036-SG-0-1-20230801	JW-PDI-1036-SG-0-1-20230801	JW-PDI-037-SG-0-1-20230801	JW-PDI-038-SG-0-1-20230801	JW-PDI-039-SG-0-1-20230801	JW-PDI-040-SG-0-1-20230801	JW-PDI-041-SG-0-1-20230801
Sample Date[1]	8/2/2023	8/2/2023	8/1/2023	8/1/2023	8/1/2023	8/1/2023	8/1/2023	8/1/2023	8/1/2023
Depth	0–6 in	0–6 in	0–8 in	0–8 in	0–6 in	0–4 in	0–4 in	0–6 in	0–4 in
Sample Type	N	N	N	FD	N	N	N	N	N
Conventional Parameters (%)									
Organic Content	--	**4.61**	--	--	**4.4**	**5.63**	**5.51**	**1.34**	--
Total Organic Carbon	--	--	--	--	--	--	--	--	--
Total Volatile Solids	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)									
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	--	**39.3 J**	--	--	--	**71 J**	**55.3 J**	**26.5**	--
Dioxin Furans (ng/kg)									
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	**16**	**9.9 J**	**10.4**	**13.6**	**7.29 J**	**13**	**12.6**	**0.716 J**	**16 J**
PCB Aroclors (µg/kg)									
Total PCB Aroclors (U = 0)	--	**110 J**	--	--	**63 J**	**99 J**	**96 J**	**120 J**	--
PCB Congeners (ng/kg)									
Total PCB Congener (U = 0)	--	--	--	--	--	--	--	--	--

Table 2a

Summary of Previous Investigation Data – Knoll Area

Location ID	JW-PDI-SG-042	JW-PDI-SG-043	JW-PDI-SG-044	JW-PDI-SG-044	JW-PDI-SG-045	JW-PDI-SG-046	JW-PDI-SG-047	JW-PDI-SG-048	JW-PDI-SG-049
Sample ID	JW-PDI-042-SG-0-1-20230731	JW-PDI-043-SG-0-1-20230801	JW-PDI-044-SG-0-1-20230731	JW-PDI-044-SG-0-1-20230815	JW-PDI-045-SG-0-1-20230731	JW-PDI-046-SG-0-1-20230801	JW-PDI-047-SG-0-1-20230731	JW-PDI-048-SG-0-1-20230801	JW-PDI-049-SG-0-1-20230801
Sample Date[1]	7/31/2023	8/1/2023	7/31/2023	8/15/2023	7/31/2023	8/1/2023	7/31/2023	8/1/2023	8/1/2023
Depth	0–6 in	0–6 in	0–4 in	0–12 in	0–4 in	0–6 in	0–6 in	0–6 in	0–12 in
Sample Type	N	N	N	N	N	N	N	N	N
Conventional Parameters (%)									
Organic Content	--	--	--	--	**4.17**	--	--	--	--
Total Organic Carbon	--	--	--	--	--	--	--	--	--
Total Volatile Solids	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)									
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	--	--	--	--	**57.4 J**	--	--	--	--
Dioxin Furans (ng/kg)									
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	**6.98 J**	**2.94 J**	**10.4 J**	**35.2 J**	**7.98 J**	**7.8 J**	**4.09 J**	**9.3 J**	**3.7 J**
PCB Aroclors (µg/kg)									
Total PCB Aroclors (U = 0)	--	--	--	--	**54**	--	--	--	--
PCB Congeners (ng/kg)									
Total PCB Congener (U = 0)	--	--	--	--	--	--	--	--	--

Table 2a

Summary of Previous Investigation Data – Knoll Area

Location ID	JW-PDI-SG-050	JW-PDI-SG-051	JW-PDI-SG-052	JW-PDI-SG-053	JW-PDI-SG-054	JW-PDI-SG-055	JW-PDI-SG-056	JW-PDI-SG-057	JW-PDI-SG-058
Sample ID	JW-PDI-050-SG-0-1-20230801	JW-PDI-051-SG-0-1-20230802	JW-PDI-052-SG-0-1-20230802	JW-PDI-053-SG-0-1-20230802	JW-PDI-054-SG-0-1-20230801	JW-PDI-055-SG-0-1-20230802	JW-PDI-056-SG-0-1-20230801	JW-PDI-057-SG-0-1-20230815	JW-PDI-058-SG-0-1-20230801
Sample Date[1]	8/1/2023	8/2/2023	8/2/2023	8/2/2023	8/1/2023	8/2/2023	8/1/2023	8/15/2023	8/1/2023
Depth	0–4 in	0–6 in	0–6 in	0–6 in	0–6 in	0–6 in	0–8 in	0–12 in	0–4 in
Sample Type	N	N	N	N	N	N	N	N	N
Conventional Parameters (%)									
Organic Content	--	2.24	4.82	2.07	4.74	5.82	5.31	1.55	4.36
Total Organic Carbon	--	--	--	--	--	--	--	--	--
Total Volatile Solids	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)									
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	--	11.5	31.8 J	15.8	55.6 J	49.7 J	50.9 J	1.7 J	47.8 J
Dioxin Furans (ng/kg)									
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	10.6 J	1.74 J	9.56 J	1.93 J	6.46 J	15.4	7.8 J	1.3 J	8.88 J
PCB Aroclors (µg/kg)									
Total PCB Aroclors (U = 0)	--	45 J	150	54	42 J	140 J	67 J	18 J	46
PCB Congeners (ng/kg)									
Total PCB Congener (U = 0)	--	--	--	--	--	--	--	--	--

Table 2a

Summary of Previous Investigation Data – Knoll Area

Location ID	JW-PDI-SG-059	JW-PDI-SG-061	JW-PDI-SG-062	JW-PDI-SG-063	JW-PDI-SG-064	JW-PDI-SG-066	JW-PDI-SG-067	JW-PDI-SG-068	JW-PDI-SG-069
Sample ID	JW-PDI-059-SG-0-1-20230801	JW-PDI-061-SG-0-1-20230802	JW-PDI-062-SG-0-1-20230815	JW-PDI-063-SG-0-1-20230815	JW-PDI-064-SG-0-1-20230801	JW-PDI-066-SG-0-1-20230731	JW-PDI-067-SG-0-1-20230731	JW-PDI-068-SG-0-1-20230731	JW-PDI-069-SG-0-1-20230731
Sample Date[1]	8/1/2023	8/2/2023	8/15/2023	8/15/2023	8/1/2023	7/31/2023	7/31/2023	7/31/2023	7/31/2023
Depth	0–6 in	0–6 in	0–6 in	0–12 in	0–4 in	0–6 in	0–12 in	0–12 in	0–6 in
Sample Type	N	N	N	N	N	N	N	N	N
Conventional Parameters (%)									
Organic Content	**4.38**	**5.76**	**4.14**	**3.68**	**5.02**	**1.46**	**1.57**	**3.68**	**2.87**
Total Organic Carbon	--	--	--	--	--	--	--	--	--
Total Volatile Solids	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)									
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	**46.5 J**	--	--	--	--	--	--	--	--
Dioxin Furans (ng/kg)									
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	**8.75 J**	--	--	--	--	--	--	--	--
PCB Aroclors (µg/kg)									
Total PCB Aroclors (U = 0)	**98 J**	--	--	--	--	--	--	--	--
PCB Congeners (ng/kg)									
Total PCB Congener (U = 0)	--	--	--	--	--	--	--	--	--

Table 2a

Summary of Previous Investigation Data – Knoll Area

Location ID	JW-PDI-SG-070	JW-PDI-SG-071	JW-PDI-SG-071	JW-PDI-SG-072	JW-PDI-SG-073	JW-PDI-SG-074	JW-PDI-SG-075	JW-PDI-SG-076	JW-PDI-SG-077
Sample ID	JW-PDI-070-SG-0-1-20230731	JW-PDI-071-SG-0-1-20230801	JW-PDI-1071-SG-0-1-20230801	JW-PDI-072-SG-0-1-20230801	JW-PDI-073-SG-0-1-20230801	JW-PDI-074-SG-0-1-20230731	JW-PDI-075-SG-0-1-20230731	JW-PDI-076-SG-0-1-20230731	JW-PDI-077-SG-0-1-20230731
Sample Date[1]	7/31/2023	8/1/2023	8/1/2023	8/1/2023	8/1/2023	7/31/2023	7/31/2023	7/31/2023	7/31/2023
Depth	0–12 in	0–12 in	0–12 in	0–6 in	0–4 in	0–5 in	0–6 in	0–6 in	0–6 in
Sample Type	N	N	FD	N	N	N	N	N	N
Conventional Parameters (%)									
Organic Content	**2.99**	**5.29**	**5.01**	**5.01**	**4.8**	**3.19**	**2.5**	**3.8**	**4.14**
Total Organic Carbon	--	--	--	--	--	--	--	--	--
Total Volatile Solids	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)									
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	**70 J**	**40.7 J**	**38.2 J**	**63.8 J**	**43.6 J**	**60.2**	**29.3 J**	**78.2 J**	**58.5 J**
Dioxin Furans (ng/kg)									
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	**9.3 J**	--	--	--	**12.6 J**	--	--	--	--
PCB Aroclors (µg/kg)									
Total PCB Aroclors (U = 0)	**80**	--	--	--	**160 J**	--	--	--	--
PCB Congeners (ng/kg)									
Total PCB Congener (U = 0)	--	--	--	--	--	--	--	--	--

Table 2a

Summary of Previous Investigation Data – Knoll Area

Location ID	JW-PDI-SG-114	JW-PDI-SG-115	JW-PDI-SG-117	JW-PDI-SG-118	JW-302-130919	JW-301-130919	JW-EA09-SC36-2013	JW-EA09-SC36-2013	JW-EA09-SC36-2013
Sample ID	JW-PDI-114-SG-0-1-20230731	JW-PDI-115-SG-0-1-20230802	JW-PDI-117-SG-0-1-20230801	JW-PDI-118-SG-0-1-20230801	JW-302-130919	JW-301-130919	JW-EA09-SC36-A-130426	JW-EA09-SC36-B-130426	JW-EA09-SC36-C-130426
Sample Date[1]	7/31/2023	8/2/2023	8/1/2023	8/1/2023	9/19/2013	9/19/2013	4/26/2013	4/26/2013	4/26/2013
Depth	0–12 in	0–6 in	0–12 in	0–6 in	0–10 cm	0–10 cm	0–2 ft	2–4 ft	4–6 ft
Sample Type	N	N	N	N	N	N	N	N	N
Conventional Parameters (%)									
Organic Content	3.23	2.47	4.96	5.04	--	--	--	--	--
Total Organic Carbon	--	--	--	--	2.28	2.1	1.84 J	0.468	0.44
Total Volatile Solids	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)									
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	39.9 J	11.7	58.6 J	67.8 J	--	--	--	--	--
Dioxin Furans (ng/kg)									
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	7.67 J	1.74 J	--	7.8	--	--	4.1 J	--	--
PCB Aroclors (µg/kg)									
Total PCB Aroclors (U = 0)	61 J	75 J	--	180 J	--	--	--	--	--
PCB Congeners (ng/kg)									
Total PCB Congener (U = 0)	--	--	--	--	7800 J	13,000 J	21,000 J	14 J	12 J

Table 2a

Summary of Previous Investigation Data – Knoll Area

Location ID	JW-EA09-SC38-2013	JW-EA09-SC38-2013	JW-EA09-SC38-2013	JW-EA09-SC38-2013	JW-EA10-SC42-2013	JW-EA10-SC42-2013	JW-EA10-SC42-2013	JW-SC212-2013	JW-SC212-2013
Sample ID	JW-EA09-SC138-C-130426	JW-EA09-SC38-A-130426	JW-EA09-SC38-B-130426	JW-EA09-SC38-C-130426	JW-EA10-SC42-A-130426	JW-EA10-SC42-B-130426	JW-EA10-SC42-C-130426	JW-SC212-A-130426	JW-SC212-B-130426
Sample Date[1]	4/26/2013	4/26/2013	4/26/2013	4/26/2013	4/26/2013	4/26/2013	4/26/2013	4/26/2013	4/26/2013
Depth	4–6 ft	0–2 ft	2–4 ft	4–6 ft	0–2 ft	2–4 ft	4–6 ft	0–2 ft	2–4 ft
Sample Type	FD	N	N	N	N	N	N	N	N
Conventional Parameters (%)									
Organic Content	--	--	--	--	--	--	--	--	--
Total Organic Carbon	**0.623**	**1.44**	**0.306**	**0.525**	**1.72**	**0.834**	**0.905**	**0.899**	**2.34**
Total Volatile Solids	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)									
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	--	--	--	--	--	--	--	--	--
Dioxin Furans (ng/kg)									
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	**0.23 J**	**1.97 J**	**0.16 J**	**0.17 J**	**7.1 J**	**0.242 J**	**0.16 J**	--	--
PCB Aroclors (µg/kg)									
Total PCB Aroclors (U = 0)	--	--	--	--	--	--	--	--	--
PCB Congeners (ng/kg)									
Total PCB Congener (U = 0)	**10 J**	**24,000 J**	**18 J**	**2.5 J**	**69,000 J**	**220 J**	**13 J**	--	--

Table 2a

Summary of Previous Investigation Data – Knoll Area

Location ID	JW-SC212-2013	JW-SS-106-2013	JW-SS-107-2013	JW-SS-108-2013	JW-SS-109-2013	JW-SS-110-2013	JW-SS-110-2013	JW-SS-208-2013	JW-SS-209-2013
Sample ID	JW-SC212-C-130426	JW-SS-106-130429	JW-SS-107-130429	JW-SS-108-130429	JW-SS-109-130429	JW-SS-110-130429	JW-SS-310-130429	JW-SS-208-130429	JW-SS-209-130429
Sample Date[1]	4/26/2013	4/29/2013	4/29/2013	4/29/2013	4/29/2013	4/29/2013	4/29/2013	4/29/2013	4/29/2013
Depth	4–6 ft	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm	0–10 cm
Sample Type	N	N	N	N	N	N	FD	N	N
Conventional Parameters (%)									
Organic Content	--	--	--	--	--	--	--	--	--
Total Organic Carbon	**0.929**	**1.59**	**1.75**	**2.24**	**2.34**	**2.34**	**2.73**	**2.18 J**	**1.67 J**
Total Volatile Solids	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)									
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	--	--	--	--	--	--	--	--	--
Dioxin Furans (ng/kg)									
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	--	--	--	**8.11 J**	**7.6 J**	**9.8 J**	**8.4 J**	--	--
PCB Aroclors (µg/kg)									
Total PCB Aroclors (U = 0)	--	--	--	--	--	--	--	--	--
PCB Congeners (ng/kg)									
Total PCB Congener (U = 0)	--	**8,400 J**	**14,000 J**	**49,000 J**	**48,000 J**	**71,000 J**	**59,000 J**	**6200 J**	**11,000 J**

Table 2a

Summary of Previous Investigation Data – Knoll Area

Location ID	JW-SS-211-2013	JW-SS-214-2013	JW-SS-215-2013	JW-SS-216-2013
Sample ID	JW-SS-211-130429	JW-SS-214-130429	JW-SS-215-130429	JW-SS-216-130429
Sample Date[1]	4/29/2013	4/29/2013	4/29/2013	4/29/2013
Depth	0–10 cm	0–10 cm	0–10 cm	0–10 cm
Sample Type	N	N	N	N
Conventional Parameters (%)				
Organic Content	--	--	--	--
Total Organic Carbon	**2.53 J**	**2.91 J**	**2.23 J**	**2.2 J**
Total Volatile Solids	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)				
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	--	--	--	--
Dioxin Furans (ng/kg)				
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	**3.2 J**	**10 J**	**5.9 J**	**1.8 J**
PCB Aroclors (µg/kg)				
Total PCB Aroclors (U = 0)	--	--	--	--
PCB Congeners (ng/kg)				
Total PCB Congener (U = 0)	**8,500 J**	**34,000 J**	**30,000 J**	**8,000 J**

Table 2a
Summary of Previous Investigation Data – Knoll Area

Notes:
Calculated values have been rounded to laboratory-reported significant digits.
CAEPA, 2005. Air Toxics Hot Spots Program Risk Assessment Guidelines, Part II Technical Support Document for Describing Available Cancer Potency Factors. Office of Environmental Health Hazard Assessment, California Environmental Protection Agency. May 2005.
1. Sample results from 2023 have not been validated and may be subject to change.
Bold: Detected result
--: not applicable
µg/kg: microgram per kilogram
CAEPA: California Environmental Protection Agency
cm: centimeter
cPAH: carcinogenic polycyclic aromatic hydrocarbon
J: Estimated value
N: normal
ng/kg: nanogram per kilogram
PCB: polychlorinated biphenyl
TEQ: toxicity equivalence
U: Compound analyzed for, but not detected above detection limit

Table 2b

Summary of Previous Investigation Data – South Shoreline

Location ID	FS2757-3SED1	FS2757-3SED1	FS2757-3SED1	FS2757-3SED1	FS2757-3SED10	FS2757-3SED10	FS2757-3SED10	FS2757-3SED2	FS2757-3SED2
Sample ID	3SED1-A	3SED1-B	3SED1-C	3SED2-A	3SED10-A	3SED10-B	3SED10-C	3SED2-B	3SED2-C
Sample Date[1]	6/3/2009	6/3/2009	6/3/2009	6/3/2009	6/5/2009	6/5/2009	6/5/2009	6/3/2009	6/3/2009
Depth	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm
Sample Type	N	N	N	N	N	N	N	N	N
Conventional Parameters (%)									
Organic Content	--	--	--	--	--	--	--	--	--
Total Organic Carbon	2.2	3.06	2.3	2.12	0.713	0.952	1.83	3.25	5.41
Total Volatile Solids	6.34	6.14	5.72	2.09	1.69	7.77	7.14	4.94	9.87
Polycyclic Aromatic Hydrocarbons (µg/kg)									
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	0.36 J	40 J	67 J	0.41 J	140	98	110	100 J	65 J
Dioxin Furans (ng/kg)									
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	20	18	16	--	--	--	--	--	--
PCB Aroclors (µg/kg)									
Total PCB Aroclors (U = 0)	7.5	15	8.3	3.9 U	3.9 U	3.9 U	11	4.7	19
PCB Congeners (ng/kg)									
Total PCB Congener (U = 0)	--	--	--	--	--	--	--	--	--

Table 2b

Summary of Previous Investigation Data – South Shoreline

Location ID	FS2757-3SED3	FS2757-3SED3	FS2757-3SED3	FS2757-3SED4	FS2757-3SED4	FS2757-3SED4	FS2757-3SED5	FS2757-3SED5	FS2757-3SED5
Sample ID	3SED3-A	3SED3-B	3SED3-C	3SED4-A	3SED4-B	3SED4-C	3SED5-A	3SED5-B	3SED5-C
Sample Date[1]	6/4/2009	6/4/2009	6/4/2009	6/4/2009	6/4/2009	6/4/2009	6/5/2009	6/5/2009	6/5/2009
Depth	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm
Sample Type	N	N	N	N	N	N	N	N	N
Conventional Parameters (%)									
Organic Content	--	--	--	--	--	--	--	--	--
Total Organic Carbon	**6.65**	**2.06**	**2.91**	**1.56**	**0.74**	**1.17**	**4.92**	**1.01**	**1.29**
Total Volatile Solids	**3.23**	**6.04**	**7.48**	**1.71**	**1.99**	**2.37**	**3.21**	**3.97**	**4.5**
Polycyclic Aromatic Hydrocarbons (µg/kg)									
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	**1.4**	**1.2 J**	**1.3 J**	**19 J**	**30 J**	**50 J**	82 U	**29**	**50**
Dioxin Furans (ng/kg)									
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	--	--	--	--	--	--	--	--	--
PCB Aroclors (µg/kg)									
Total PCB Aroclors (U = 0)	**7.3**	**11**	**4.2**	**5.1**	3.9 U	3.9 U	**4.1**	3.9 U	4 U
PCB Congeners (ng/kg)									
Total PCB Congener (U = 0)	--	--	--	--	--	--	--	--	--

Table 2b

Summary of Previous Investigation Data – South Shoreline

Location ID	FS2757-3SED6	FS2757-3SED6	FS2757-3SED6	JW-EA05-Composite	JW-EA06-Composite	JW-EA06-SS21	JW-EA06-SS22	JW-EA06-SS23	JW-EA06-SS24
Sample ID	3SED6-A	3SED6-B	3SED6-C	JW-EA05-COMP-120509	JW-EA06-COMP-120507	JW-EA06-SS21-120507	JW-EA06-SS22-120507	JW-EA06-SS23-120507	JW-EA06-SS24-120507
Sample Date[1]	6/4/2009	6/4/2009	6/4/2009	5/9/2012	5/7/2012	5/7/2012	5/7/2012	5/7/2012	5/7/2012
Depth	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm
Sample Type	N	N	N	N	N	N	N	N	N
Conventional Parameters (%)									
Organic Content	--	--	--	--	--	--	--	--	--
Total Organic Carbon	**0.922**	**0.289**	**0.686**	**0.74**	**1.9**	**2.9**	**1.3**	**2.6**	**1.1**
Total Volatile Solids	**2.71**	**3.21**	**3.5**	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)									
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	19 U	20 U	**0.11 J**	--	--	--	--	--	--
Dioxin Furans (ng/kg)									
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	--	--	--	**0.381 J**	**11 J**	**10.5 J**	**1.83 J**	**90.6 J**	**2.11 J**
PCB Aroclors (µg/kg)									
Total PCB Aroclors (U = 0)	3.8 U	3.9 U	3.9 U	--	--	--	--	--	--
PCB Congeners (ng/kg)									
Total PCB Congener (U = 0)	--	--	--	**600 J**	**3,100 J**	--	--	--	--

Table 2b

Summary of Previous Investigation Data – South Shoreline

Location ID	JW-EA07-Composite	JW-EA07-SS25	JW-EA07-SS26	JW-EA07-SS27	JW-EA07-SS28	JW-EA08-Composite	JW-EA08-Composite	JW-EA08-SS29	JW-EA08-SS30
Sample ID	JW-EA07-COMP-120507	JW-EA07-SS25-120507	JW-EA07-SS26-120507	JW-EA07-SS27-120507	JW-EA07-SS28-120507	JW-EA08-COMP-120507	JW-EA58-COMP-120507	JW-EA08-SS29-120507	JW-EA08-SS30-120507
Sample Date[1]	5/7/2012	5/7/2012	5/7/2012	5/7/2012	5/7/2012	5/7/2012	5/7/2012	5/7/2012	5/7/2012
Depth	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm
Sample Type	N	N	N	N	N	N	FD	N	N
Conventional Parameters (%)									
Organic Content	--	--	--	--	--	--	--	--	--
Total Organic Carbon	3.1	2.1	2.7	3.2	3.5	2.9	2.8	3.4	3.5
Total Volatile Solids	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)									
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	--	--	--	--	--	12	10	--	--
Dioxin Furans (ng/kg)									
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	18.8 J	9.9 J	3.63 J	49 J	5 J	3.3 J	7.56 J	14.1 J	6.63 J
PCB Aroclors (µg/kg)									
Total PCB Aroclors (U = 0)	--	--	--	--	--	--	--	--	--
PCB Congeners (ng/kg)									
Total PCB Congener (U = 0)	13,000 J	--	--	--	--	4,600 J	13,000 J	--	--

Table 2b

Summary of Previous Investigation Data – South Shoreline

Location ID	JW-EA08-SS31	JW-EA08-SS31	JW-EA08-SS32	JW-EA09-SS33	JW-PDI-SG-001	JW-PDI-SG-002	JW-PDI-SG-003	JW-PDI-SG-004	JW-PDI-SG-005
Sample ID	JW-EA08-SS131-120507	JW-EA08-SS31-120507	JW-EA08-SS32-120507	JW-EA09-SS33-120507	JW-PDI-001-SG-0-1-20230803	JW-PDI-002-SG-0-1-20230803	JW-PDI-003-SG-0-1-20230815	JW-PDI-004-SG-0-1-20230815	JW-PDI-005-SG-0-1-20230815
Sample Date[1]	5/7/2012	5/7/2012	5/7/2012	5/7/2012	8/3/2023	8/3/2023	8/15/2023	8/15/2023	8/15/2023
Depth	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 12 in	0 - 12 in	0 - 12 in	0 - 12 in	0 - 8 in
Sample Type	FD	N	N	N	N	N	N	N	N
Conventional Parameters (%)									
Organic Content	--	--	--	--	--	--	--	--	--
Total Organic Carbon	--	2.2	2.6	1.9	--	--	--	--	--
Total Volatile Solids	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)									
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	--	--	--	--	--	--	--	--	--
Dioxin Furans (ng/kg)									
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	18.4 J	15 J	7.12 J	3.35 J	16.5 J	3.52 J	7.11 J	2.97 J	7.55 J
PCB Aroclors (µg/kg)									
Total PCB Aroclors (U = 0)	--	--	--	--	--	--	--	--	--
PCB Congeners (ng/kg)									
Total PCB Congener (U = 0)	--	--	--	9,700 J	--	--	--	--	--

Table 2b

Summary of Previous Investigation Data – South Shoreline

Location ID	JW-PDI-SG-006	JW-PDI-SG-007	JW-PDI-SG-008	JW-PDI-SG-009	JW-PDI-SG-010	JW-PDI-SG-011	JW-PDI-SG-012	JW-PDI-SG-013	JW-PDI-SG-014
Sample ID	JW-PDI-006-SG-0-1-20230804	JW-PDI-007-SG-0-1-20230803	JW-PDI-008-SG-0-1-20230803	JW-PDI-009-SG-0-1-20230803	JW-PDI-010-SG-0-1-20230803	JW-PDI-011-SG-0-1-20230803	JW-PDI-012-SG-0-1-20230803	JW-PDI-013-SG-0-1-20230803	JW-PDI-014-SG-0-1-20230803
Sample Date[1]	8/4/2023	8/3/2023	8/3/2023	8/3/2023	8/3/2023	8/3/2023	8/3/2023	8/3/2023	8/3/2023
Depth	0 - 12 in	0 - 6 in	0 - 6 in	0 - 6 in	0 - 12 in	0 - 12 in	0 - 12 in	0 - 12 in	0 - 12 in
Sample Type	N	N	N	N	N	N	N	N	N
Conventional Parameters (%)									
Organic Content	--	--	--	--	--	--	--	--	**3.65**
Total Organic Carbon	--	--	--	--	--	--	--	--	--
Total Volatile Solids	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)									
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	--	--	--	--	--	--	--	--	**24.7 J**
Dioxin Furans (ng/kg)									
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	**6.28 J**	**5.93 J**	**16 J**	**7.5 J**	**9.11 J**	**8.44 J**	**13.6 J**	**27 J**	**43.2 J**
PCB Aroclors (µg/kg)									
Total PCB Aroclors (U = 0)	--	--	--	--	--	--	--	--	9.2 U
PCB Congeners (ng/kg)									
Total PCB Congener (U = 0)	--	--	--	--	--	--	--	--	--

Table 2b

Summary of Previous Investigation Data – South Shoreline

Location ID	JW-PDI-SG-018	JW-PDI-SG-019	JW-PDI-SG-019	JW-PDI-SG-020	JW-PDI-SG-021	JW-PDI-SG-022	JW-PDI-SG-022	JW-PDI-SG-023	JW-PDI-SG-024
Sample ID	JW-PDI-018-SG-0-1-20230803	JW-PDI-019-SG-0-1-20230803	JW-PDI-1019-SG-0-1-20230803	JW-PDI-020-SG-0-1-20230803	JW-PDI-021-SG-0-1-20230803	JW-PDI-022-SG-0-1-20230803	JW-PDI-1022-SG-0-1-20230803	JW-PDI-023-SG-0-1-20230815	JW-PDI-024-SG-0-1-20230815
Sample Date[1]	8/3/2023	8/3/2023	8/3/2023	8/3/2023	8/3/2023	8/3/2023	8/3/2023	8/15/2023	8/15/2023
Depth	0 - 6 in	0 - 6 in	0 - 6 in	0 - 6 in	0 - 12 in	0 - 12 in	0 - 12 in	0 - 10 in	0 - 12 in
Sample Type	N	N	FD	N	N	N	FD	N	N
Conventional Parameters (%)									
Organic Content	**4.51**	**3.57**	**3.51**	**4.49**	**5.33**	**5.36**	**5.38**	**3.95**	**5.62**
Total Organic Carbon	--	--	--	--	--	--	--	--	--
Total Volatile Solids	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)									
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	**23.1 J**	**20.5**	**32.7**	**52.4**	--	--	--	--	--
Dioxin Furans (ng/kg)									
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	**5.8 J**	**7.51 J**	**7.47 J**	**13.1 J**	--	**3.14 J**	**3 J**	**1.38 J**	**2.4 J**
PCB Aroclors (µg/kg)									
Total PCB Aroclors (U = 0)	**24 J**	**10 J**	9.3 U	**34 J**	--	--	--	--	--
PCB Congeners (ng/kg)									
Total PCB Congener (U = 0)	--	--	--	--	--	--	--	--	--

Table 2b

Summary of Previous Investigation Data – South Shoreline

Location ID	JW-PDI-SG-025	JW-PDI-SG-026	JW-PDI-SG-027	JW-PDI-SG-028	JW-PDI-SG-029	JW-PDI-SG-030	JW-PDI-SG-031	JW-PDI-SG-032	JW-PDI-SG-033
Sample ID	JW-PDI-025-SG-0-1-20230804	JW-PDI-026-SG-0-1-20230803	JW-PDI-027-SG-0-1-20230803	JW-PDI-028-SG-0-1-20230802	JW-PDI-029-SG-0-1-20230802	JW-PDI-030-SG-0-1-20230802	JW-PDI-031-SG-0-1-20230803	JW-PDI-032-SG-0-1-20230802	JW-PDI-033-SG-0-1-20230802
Sample Date[1]	8/4/2023	8/3/2023	8/3/2023	8/2/2023	8/2/2023	8/2/2023	8/3/2023	8/2/2023	8/2/2023
Depth	0 - 6 in	0 - 6 in	0 - 6 in	0 - 6 in	0 - 6 in	0 - 6 in	0 - 6 in	0 - 4 in	0 - 6 in
Sample Type	N	N	N	N	N	N	N	N	N
Conventional Parameters (%)									
Organic Content	**4.09**	**4.27**	**3.82**	**6.05**	**5.38**	**4.89**	**3.8**	**5.14**	**5.66**
Total Organic Carbon	--	--	--	--	--	--	--	--	--
Total Volatile Solids	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)									
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	**12.9**	--	--	--	--	--	**20.4 J**	**24.1**	**35.9**
Dioxin Furans (ng/kg)									
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	**5.77 J**	--	**4.5 J**	**7.76 J**	**10.3 J**	--	--	--	--
PCB Aroclors (µg/kg)									
Total PCB Aroclors (U = 0)	9.2 U	--	--	--	--	--	--	--	--
PCB Congeners (ng/kg)									
Total PCB Congener (U = 0)	--	--	--	--	--	--	--	--	--

Table 2b

Summary of Previous Investigation Data – South Shoreline

Location ID	JW-PDI-SG-060	JW-EA06-SC21-2013	JW-EA06-SC21-2013	JW-EA06-SC23-2013	JW-EA06-SC23-2013	JW-EA06-SC23-2013	W-EA06-SC23-201342	JW-EA07-SC27-2013	JW-EA07-SC27-2013
Sample ID	JW-PDI-060-SG-0-1-20230802	JW-EA06-SC21-A-130423	JW-EA06-SC21-B-130423	JW-EA06-SC23-A-130423	JW-EA06-SC23-B-130423	JW-EA06-SC23-C-130423	JW-EA06-SC23-A-130426	JW-EA07-SC27-A-130429	JW-EA07-SC27-B-130429
Sample Date[1]	8/2/2023	4/23/2013	4/23/2013	4/23/2013	4/23/2013	4/23/2013	4/26/2013	4/29/2013	4/29/2013
Depth	0 - 4 in	0 - 2 ft	2 - 4 ft	0 - 2 ft	2 - 4 ft	4 - 6 ft	0 - 2 ft	0 - 1 ft	1 - 2 ft
Sample Type	N	N	N	N	N	N	N	N	N
Conventional Parameters (%)									
Organic Content	**4.81**	--	--	--	--	--	--	--	--
Total Organic Carbon	--	**2.43 J**	**2.55 J**	**2.07**	**2.61**	**0.83**	**2.24 J**	**2.29**	**3.5**
Total Volatile Solids	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)									
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	--	--	--	--	--	--	--	--	--
Dioxin Furans (ng/kg)									
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	--	**29 J**	**14 J**	**38 J**	**23 J**	**0.217 J**	--	**51 J**	**105 J**
PCB Aroclors (µg/kg)									
Total PCB Aroclors (U = 0)	--	--	--	--	--	--	--	--	--
PCB Congeners (ng/kg)									
Total PCB Congener (U = 0)	--	--	--	--	--	--	--	--	--

Table 2b

Summary of Previous Investigation Data – South Shoreline

Location ID	JW-EA07-SC27-2013	JW-EA07-SC28-2013	JW-EA07-SC28-2013	JW-EA07-SC28-2013	JW-SC401-130928	JW-SC401-130928	JW-SC401-130928	JW-SS-101-2013	JW-SS-102-2013
Sample ID	JW-EA07-SC27-C-130429	JW-EA07-SC28-A-130426	JW-EA07-SC28-B-130426	JW-EA07-SC28-C-130426	JW-SC401-A-130928	JW-SC401-B-130928	JW-SC401-C-130928	JW-SS-101-130429	JW-SS-102-130429
Sample Date[1]	4/29/2013	4/26/2013	4/26/2013	4/26/2013	9/28/2013	9/28/2013	9/28/2013	4/29/2013	4/29/2013
Depth	2 - 2.6 ft	0 - 2 ft	2 - 4 ft	4 - 6 ft	0 - 2 ft	2 - 4 ft	4 - 6 ft	0 - 10 cm	0 - 10 cm
Sample Type	N	N	N	N	N	N	N	N	N
Conventional Parameters (%)									
Organic Content	--	--	--	--	--	--	--	--	--
Total Organic Carbon	2.54	--	0.8 J	0.45 J	2.16	1.76	0.949	2.2	1.97
Total Volatile Solids	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)									
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	--	--	--	--	--	--	--	--	--
Dioxin Furans (ng/kg)									
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	25	13.6 J	0.363 J	0.195 J	2.4 J	0.81 J	0.203 J	3.45 J	3.2 J
PCB Aroclors (µg/kg)									
Total PCB Aroclors (U = 0)	--	--	--	--	--	--	--	--	--
PCB Congeners (ng/kg)									
Total PCB Congener (U = 0)	--	--	--	--	--	--	--	--	--

Table 2b

Summary of Previous Investigation Data – South Shoreline

Location ID	JW-SS-103-2013	JW-SS-104-2013	JW-SS-105-2013	JW-SS-207-2013
Sample ID	JW-SS-103-130429	JW-SS-104-130429	JW-SS-105-130429	JW-SS-207-130429
Sample Date[1]	4/29/2013	4/29/2013	4/29/2013	4/29/2013
Depth	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm
Sample Type	N	N	N	N
Conventional Parameters (%)				
Organic Content	--	--	--	--
Total Organic Carbon	**2.14**	**1.95**	**1.88**	**2.35 J**
Total Volatile Solids	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)				
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	--	--	--	--
Dioxin Furans (ng/kg)				
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	**3.1 J**	**3.3 J**	**2.66 J**	--
PCB Aroclors (µg/kg)				
Total PCB Aroclors (U = 0)	--	--	--	--
PCB Congeners (ng/kg)				
Total PCB Congener (U = 0)	--	--	--	**11,000 J**

Table 2b
Summary of Previous Investigation Data – South Shoreline

Notes:
Calculated values have been rounded to laboratory-reported significant digits.
CAEPA, 2005. Air Toxics Hot Spots Program Risk Assessment Guidelines, Part II Technical Support Document for Describing Available Cancer Potency Factors. Office of Environmental Health Hazard Assessment, California Environmental Protection Agency. May 2005.
1. Sample results from 2023 have not been validated and may be subject to change.
Bold: Detected result
--: not applicable
µg/kg: microgram per kilogram
CAEPA: California Environmental Protection Agency
cm: centimeter
cPAH: carcinogenic polycyclic aromatic hydrocarbon
J: Estimated value
N: normal
ng/kg: nanogram per kilogram
PCB: polychlorinated biphenyl
TEQ: toxicity equivalence
U: Compound analyzed for, but not detected above detection limit

Table 2c

Summary of Previous Investigation Data – Logway

Location ID	FS2757-3SED7	FS2757-3SED7	FS2757-3SED7	FS2757-3SED8	FS2757-3SED8	FS2757-3SED8	FS2757-3SED9	FS2757-3SED9	FS2757-3SED9
Sample ID	3SED7-A	3SED7-B	3SED7-C	3SED8-A	3SED8-B	3SED8-C	3SED9-A	3SED9-B	3SED9-C
Sample Date[1]	6/4/2009	6/4/2009	6/4/2009	6/5/2009	6/5/2009	6/5/2009	6/4/2009	6/4/2009	6/4/2009
Depth	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm
Sample Type	N	N	N	N	N	N	N	N	N
Conventional Parameters (%)									
Organic Content	--	--	--	--	--	--	--	--	--
Total Organic Carbon	**2.2**	**2.51**	**2.66**	**4.88**	**4.14**	**3.98**	**1.37**	**1.24**	**3.98**
Total Volatile Solids	**3.59**	**8.24**	**6.87**	**6.67**	**10.53**	**8.45**	**9.36**	**7.39**	**6.29**
Polycyclic Aromatic Hydrocarbons (µg/kg)									
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	**8.8 J**	**69**	**92 J**	**430**	**210**	**260**	**150 J**	**200 J**	**95 J**
Dioxin Furans (ng/kg)									
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	**42**	**31**	**48.5**	**72 J**	**170 J**	**58 J**	**29 J**	**30 J**	**29 J**
PCB Aroclors (µg/kg)									
Total PCB Aroclors (U = 0)	3.9 U	**4.5**	**6.4**	**59**	**10**	**20**	**54**	**38**	**31**
PCB Congeners (ng/kg)									
Total PCB Congener (U = 0)	--	--	--	--	--	--	--	--	--

Table 2c

Summary of Previous Investigation Data – Logway

Location ID Sample ID Sample Date[1] Depth Sample Type	JW-EA01-Composite JW-EA01-COMP-120507 5/7/2012 0 - 10 cm N	JW-EA01-SS01 JW-EA01-SS01-120507 5/7/2012 0 - 10 cm N	JW-EA01-SS01 JW-EA01-SS51-120507 5/7/2012 0 - 10 cm FD	JW-EA01-SS02 JW-EA01-SS02-120507 5/7/2012 0 - 10 cm N	JW-EA01-SS03 JW-EA01-SS03-120507 5/7/2012 0 - 10 cm N	JW-EA01-SS04 JW-EA01-SS04-120507 5/7/2012 0 - 10 cm N	JW-EA02-Composite JW-EA02-COMP-120507 5/7/2012 0 - 10 cm N	JW-EA02-SS05 JW-EA02-SS05-120507 5/7/2012 0 - 10 cm N	JW-EA02-SS06 JW-EA02-SS06-120507 5/7/2012 0 - 10 cm N
Conventional Parameters (%)									
Organic Content	--	--	--	--	--	--	--	--	--
Total Organic Carbon	**2.8**	**2.9**	--	**3.9**	**1.9**	**2.7**	**2.8**	**2.6**	**2.6**
Total Volatile Solids	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)									
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	**9.9 J**	--	--	--	--	--	--	--	--
Dioxin Furans (ng/kg)									
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	--	**7.29 J**	**10.5 J**	**11 J**	**7.07 J**	**4.39 J**	**4.2 J**	**12 J**	**4.72 J**
PCB Aroclors (µg/kg)									
Total PCB Aroclors (U = 0)	--	--	--	--	--	--	--	--	--
PCB Congeners (ng/kg)									
Total PCB Congener (U = 0)	**14,000 J**	--	--	--	--	--	**7,300 J**	--	--

Table 2c

Summary of Previous Investigation Data – Logway

Location ID Sample ID Sample Date[1] Depth Sample Type	JW-EA02-SS07 JW-EA02-SS07-120507 5/7/2012 0 - 10 cm N	JW-EA03-Composite JW-EA03-COMP-120507 5/7/2012 0 - 10 cm N	JW-EA03-SS11 JW-EA03-SS11-120507 5/7/2012 0 - 10 cm N	JW-EA03-SS12 JW-EA03-SS12-120507 5/7/2012 0 - 10 cm N	JW-EA04-Composite JW-EA04-COMP-120507 5/7/2012 0 - 10 cm N	JW-EA04-SS13 JW-EA04-SS13-120507 5/7/2012 0 - 10 cm N	JW-EA04-SS14 JW-EA04-SS14-120507 5/7/2012 0 - 10 cm N	JW-EA04-SS15 JW-EA04-SS15-120507 5/7/2012 0 - 10 cm N	JW-EA04-SS16 JW-EA04-SS16-120507 5/7/2012 0 - 10 cm N
Conventional Parameters (%)									
Organic Content	--	--	--	--	--	--	--	--	--
Total Organic Carbon	**2.1 J**	**2.5**	**2.1 J**	**2.2 J**	**1.7**	**1.9**	**1.9**	**1.3**	**1.8**
Total Volatile Solids	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)									
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	--	--	--	--	--	--	--	--	--
Dioxin Furans (ng/kg)									
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	**17 J**	**0.97 J**	**5.73 J**	**3.3 J**	**4.02 J**	**17.2 J**	**2.08 J**	**4.08 J**	**1.85 J**
PCB Aroclors (µg/kg)									
Total PCB Aroclors (U = 0)	--	--	--	--	--	--	--	--	--
PCB Congeners (ng/kg)									
Total PCB Congener (U = 0)	--	**1,400 J**	--	--	**4,400 J**	--	--	--	--

Table 2c

Summary of Previous Investigation Data – Logway

Location ID	JW-PDI-SG-078	JW-PDI-SG-079	JW-PDI-SG-080	JW-PDI-SG-081	JW-PDI-SG-081	JW-PDI-SG-083	JW-PDI-SG-084	JW-PDI-SG-085	JW-PDI-SG-086
Sample ID	JW-PDI-078-SG-0-1-20230814	JW-PDI-079-SG-0-1-20230814	JW-PDI-080-SG-0-1-20230814	JW-PDI-081-SG-0-1-20230814	JW-PDI-082-SG-0-1-20230816[2]	JW-PDI-083-SG-0-1-20230816	JW-PDI-084-SG-0-1-20230816	JW-PDI-085-SG-0-1-20230816	JW-PDI-086-SG-0-1-20230816
Sample Date[1]	8/14/2023	8/14/2023	8/14/2023	8/14/2023	8/16/2023	8/16/2023	8/16/2023	8/16/2023	8/16/2023
Depth	0 - 12 in	0 - 12 in	0 - 12 in	0 - 12 in	0 - 12 in	0 - 12 in	0 - 12 in	0 - 12 in	0 - 12 in
Sample Type	N	N	N	N	N	N	N	N	N
Conventional Parameters (%)									
Organic Content	--	--	--	--	--	--	--	--	--
Total Organic Carbon	--	--	--	--	--	--	--	--	--
Total Volatile Solids	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)									
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	--	--	--	--	--	--	--	--	--
Dioxin Furans (ng/kg)									
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	**8 J**	**4.64 J**	**9.94 J**	**7.24 J**	**3.09 J**	**7.2 J**	**21 J**	**5.29 J**	**3.72 J**
PCB Aroclors (µg/kg)									
Total PCB Aroclors (U = 0)	--	--	--	--	--	--	--	--	--
PCB Congeners (ng/kg)									
Total PCB Congener (U = 0)	--	--	--	--	--	--	--	--	--

Table 2c

Summary of Previous Investigation Data – Logway

Location ID	JW-PDI-SG-087	JW-PDI-SG-088	JW-PDI-SG-089	JW-PDI-SG-090	JW-PDI-SG-091	JW-PDI-SG-092	JW-PDI-SG-093	JW-PDI-SG-094	JW-PDI-SG-095
Sample ID	JW-PDI-087-SG-0-1-20230817	JW-PDI-088-SG-0-1-20230817	JW-PDI-089-SG-0-1-20230817	JW-PDI-090-SG-0-1-20230814	JW-PDI-091-SG-0-1-20230814	JW-PDI-092-SG-0-1-20230814	JW-PDI-093-SG-0-1-20230814	JW-PDI-094-SG-0-1-20230816	JW-PDI-095-SG-0-1-20230816
Sample Date[1]	8/17/2023	8/17/2023	8/17/2023	8/14/2023	8/14/2023	8/14/2023	8/14/2023	8/16/2023	8/16/2023
Depth	0 - 4 in	0 - 10 in	0 - 10 in	0 - 9 in	0 - 12 in	0 - 12 in	0 - 12 in	0 - 12 in	0 - 12 in
Sample Type	N	N	N	N	N	N	N	N	N
Conventional Parameters (%)									
Organic Content	**6.89**	**2.06**	**1.61**	**2.16**	**4.01**	**4.02**	**5.61**	**4.49**	**4**
Total Organic Carbon	--	--	--	--	--	--	--	--	--
Total Volatile Solids	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)									
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	--	--	--	**11.7**	**24.5**	**22.2**	**20.6**	**14**	**24.6**
Dioxin Furans (ng/kg)									
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	--	--	**1.59 J**	**3.71 J**	**3.37 J**	**4.21 J**	**5.61 J**	**3.24 J**	**1.56 J**
PCB Aroclors (µg/kg)									
Total PCB Aroclors (U = 0)	--	--	--	**35 J**	**42 J**	8.5 U	9.3 U	9.2 U	9.2 U
PCB Congeners (ng/kg)									
Total PCB Congener (U = 0)	--	--	--	--	--	--	--	--	--

Table 2c

Summary of Previous Investigation Data – Logway

Location ID	JW-PDI-SG-096	JW-PDI-SG-097	JW-PDI-SG-098	JW-PDI-SG-099	JW-PDI-SG-100	JW-PDI-SG-101	JW-PDI-SG-101	JW-PDI-SG-102	JW-PDI-SG-103
Sample ID	JW-PDI-096-SG-0-1-20230816	JW-PDI-097-SG-0-1-20230816	JW-PDI-098-SG-0-1-20230816	JW-PDI-099-SG-0-1-20230817	JW-PDI-100-SG-0-1-20230817	JW-PDI-101-SG-0-1-20230817	JW-PDI-1101-SG-0-1-20230817	JW-PDI-102-SG-0-1-20230817	JW-PDI-103-SG-0-1-20230814
Sample Date[1]	8/16/2023	8/16/2023	8/16/2023	8/17/2023	8/17/2023	8/17/2023	8/17/2023	8/17/2023	8/14/2023
Depth	0 - 12 in	0 - 12 in	0 - 12 in	0 - 6 in	0 - 12 in	0 - 12 in	0 - 12 in	0 - 10 in	0 - 12 in
Sample Type	N	N	N	N	N	N	FD	N	N
Conventional Parameters (%)									
Organic Content	**3.86**	**3.91**	**5.26**	**4.87**	--	**6.91**	--	**4.73**	**3.44**
Total Organic Carbon	--	--	--	--	--	--	--	--	--
Total Volatile Solids	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)									
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	**30.3**	**23.2**	**31.3**	**10.9**	**50.6**	**21.5**	**8.7**	**7100**	--
Dioxin Furans (ng/kg)									
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	**4.85 J**	**1.48 J**	**6.74 J**	**4.9 J**	**6.26 J**	**7.1 J**	**7.81 J**	**8.89 J**	--
PCB Aroclors (µg/kg)									
Total PCB Aroclors (U = 0)	9.2 U	9.3 U	9.2 U	**26 J**	**71 J**	**31 J**	**37 J**	**42 J**	--
PCB Congeners (ng/kg)									
Total PCB Congener (U = 0)	--	--	--	--	--	--	--	--	--

Table 2c

Summary of Previous Investigation Data – Logway

Location ID	JW-PDI-SG-104	JW-PDI-SG-105	JW-PDI-SG-106	JW-PDI-SG-107	JW-PDI-SG-108	JW-PDI-SG-109	JW-PDI-SG-110	JW-PDI-SG-111	JW-PDI-SG-112
Sample ID	JW-PDI-104-SG-0-1-20230814	JW-PDI-105-SG-0-1-20230814	JW-PDI-106-SG-0-1-20230814	JW-PDI-107-SG-0-1-20230816	JW-PDI-108-SG-0-1-20230817	JW-PDI-109-SG-0-1-20230814	JW-PDI-110-SG-0-1-20230816	JW-PDI-111-SG-0-1-20230816	JW-PDI-112-SG-0-1-20230816
Sample Date[1]	8/14/2023	8/14/2023	8/14/2023	8/16/2023	8/17/2023	8/14/2023	8/16/2023	8/16/2023	8/16/2023
Depth	0 - 12 in	0 - 12 in	0 - 12 in	0 - 12 in	0 - 12 in	0 - 12 in	0 - 12 in	0 - 12 in	0 - 12 in
Sample Type	N	N	N	N	N	N	N	N	N
Conventional Parameters (%)									
Organic Content	**4.59**	**4.13**	**5.84**	**4.24**	**6.57**	**1.84**	**4.78**	**4.24**	**3.99**
Total Organic Carbon	--	--	--	--	--	--	--	--	--
Total Volatile Solids	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)									
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	--	--	--	--	--	**220**	**25.7**	**22.9**	**16.2**
Dioxin Furans (ng/kg)									
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	--	--	--	--	--	--	--	**5.6 J**	--
PCB Aroclors (µg/kg)									
Total PCB Aroclors (U = 0)	--	--	--	--	--	--	--	9.2 U	--
PCB Congeners (ng/kg)									
Total PCB Congener (U = 0)	--	--	--	--	--	--	--	--	--

Table 2c

Summary of Previous Investigation Data – Logway

Location ID	JW-PDI-SG-113	JW-PDI-SG-116	JW-EA02-SC05-2013	JW-EA02-SC05-2013	JW-EA02-SC05-2013	JW-EA02-SC05-2013	JW-EA02-SC05-2013	JW-EA02-SC05-2013	JW-EA04-SC13-2013
Sample ID	JW-PDI-113-SG-0-1-20230816	JW-PDI-116-SG-0-1-20230814	JW-EA02-SC05-A-130423	JW-EA02-SC05-B-130423	JW-EA02-SC05-C-130423	JW-EA02-SC05-D-130423	JW-EA02-SC05-E-130423	JW-EA02-SC105-B-130423	JW-EA04-SC13-A-130423
Sample Date[1]	8/16/2023	8/14/2023	4/23/2013	4/23/2013	4/23/2013	4/23/2013	4/23/2013	4/23/2013	4/23/2013
Depth	0 - 12 in	0 - 12 in	0 - 2 ft	2 - 4 ft	4 - 6 ft	6 - 7 ft	7 - 7.3 ft	2 - 4 ft	0 - 2 ft
Sample Type	N	N	N	N	N	N	N	FD	N
Conventional Parameters (%)									
Organic Content	**6.81**	**3.63**	--	--	--	--	--	--	--
Total Organic Carbon	--	--	**3.19**	**5.04**	**6.32**	**4.35 J**	**8.78**	**6.59**	**1.02**
Total Volatile Solids	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)									
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	**17.8**	**25.7**	--	--	--	**110**	**130**	--	--
Dioxin Furans (ng/kg)									
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	--	**6.03 J**	**9.61 J**	**34 J**	**47**	**87.4 J**	--	**30 J**	**12 J**
PCB Aroclors (µg/kg)									
Total PCB Aroclors (U = 0)	--	9.2 U	--	--	--	--	**47**	--	--
PCB Congeners (ng/kg)									
Total PCB Congener (U = 0)	--	--	--	--	--	--	--	--	--

Table 2c

Summary of Previous Investigation Data – Logway

Location ID	JW-EA04-SC13-2013	JW-EA04-SC13-2013	JW-EA04-SC13-2013	JW-EA04-SC13-2013	JW-SC402-130928	JW-SC402-130928	JW-SC402-130928	JW-SC402-130928
Sample ID	JW-EA04-SC13-B-130423	JW-EA04-SC13-C-130423	JW-EA04-SC13-D-130423	JW-EA04-SC13-EF-130423	JW-SC402-A-130928	JW-SC402-B-130928	JW-SC402-C-130928	JW-SC402-D-130928
Sample Date[1]	4/23/2013	4/23/2013	4/23/2013	4/23/2013	9/28/2013	9/28/2013	9/28/2013	9/28/2013
Depth	2 - 4 ft	4 - 6 ft	6 - 7 ft	7 - 9 ft	0 - 2 ft	2 - 4 ft	4 - 6 ft	6 - 8 ft
Sample Type	N	N	N	N	N	N	N	N
Conventional Parameters (%)								
Organic Content	--	--	--	--	--	--	--	--
Total Organic Carbon	**3.51**	**1.85**	**2.55 J**	**4.46**	**2.15**	**0.368**	**0.358**	**0.305**
Total Volatile Solids	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)								
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 0)	--	--	**110**	--	--	--	--	--
Dioxin Furans (ng/kg)								
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	**29**	**4 J**	**9.5 J**	**0.46 J**	**3.9 J**	**0.209 J**	**0.194 J**	0.126 U
PCB Aroclors (µg/kg)								
Total PCB Aroclors (U = 0)	--	--	--	--	--	--	--	--
PCB Congeners (ng/kg)								
Total PCB Congener (U = 0)	--	--	--	--	--	--	--	--

Table 2c
Summary of Previous Investigation Data – Logway

Notes:
Calculated values have been rounded to laboratory-reported significant digits.
CAEPA, 2005. Air Toxics Hot Spots Program Risk Assessment Guidelines, Part II Technical Support Document for Describing Available Cancer Potency Factors. Office of Environmental Health Hazard Assessment, California Environmental Protection Agency. May 2005.
1. Sample results from 2023 have not been validated and may be subject to change.
2. Sample collection information is currently being validated. Any changes are not expected to affect the current dioxin/furan TEQ interpolation.
Bold: Detected result
--: not applicable
µg/kg: microgram per kilogram
CAEPA: California Environmental Protection Agency.
cm: centimeter
cPAH: carcinogenic polycyclic aromatic hydrocarbon
J: Estimated value
N: normal
ng/kg: nanogram per kilogram
PCB: polychlorinated biphenyl
TEQ: toxicity equivalence
U: Compound analyzed for, but not detected above detection limit

Figures

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LEGEND:

- Marine Site Boundary
- Remnant Barge Structure
- Data Gap Areas

NOTES:
1. Aerial imagery: Esri (2022)
2. Base map: Esri World Topographic Map

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Feet

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ANCHOR QEA

Figure 1
Site Vicinity Map
Step 2 Pre-Remedial Design Investigation Work Plan
Jeld Wen Site

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LEGEND:

- Stormwater Outfall
- Jeld-Wen Outfall
- Pile Location Outside Project Boundary
- Pile Location Within Project Boundary
- Pile Location Outside Project Boundary but Identified for Removal Pending Owner Approval
- Bulkhead Removal (350 L.F.)
- Riprap Shoreline Protection (2,300 L.F.)
- Remnant Barge Structure to be Removed

SMA 1

- Monitored Natural Recovery (8.2 acres)

SMA 2

- Enhanced Monitored Natural Recovery (5.2 acres)

SMA 3

- 2-Foot Removal and Backfill (0.5 acre)
- Remove All (4-Foot assumption)* and backfill
- 2-Foot Removal and Engineered Cap (0.47 acre)

NOTES:
1. Aerial imagery: Esri (2022)
2. Piling and large surficial wood debris to be removed throughout the site.

*Maximum excavation depths in intertidal areas to be evaluated in design.

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Figure 2
Selected Cleanup Remedy - Ecology 2023 CAP
Step 2 Pre-Remedial Design Investigation Work Plan
Jeld Wen Site

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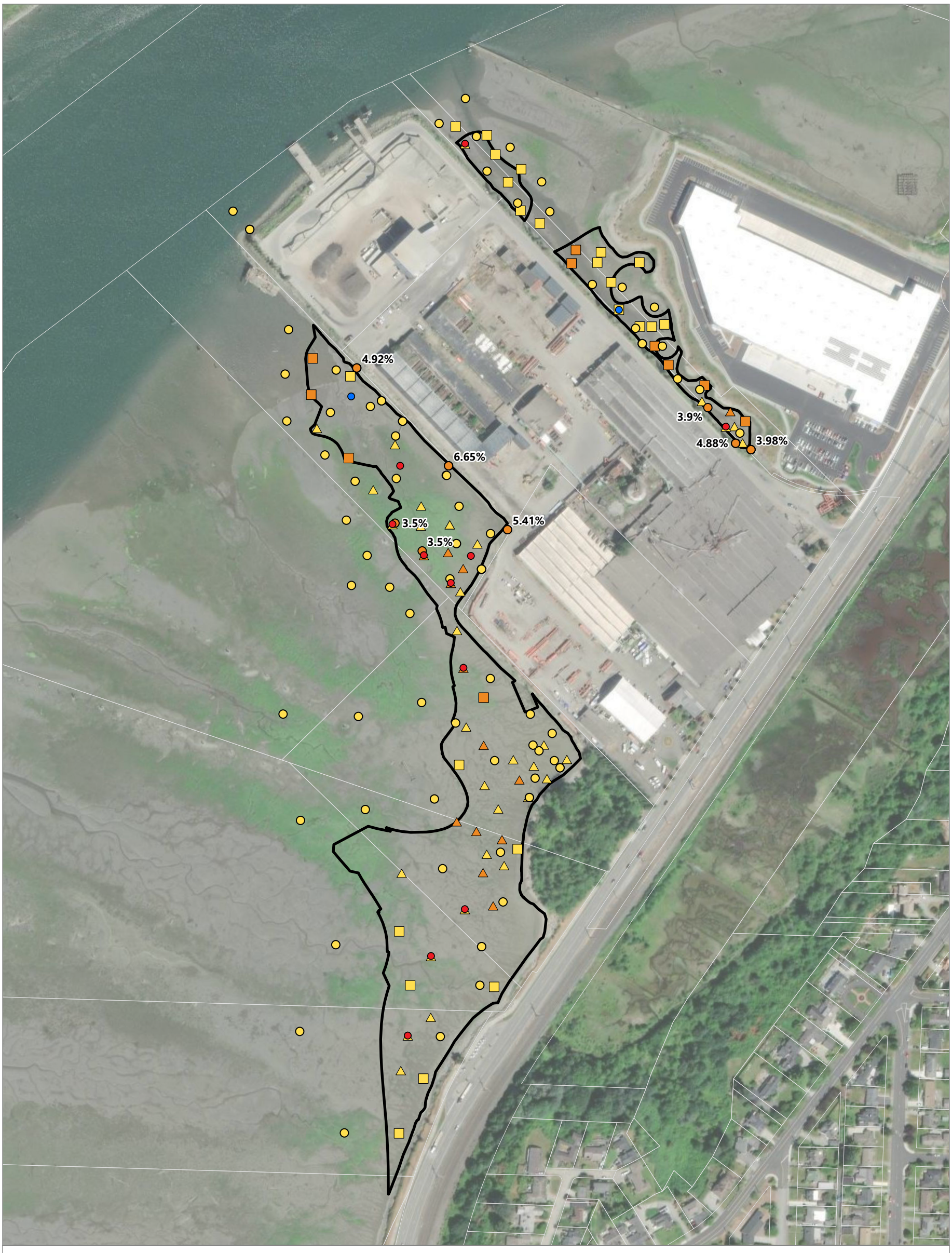

LEGEND:

- Marine Site Boundary
- Parcel
- Proposed 3-Foot Core for Sieving (Co-located with 1-Foot Recovery Location from Step 1)
- Proposed 3-Foot Core for Sieving (Co-located with <1-Foot Recovery Location from Step 1)

Remedial Investigation Study

Total Organic Carbon

- <3.5%
- >3.5%

Step 1 PRDI Sample Locations

Total Volatile Solids (<1 Foot Below Mudline)

- <5%
- 5% - 6.98%

Total Volatile Solids (1 Foot Below Mudline)

- <5%
- 5% - 6.91%

NOTE:
1. Aerial imagery: Esri (2022)

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Feet

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Figure 3
Site-Wide TOC and TVS Data with Proposed Sieving Locations
Step 2 Pre-Remedial Design Investigation Work Plan
Jeld Wen Site

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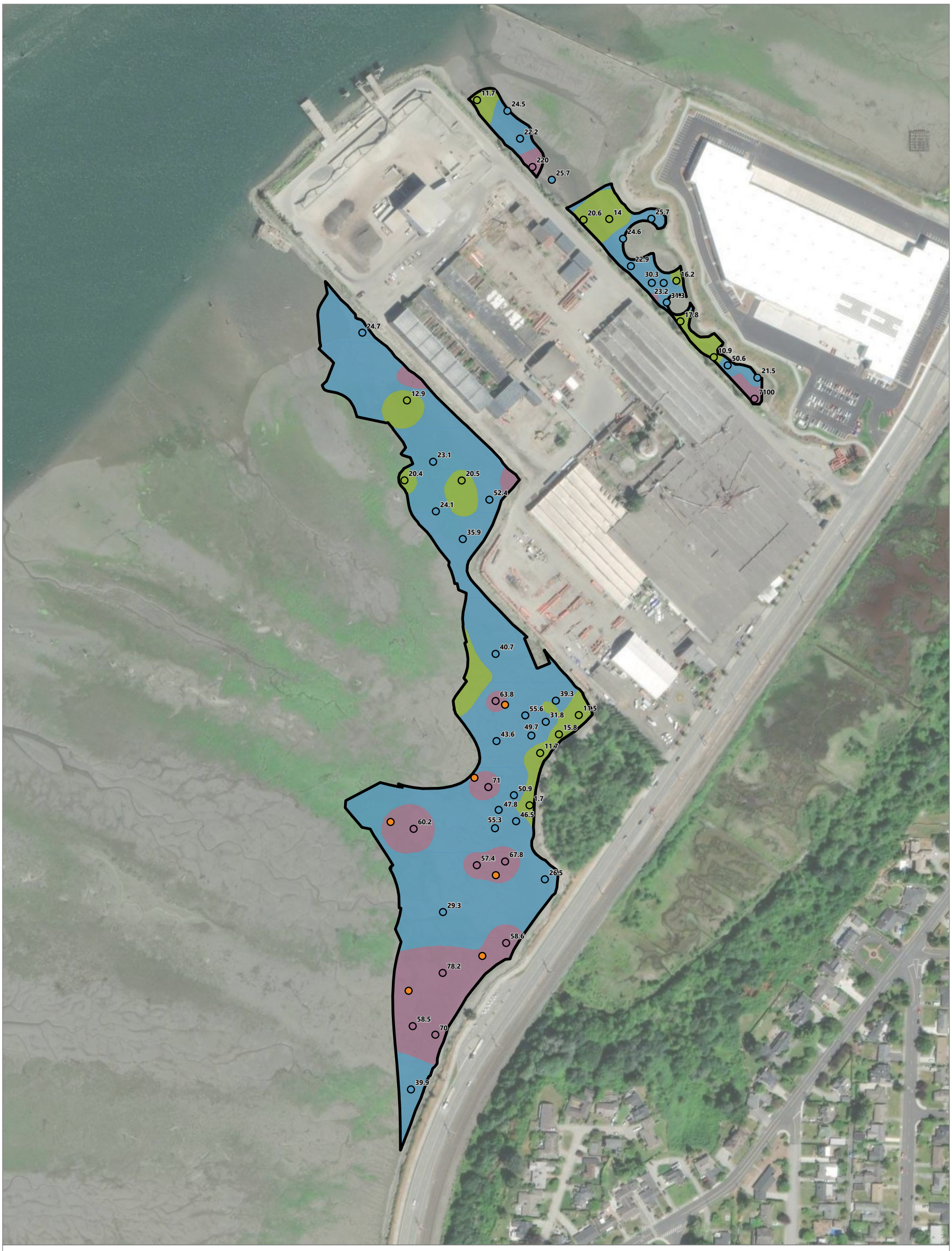

LEGEND:

- Marine Site Boundary
- Proposed 3-Foot Core or Power Grab for cPAH Analysis

Total cPAH TEQ (ug/kg)

- 0 - 21
- 21.1 - 55.9
- >56 (Port Gardner Bay Regional Background - SCUM)

NOTES:
1. Aerial imagery: Esri (2022)
2. Step 1 locations and RI/FS locations are included in interpolation data set.
3. Interpolation was created using Inverse Distance Weighting.

0 300
Feet

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Figure 4
Site-Wide cPAH TEQ Data with Proposed Grab/Short Core Locations
Step 2 Pre-Remedial Design Investigation Work Plan
Jeld Wen Site

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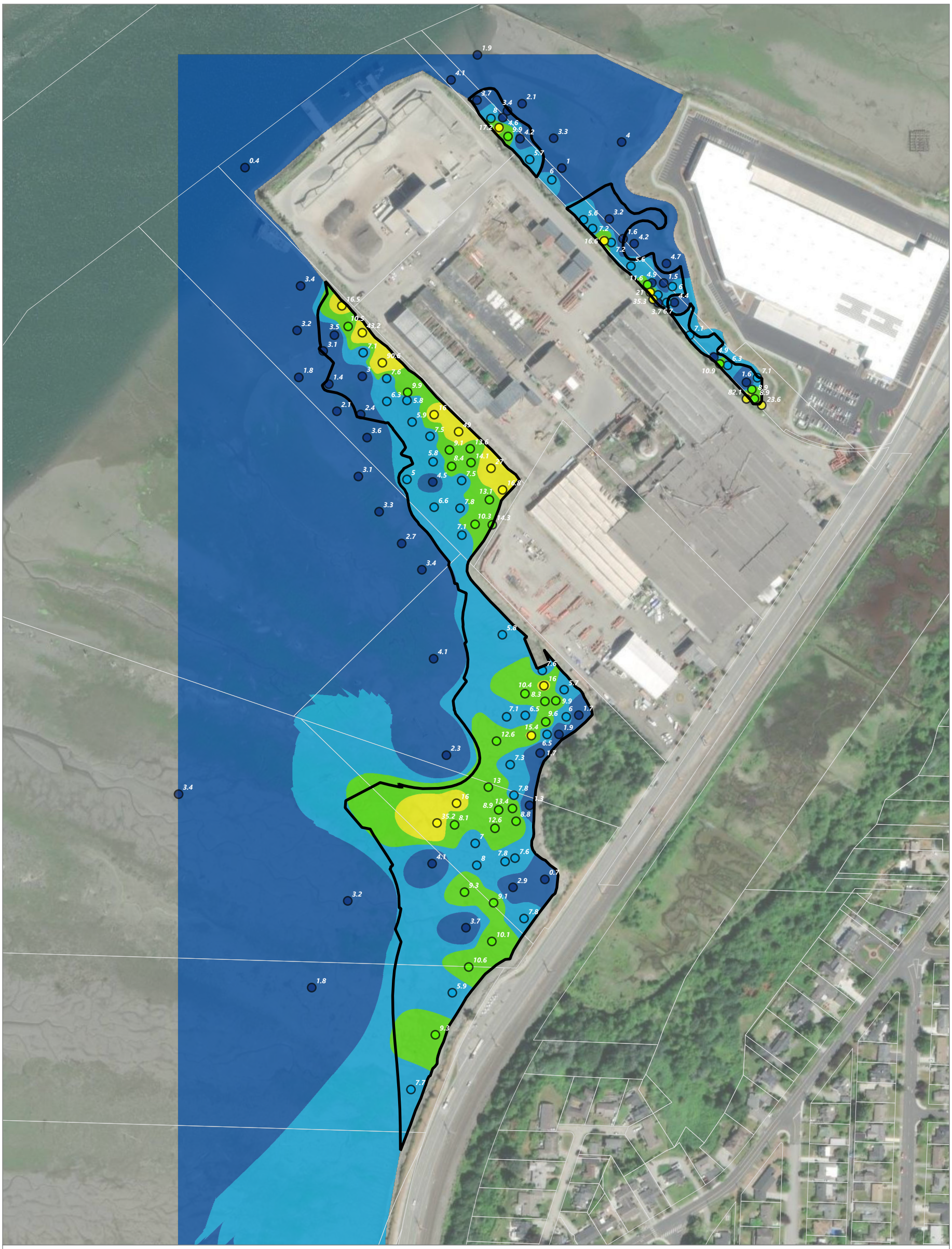

LEGEND:

- Marine Site Boundary
- Parcel

Dioxin/Furan TEQ (ng/kg)

- 0.4 - 5
- 5.1 - 8
- 8.1 - 15
- 15.1 - 90.6

NOTE:

1. Aerial imagery: Esri (2022)
2. Step 1 locations and RI/FS locations are included in interpolation data set.
3. Interpolation was created using Inverse Distance Weighting.

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Feet

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Figure 5
Site-Wide Dioxin/Furan TEQ Data - Updated IDW Interpolation
Step 2 Pre-Remedial Design Investigation Work Plan
Jeld Wen Site

DRAFT

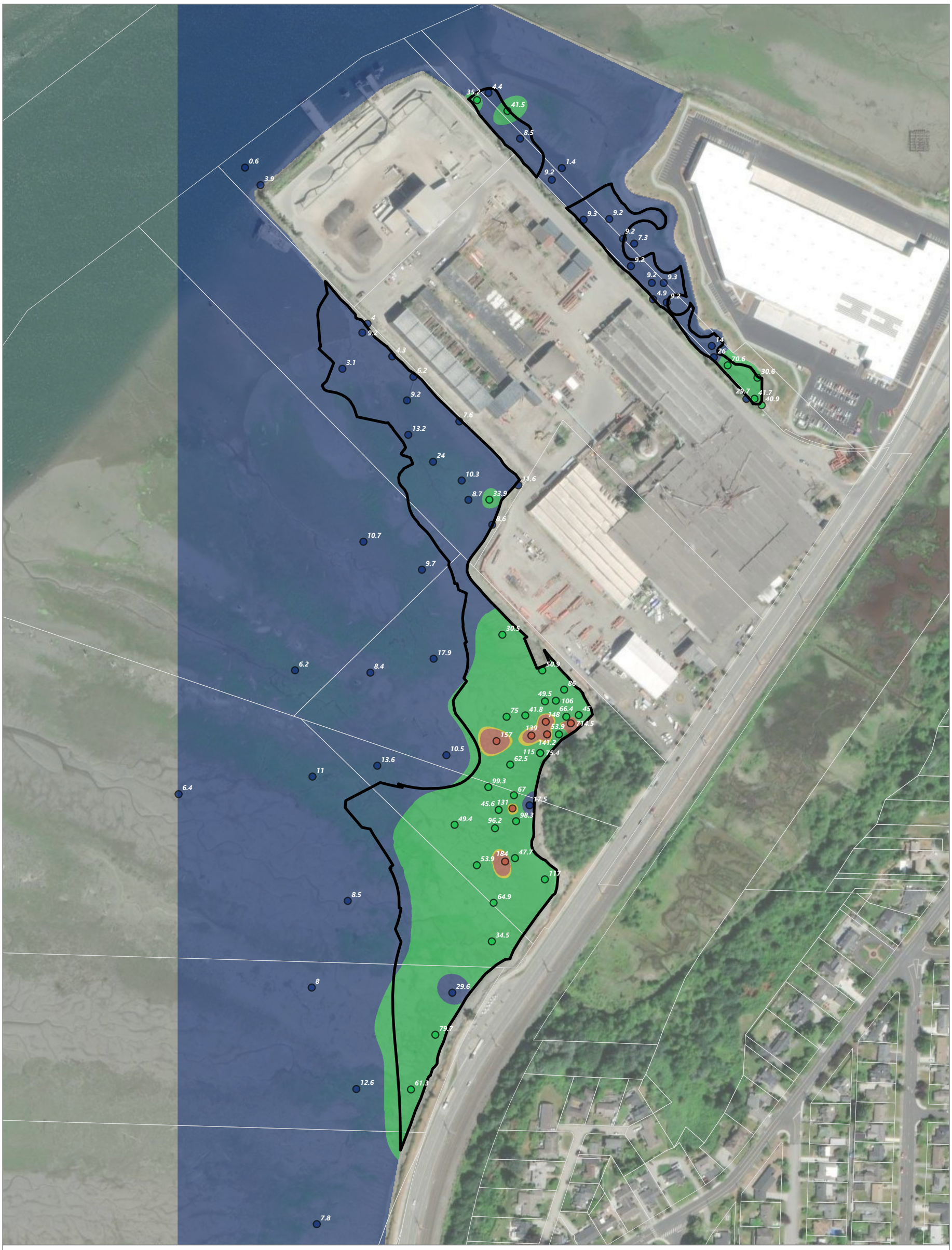

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Figure 6
Site-Wide Total PCB Aroclor Data - Updated IDW Interpolation
Step 2 Pre-Remedial Design Investigation Work Plan
Jeld Wen Site

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LEGEND:

- Marine Site Boundary
- Parcel

EMNR and Removal or Capping Areas Derived from Total PCB and Dioxin/Furan TEQ (Combined Step 1 PRDI and RI/FS Data)

- EMNR Area (5.3 acres)
- Removal or Capping Area (1.7 acres)

NOTE:
1. Aerial imagery: Esri (2022)

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Feet

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Figure 7
EMNR and Removal/Capping Areas - Updated with Step 1 PRDI Data
Step 2 Pre-Remedial Design Investigation Work Plan
Jeld Wen Site

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JW-EA10-SC42		
Depth Below Mudline (ft)	D/F TEQ (ng/kg dw)	Total PCB Congener (ug/kg dw)
0-0.33'	6 J	86 J
0-2'	7 J	69 J
2-4'	0.2 J	0.22 J
4-6'	0.2 J	0.01 J

JW-EA09-SC36		
Depth Below Mudline (ft)	D/F TEQ (ng/kg dw)	Total PCB Congener (ug/kg dw)
0-0.33'	7 J	75 J
0-2'	4 J	21 J
2-4'	--	0.04 J
4-6'	--	0.04 J

JW-EA09-SC38		
Depth Below Mudline (ft)	D/F TEQ (ng/kg dw)	Total PCB Congener (ug/kg dw)
0-0.33'	13 J	131 J
0-2'	2 J	24 J
2-4'	0.2 J	0.02 J
4-6'	0.2 J	0.007 J

Analyze Archives from Step 1 for D/F

SV-09, SV-08, GT-004, SG-118, SV-10, SG-117, SG-119, SG-122, SG-121, SG-120, SG-143, SC-028, SG-123, SG-124, SC-031, SC-029, SG-145, SV-11, SC-030, SG-125, SG-144, SG-126, SV-12, SG-146, SG-127, SG-147, SV-13, SG-128, SG-129, SG-130, SG-131, SG-132

0 150 Feet

LEGEND:

- 50-Foot Sample Grid
- Contour 1-Foot Interval (MLLW)
- Historical Core Sample Location
- Surface Sediment Sample

Dioxin/Furan TEQ (U=1/2) (ng/kg)

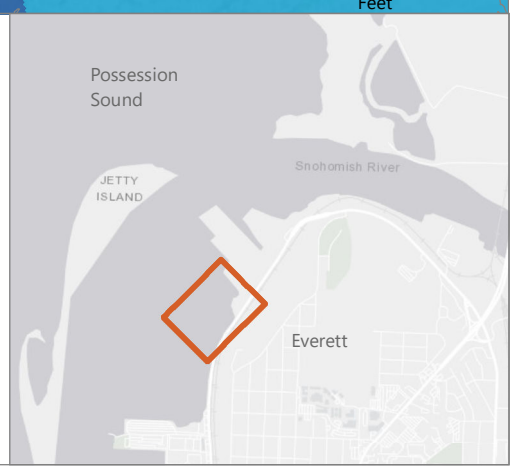
- 0.5 - 5
- 5.1 - 8
- 8.1 - 15
- 15.1 - 90.6

- Ex Situ Solid Phase Microextraction (SPME) Sample Location

Proposed Sampling Locations

- 3-Foot Short Core (D/F)
- Archived Power Grab or Short Core (D/F and PCBs)
- Power Grab or Short Core (D/F)
- Shoreline Geotechnical Boring

NOTES:
1. Aerial imagery: Esri (2022)
2. Base map: Esri Light Gray Canvas
3. D/F TEQ and Total PCB tables are historical core data from the remedial investigation.



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ANCHOR QEA

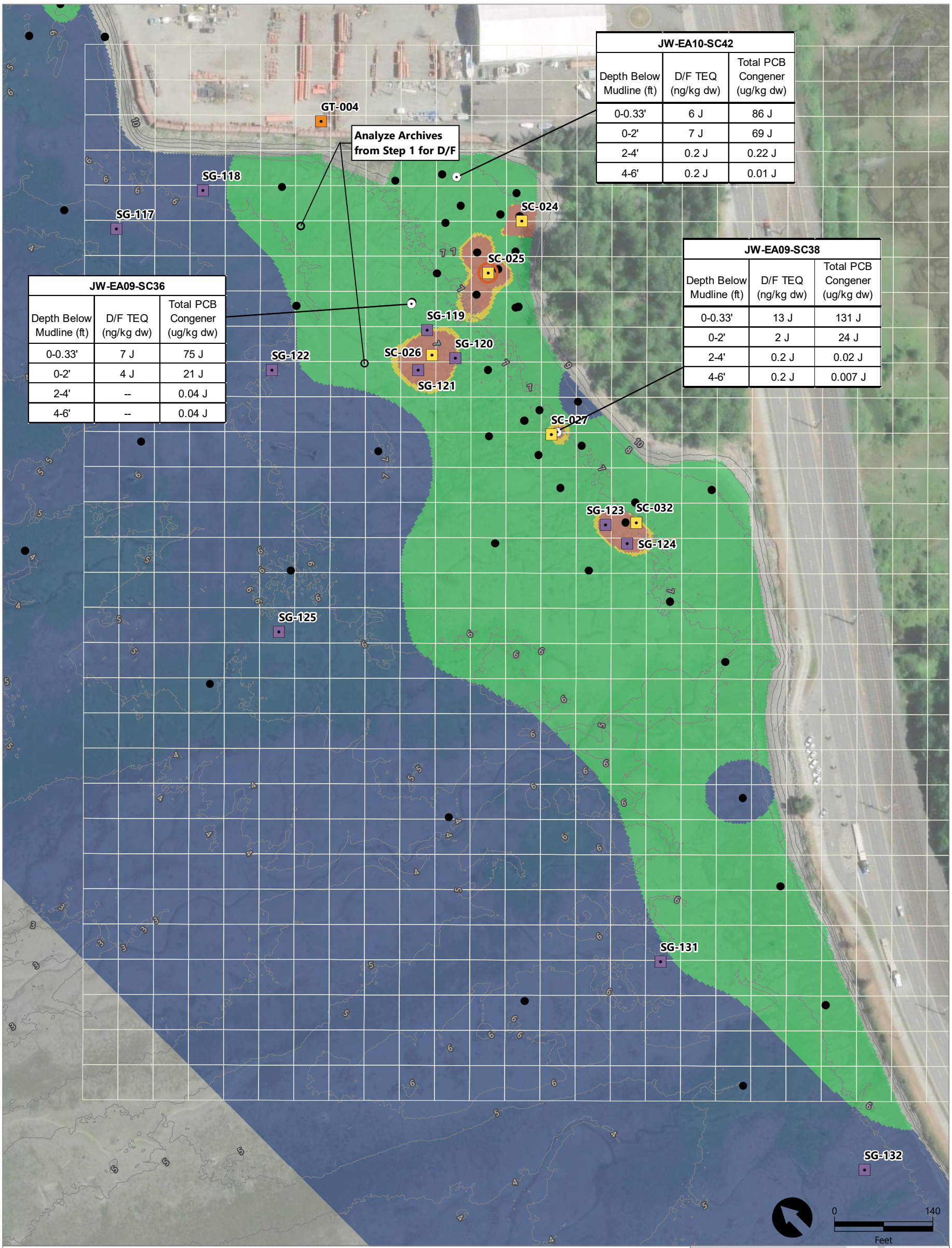
Figure 8a
Knoll Area Dioxin/Furan TEQ Data - Proposed Sample Locations
Step 2 Pre-Remedial Design Investigation Work Plan
Jeld Wen Site

DRAFT

JW-EA10-SC42		
Depth Below Mudline (ft)	D/F TEQ (ng/kg dw)	Total PCB Congener (ug/kg dw)
0-0.33'	6 J	86 J
0-2'	7 J	69 J
2-4'	0.2 J	0.22 J
4-6'	0.2 J	0.01 J

JW-EA09-SC36		
Depth Below Mudline (ft)	D/F TEQ (ng/kg dw)	Total PCB Congener (ug/kg dw)
0-0.33'	7 J	75 J
0-2'	4 J	21 J
2-4'	--	0.04 J
4-6'	--	0.04 J

JW-EA09-SC38		
Depth Below Mudline (ft)	D/F TEQ (ng/kg dw)	Total PCB Congener (ug/kg dw)
0-0.33'	13 J	131 J
0-2'	2 J	24 J
2-4'	0.2 J	0.02 J
4-6'	0.2 J	0.007 J



LEGEND:

- 50-Foot Sample Grid
- Contour 1-Foot Interval (MLLW)
- Historical Core Sample Location
- Surface Sediment Sample

Total PCBs (ug/kg)

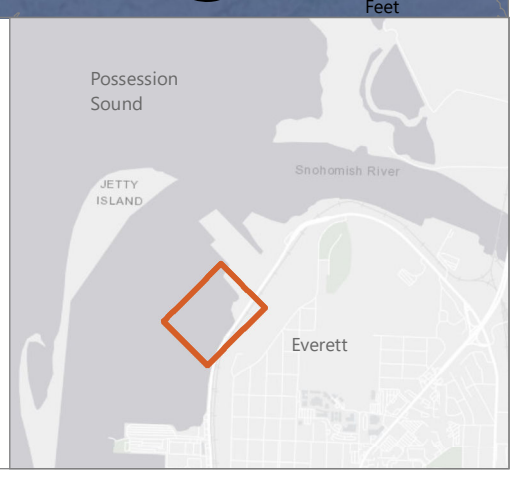
- 0.60 - 30.00
- 30.01 - 117.00
- 117.01 - 130.00
- 130.01 - 714.50

- Ex Situ Solid Phase Microextraction (SPME) Sample Location

Proposed Sampling Locations

- 3-Foot Short Core (PCBs)
- Archived Power Grab or Short Core (D/F and PCBs)
- Shoreline Geotechnical Boring

NOTES:
1. Aerial imagery: Esri (2022)
2. Base map: Esri Light Gray Canvas
3. D/F TEQ and Total PCB tables are historical core data from the remedial investigation.



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Filepath: \\Orcas\GIS\Jobs\JELD-WEN_0546\Maps\2023_PDIR\Step 2\WorkPlan\AQ_JW_WP_Fig8B_KnollTotalPCB.mxd

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Figure 8b
Knoll Area Total PCB Data - Proposed Sample Locations
Step 2 Pre-Remedial Design Investigation Work Plan
Jeld Wen Site

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SC-001
SC-002
SC-003
SC-004
SC-005
SV-04
SC-007
SC-008
GT-001
SC-009
SV-05
SC-011
SC-012
SC-013
SC-014
GT-002
SV-06
SC-017
SV-07
SC-018
SC-020
SC-019
SV-09
SV-08
GT-003

JW-SC401	
Depth Below Mudline (ft)	D/F TEQ (ng/kg dw)
0-2'	2.4 J
2-4'	0.8 J
4-6'	0.2 J

JW-EA06-SC21	
Depth Below Mudline (ft)	D/F TEQ (ng/kg dw)
0-0.33'	10 J
0-2'	29 J
2-4	14 J

JW-EA06-SC23	
Depth Below Mudline (ft)	D/F TEQ (ng/kg dw)
0-0.33'	91 J
0-2'	38 J
2-4	23 J
4-6	0.2 J

JW-EA07-SC27	
Depth Below Mudline (ft)	D/F TEQ (ng/kg dw)
0-0.33'	49 J
0-1'	51 J
1-2'	105 J
2-2.5'	25

JW-EA07-SC28	
Depth Below Mudline (ft)	D/F TEQ (ng/kg dw)
0-0.33'	5 J
0-2'	14 J
2-4'	0.4 J
4-6'	0.2 J

0 80
Feet

LEGEND:

- 50-Foot Sample Grid
- Contour 1-Foot Interval (MLLW)
- Historical Core Sample Location
- Surface Sediment Sample

Dioxin/Furan TEQ (U=1/2) (ng/kg)

- 0.5 - 5
- 5.1 - 8
- 8.1 - 15
- 15.1 - 90.6

- Ex Situ Solid Phase Microextraction (SPME) Sample Location

Proposed Sampling Locations

- 6-Foot Core (D/F)
- Shoreline Geotechnical Boring

NOTES:
1. Aerial imagery: Esri (2022)
2. Base map: Esri Light Gray Canvas
3. D/F TEQ and Total PCB tables are historical core data from the remedial investigation.

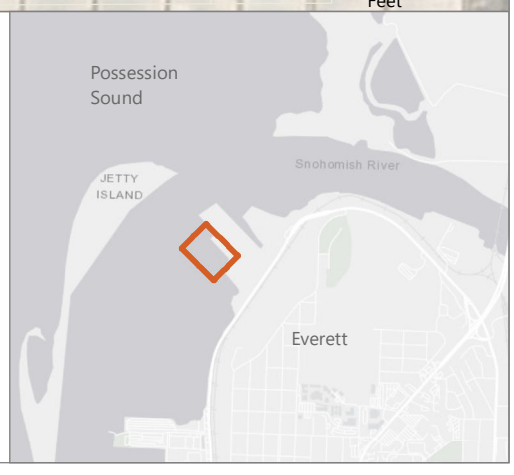

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Figure 9a
Southern Shoreline Area Dioxin/Furan TEQ Data - Proposed Sample Locations
Step 2 Pre-Remedial Design Investigation Work Plan
Jeld Wen Site

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JW-SC401	
Depth Below Mudline (ft)	D/F TEQ (ng/kg dw)
0-2'	2.4 J
2-4'	0.8 J
4-6'	0.2 J

JW-EA06-SC21	
Depth Below Mudline (ft)	D/F TEQ (ng/kg dw)
0-0.33'	10 J
0-2'	29 J
2-4	14 J

JW-EA06-SC23	
Depth Below Mudline (ft)	D/F TEQ (ng/kg dw)
0-0.33'	91 J
0-2'	38 J
2-4	23 J
4-6	0.2 J

JW-EA07-SC27	
Depth Below Mudline (ft)	D/F TEQ (ng/kg dw)
0-0.33'	49 J
0-1'	51 J
1-2'	105 J
2-2.5'	25

JW-EA07-SC28	
Depth Below Mudline (ft)	D/F TEQ (ng/kg dw)
0-0.33'	5 J
0-2'	14 J
2-4'	0.4 J
4-6'	0.2 J

SC-001, SC-002, SC-003, SC-004, SC-005, SV-04, SC-007, SC-008, GT-001, SC-009, SV-05, SC-011, SC-012, SC-013, SC-014, GT-002, SC-017, SV-06, SV-07, SC-018, SC-020, SC-019, SV-09, SV-08, GT-003

0 80
Feet

LEGEND:

- 50-Foot Sample Grid
- Contour 1-Foot Interval (MLLW)
- Historical Core Sample Location
- Surface Sediment Sample

Dioxin/Furan TEQ (U=1/2) (ng/kg)

- 0.5 - 5
- 5.1 - 8
- 8.1 - 15
- 15.1 - 90.6

- Ex Situ Solid Phase Microextraction (SPME) Sample Location

Proposed Sampling Locations

- 6-Foot Core (D/F)
- Shoreline Geotechnical Boring

NOTES:
1. Aerial imagery: Esri (2022)
2. Base map: Esri Light Gray Canvas
3. D/F TEQ and Total PCB tables are historical core data from the remedial investigation.

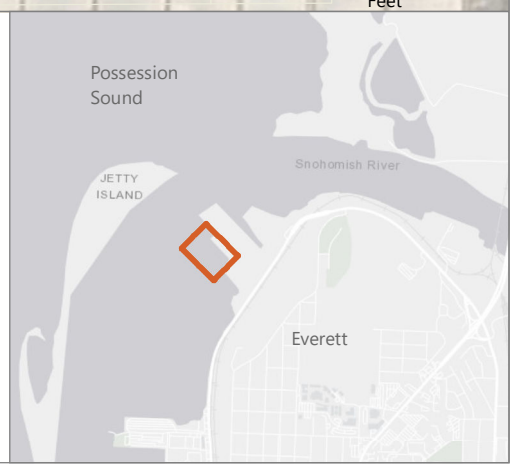

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Figure 9b
Southern Shoreline Area Dioxin/Furan TEQ Without <1-Foot Refusal Data - Proposed Sample Locations
Step 2 Pre-Remedial Design Investigation Work Plan
Jeld Wen Site

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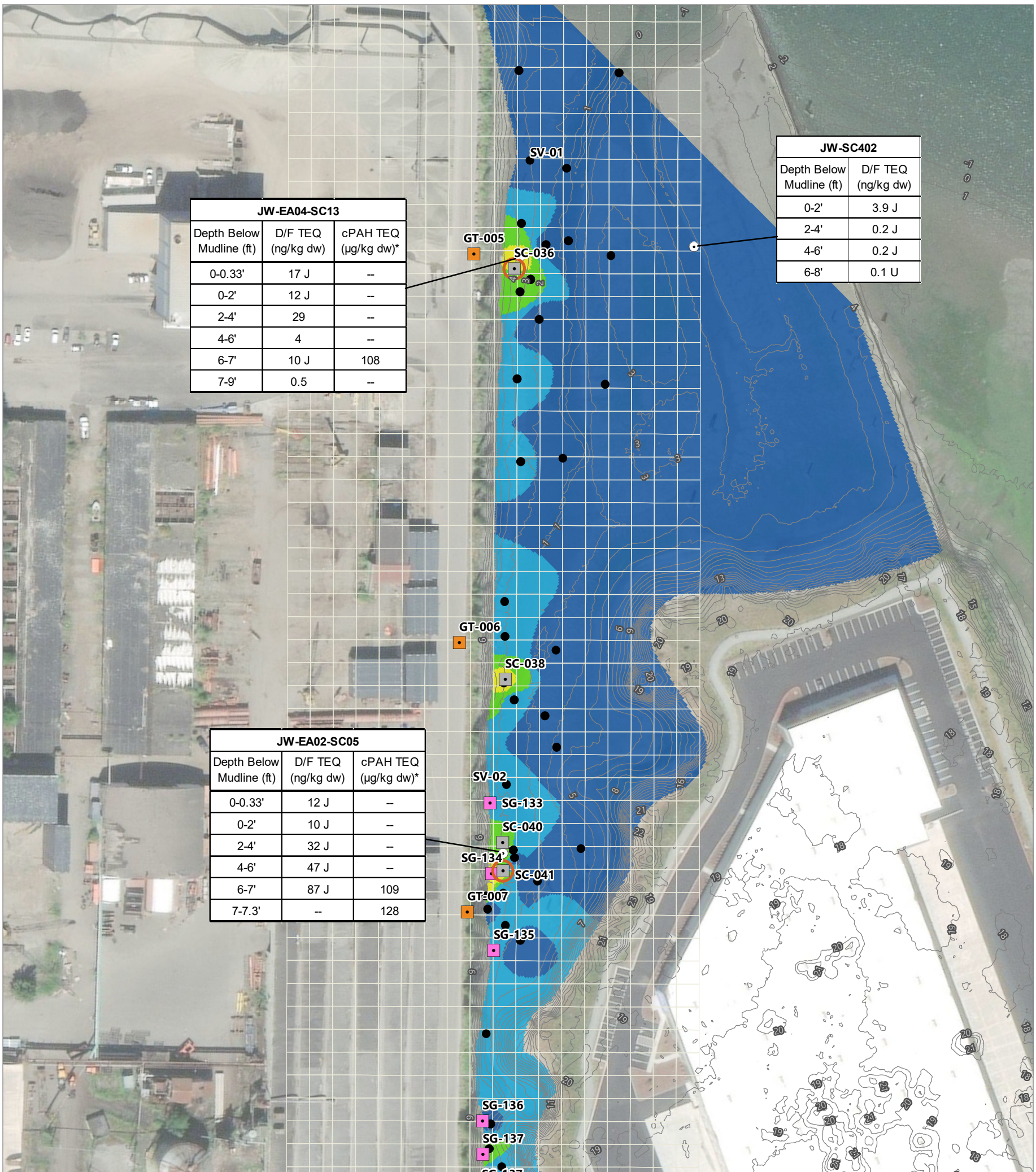
JW-EA04-SC13		
Depth Below Mudline (ft)	D/F TEQ (ng/kg dw)	cPAH TEQ (µg/kg dw)*
0-0.33'	17 J	--
0-2'	12 J	--
2-4'	29	--
4-6'	4	--
6-7'	10 J	108
7-9'	0.5	--

JW-SC402	
Depth Below Mudline (ft)	D/F TEQ (ng/kg dw)
0-2'	3.9 J
2-4'	0.2 J
4-6'	0.2 J
6-8'	0.1 U

JW-EA02-SC05		
Depth Below Mudline (ft)	D/F TEQ (ng/kg dw)	cPAH TEQ (µg/kg dw)*
0-0.33'	12 J	--
0-2'	10 J	--
2-4'	32 J	--
4-6'	47 J	--
6-7'	87 J	109
7-7.3'	--	128



LEGEND:

- 25-Foot Sample Grid
- Contour 1-Foot Interval (MLLW)
- Historical Core Sample Location
- Surface Sediment Sample

Dioxin/Furan TEQ (U=1/2) (ng/kg)

- 0.5 - 5
- 5.1 - 8
- 8.1 - 15
- 15.1 - 90.6

- Ex Situ Solid Phase Microextraction (SPME) Sample Location

Proposed Sampling Locations

- 8-Foot Core (D/F)
- Surface Grab Sample for PCBs and D/F (0-0.5 feet) Aliquot for Composites SG-136 through SG-141 and SG-133 through SG-135)
- Shoreline Geotechnical Boring

NOTES:

1. Aerial imagery: Esri (2022)
2. Base map: Esri Light Gray Canvas
3. D/F TEQ and Total PCB tables are historical core data from the remedial investigation.

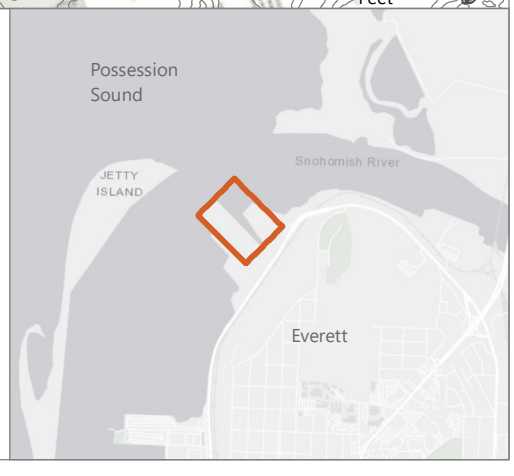


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Figure 10a
Logway Area Dioxin/Furan TEQ Data - Proposed Sample Locations
Step 2 Pre-Remedial Design Investigation Work Plan
Jeld Wen Site

DRAFT

JW-EA04-SC13		
Depth Below Mudline (ft)	D/F TEQ (ng/kg dw)	cPAH TEQ (µg/kg dw)*
0-0.33'	17 J	--
0-2'	12 J	--
2-4'	29	--
4-6'	4	--
6-7'	10 J	108
7-9'	0.5	--

JW-SC402	
Depth Below Mudline (ft)	D/F TEQ (ng/kg dw)
0-2'	3.9 J
2-4'	0.2 J
4-6'	0.2 J
6-8'	0.1 U

JW-EA02-SC05		
Depth Below Mudline (ft)	D/F TEQ (ng/kg dw)	cPAH TEQ (µg/kg dw)*
0-0.33'	12 J	--
0-2'	10 J	--
2-4'	32 J	--
4-6'	47 J	--
6-7'	87 J	109
7-7.3'	--	128

SV-01
GT-005
SC-036
GT-006
SC-038
SV-02
SG-133
SC-040
SG-134
SC-041
GT-007
SG-135
SG-136
SG-137
SG-137
SG-139
SV-03
SG-140
GT-008
SC-044
SG-141

0 125 Feet

LEGEND:

- 25-Foot Sample Grid
- Contour 1-Foot Interval (MLLW)
- Historical Core Sample Location
- Surface Sediment Sample

Dioxin/Furan TEQ (U=1/2) (ng/kg)

- 0.5 - 5
- 5.1 - 8
- 8.1 - 15
- 15.1 - 90.6

- Ex Situ Solid Phase Microextraction (SPME) Sample Location

Proposed Sampling Locations

- 8-Foot Core (D/F)
- Surface Grab Sample for PCBs and D/F (0-0.5 feet) Aliquot for Composites SG-136 through SG-141 and SG-133 through SG-135)
- Shoreline Geotechnical Boring

NOTES:
1. Aerial imagery: Esri (2022)
2. Base map: Esri Light Gray Canvas
3. D/F TEQ and Total PCB tables are historical core data from the remedial investigation.

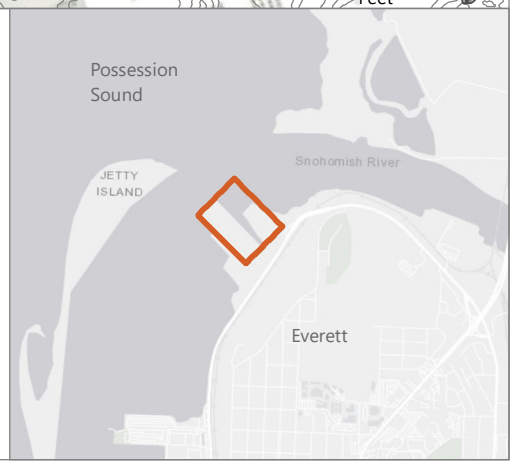

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Figure 10b
Logway Area Dioxin/Furan TEQ Without <1-Foot Refusal Data - Proposed Sample Locations
Step 2 Pre-Remedial Design Investigation Work Plan
Jeld Wen Site

Appendix A
Sampling and Analysis Plan

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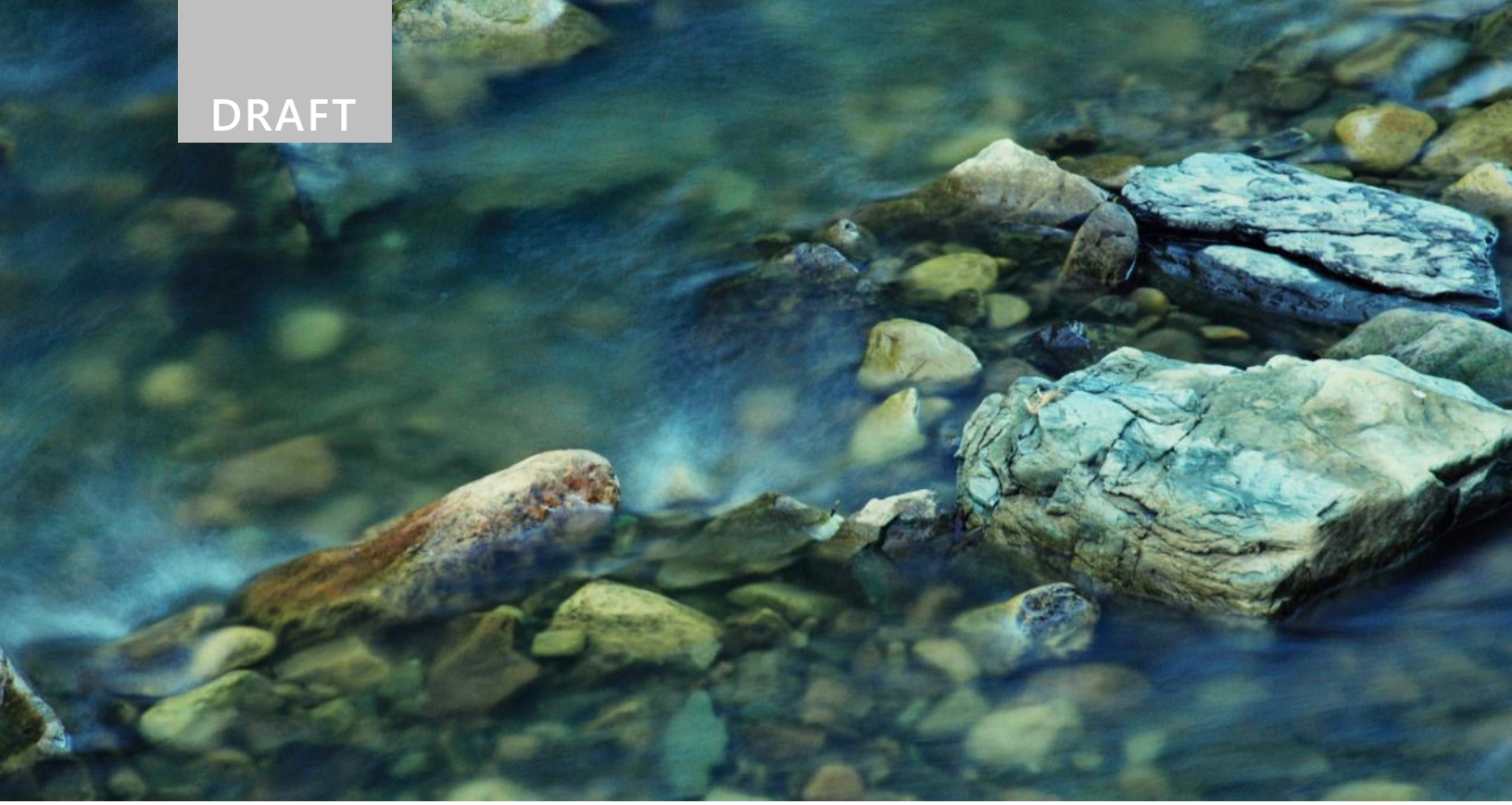

January 2024
Jeld Wen Site, Everett

ANCHOR QEA

Step 2 Pre-Remedial Design Investigation Sampling and Analysis Plan – Marine Areas of Jeld Wen Site

Prepared for JELD-WEN, Inc., and Washington State Department of Ecology

DRAFT

January 2024
Jeld Wen Site, Everett

Phase 2 Pre-Remedial Design Investigation Sampling and Analysis Plan – Marine Areas of Jeld Wen Site

Prepared for
JELD-WEN, Inc.
2645 Silver Crescent Dr.
Charlotte, NC 28273

Washington State Department of Ecology
P.O. Box 47600
Olympia, Washington 98504-7600

Prepared by
Anchor QEA, LLC
949 Market Street, Suite 700
Tacoma, Washington 98402

Project Number: 230909-01

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TABLE

FIGURES

ATTACHMENTS

ABBREVIATIONS

ARL	Analytical Resources, LLC.
ASTM	ASTM International
COC	chain of custody
cPAH	carcinogenic polycyclic aromatic hydrocarbons
DF	dioxin/furan
DGPS	differential global positioning system
Ecology	Washington State Department of Ecology
EGL	Environmental Geochemistry Lab
EMNR	enhanced monitored natural recovery
HDPE	high-density polyethylene
PCB	polychlorinated biphenyl
PRDI	Pre-Remedial Design Investigation
QA	quality assurance
QC	quality control
REL	remediation levels
RL	reporting limit
SAP	Sampling and Analysis Plan
SGS	SGS North America, Inc.
Site	Jeld Wen Site
SMA	sediment management area
SOP	Standard Operating Procedure
SPME	solid-phase microextraction
SWAC	surface-weighted average concentration
TEQ	toxicity equivalency quotient
WP	Work Plan

1 Introduction

This Draft Step 2 Pre-Remedial Design Investigation (PRDI) Sampling and Analysis Plan (SAP) describes procedures for the collection, processing, and handling of additional sediment sieving wood volume measurements, surface sediment, subsurface sediment, and porewater chemical concentration data, and geotechnical soil data under the Step 2 PRDI Work Plan (WP). JELD-WEN, Inc., is implementing this work under the Second Amendment (effective July 28, 2023) to Agreed Order Number DE 5095 entered in January 2008 between JELD-WEN and the Washington State Department of Ecology (Ecology), and the *Final Cleanup Action Plan, Jeld Wen Site* (Ecology 2023) for the marine portion of the Jeld Wen Site (Site) located in Everett, Washington. Specifically, this SAP is for the Southern Shoreline, Knoll Area, and Logway (marine areas) depicted on Figure 1 of the Step 2 PRDI WP.

As discussed in the Final Cleanup Action Plan, PRDI activities will begin with development of a PRDI WP to inform future remedial design work. The purpose of the additional data collection conducted as part of the PRDI WP and this SAP is to address specific remaining data gaps needed to further refine the sediment management areas (SMAs) depicted on Figure 2 of the PRDI WP and initiate remedial design of the cleanup action for the marine areas of the Site. In accordance with the PRDI WP, surface sediment samples will be collected and analyzed for dioxins/furans (DF) toxicity equivalence (TEQ), total polychlorinated biphenyl (PCB) Aroclors, and carcinogenic polycyclic aromatic hydrocarbons (cPAHs). Subsurface sediment samples will be collected and analyzed for DF TEQ and PCBs. Surface and potentially subsurface sediments at select locations will be sieved for wood volume. Porewater samples will be collected and analyzed for DF TEQ and PCB congeners. Upland soil geotechnical samples will be collected and analyzed for moisture content, Atterberg limits, bulk density, grain size, specific gravity, consolidated undrained triaxial strength, and 1D consolidation. Work will be conducted in accordance with the Model Toxics Control Cleanup Act and Sediment Management Standards administered by Ecology under Chapter 173-340 and 173-204, respectively, of the Washington Administrative Code.

1.1 Purpose and Objectives of the Pre-Remedial Design Sampling and Analysis Plan

This SAP, which is Appendix A of the Step 2 PRDI WP, details the methods and processes that will be used to collect data as part of the PRDI objectives laid out in Section 1.4 of the Step 2 PRDI WP. This SAP is being implemented to support remedial design by filling the following data gaps presented in the PRDI WP:

- Wood volume measurements from the 0-to 1-foot interval are needed to address uncertainty regarding the presence of wood in areas where Step 1 PRDI sampling encountered refusal.

- Surface sediment cPAH data are needed to inform design parameters and post-construction cPAH TEQ surface-weighted average concentration (SWAC) evaluations.
- Surface chemical data for further lateral delineation of surface sediment D/F TEQ and PCB chemical concentrations in enhanced monitored natural recovery (EMNR) and removal and/or capping areas are needed to refine these areas for the remedial design and to ensure actions are protective of human health.
- Chemical characterization data for D/F TEQ and PCBs are needed for sediment behind the bulkheads in the Logway that will be removed as part of the cleanup action.
- Subsurface chemical concentration data are needed to inform the remedial design of dredge/excavation prisms (i.e., depth of contamination within the laterally refined removal and EMNR areas) and achieve complete removal of areas exceeding remediation levels (RELs) within SMA-3 and portions of SMA-2 within the Knoll Area, or to inform engineered cap design in areas where complete removal of sediment exceeding RELs is not feasible.
- Geotechnical data for material physical properties within the immediately adjacent shoreline slopes are needed to support remedial excavation design and potential shoring requirements.
- Porewater data in SMA-3 (and a small portion of SMA-2 in the Knoll Area, subject to remedial design) are needed to ensure capping will remain protective and will not be subject to recontamination.

1.2 Document Organization

The remainder of this document is organized into the following sections:

- Section 2 – Project Management and Responsibilities
- Section 3 – Sample Collection, Processing, Identification, and Positioning Procedures
- Section 4 – Field Documentation, Decontamination, Sample Handling, and Waste Management
- Section 5 – Chemical and Physical Testing
- Section 6 – Field Sampling Schedule
- Section 7 – References

2 Project Management and Responsibilities

This section describes the project management structure for implementing this SAP. Additional information about staff responsible for project management and other roles is defined in the Quality Assurance Project Plan (QAPP; Appendix B of the Step 2 PRDI WP).

2.1 Project Planning and Coordination

Frank Winslow will serve as the government project manager for Ecology, who will conduct the overall project coordination, review reports, and coordinate with JELD-WEN and Anchor QEA. Jason Cornetta, Anchor QEA, will serve as the Anchor QEA task and field manager and is responsible for executing this SAP by overseeing the collection and analysis of field samples and reporting the analytical results to Ecology. Lexus Sullivan and Nina Maas, Anchor QEA, will serve as the field leads and are responsible for executing this SAP by overseeing the field sampling effort in terms of logistics, personnel, and field operations.

2.2 Laboratory Planning and Coordination

Jennifer Marsalla, Anchor QEA, will serve as the project chemist and quality assurance (QA) manager and laboratory coordinator. She is responsible for subcontracting the state-certified laboratory, ensuring observation of established protocols for sample processing, decontamination, sample preservation, holding times, chain-of-custody (COC) documentation, and data management. She will provide QA oversight of the analytical and data validation programs, ensuring that the chemistry data are valid and usable for their intended purpose, and that all sample processing and analytical procedures meet the quality control (QC) requirements identified in the QAPP.

2.3 Subcontractor Support

Sediment samples collected by Anchor QEA are assumed to be analyzed by Analytical Resources, Inc. (ARL), located in Tukwila, Washington, or another Ecology-accredited laboratory. Sediments collected for porewater samples are assumed to be processed by the Anchor QEA Environmental Geochemistry Lab (EGL) located in Portland, Oregon, and analyzed by SGS North America, Inc. (SGS), located in Wilmington, North Carolina. Geotechnical samples will be analyzed by a laboratory following relevant protocols to be selected prior to the field effort. All chemical and geotechnical testing will adhere to SW-846 QA/QC procedures and analysis protocols[1] or follow the appropriate ASTM International (ASTM) or Standard Method protocols. If more current analytical methods are available, the laboratory may use them as long as the lab holds accreditation for the analytes and method.

[1] U.S. Environmental Protection Agency, 2019. *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*; Third Edition; Final Update VII. May 2019.

Sue Dunihoo will serve as the laboratory project manager at ARL, Masa Kanematsu will serve as the laboratory project manager at EGL, and Amy Boehm will serve as the laboratory project manager at SGS. The laboratory manager for geotechnical samples will be established upon laboratory selection prior to the field effort. The laboratory manager will oversee all laboratory operations associated with the receipt of the environmental or geotechnical samples, chemical or physical analyses, and laboratory report preparation for this project. The laboratory manager will review all laboratory reports and prepare case narratives describing any anomalies and exceptions that occurred during analyses.

The data validator project manager will be Stella Cuenco, Laboratory Data Consultants, who will serve as the primary contact and perform all applicable Stage 2B and Stage 4 data validation.

2.4 Health and Safety Program

An updated site-specific Health and Safety Plan is included in Appendix C of the Step 2 PRDI WP. A job safety analysis specific to the sample collection and described herein, has been added to the updated Health and Safety Plan and includes identification of potential physical and chemical hazards, and key project personnel.

3 Sample Collection, Processing, Identification and Positioning Procedures

This SAP describes the procedures that will be used to collect surface and sediment samples needed to provide the additional data described in the Step 2 PRDI WP. The target sampling locations and coordinates are included in Table 1 and depicted in Figures 1 through 4. The Inadvertent Discovery Plan (Attachment A) will be followed during all field work described in this SAP. Components of this work that rely on ASTM methods will refer to currently adopted versions of the methods to ensure data quality.

3.1 Surface Sediment Chemistry Sampling

Surface sediment chemistry samples will be collected from 62 targeted marine area locations identified in the Step 2 PRDI WP. The purpose of this additional surface sediment sample collection is to inform the remedial design by further delineating the lateral extent of DF TEQ and PCBs in these remediation areas and to inform post-cleanup cPAH SWAC evaluations.

As described in the Step 2 PRDI WP, the following surface sediment samples, along with additional sample volumes to be archived for potential analysis based on initial Step 2 data, will be collected from 0 to 1 foot below ground surface:

Knoll Area – 31 locations (Figure 2)

- Collecting and analyzing power grab or short core samples for D/F TEQ at five locations
- Collecting and analyzing samples from the 0-to 1-foot interval of 3-foot subsurface cores for D/F TEQ at four locations
- Collecting and analyzing samples from the 0-to 1-foot interval of 3-foot subsurface cores for PCBs at five locations
- Collecting and analyzing power grab or short core samples for cPAHs at six locations
- Collecting power grab or short core samples for archive only at 11 locations

South Shoreline – 16 locations (Figure 3)

- Collecting and analyzing samples from the 0-to 1-foot interval of 6-foot subsurface sediment cores for D/F TEQ at 16 locations

Logway – 15 locations (Figure 4)

- Collecting and analyzing samples from the 0-to 1-foot interval of 8-foot subsurface cores for D/F TEQ at six locations
- Collecting 0-to 0.5-foot hand samples from three locations behind the northern bulkhead and from six locations behind the southern bulkhead for composite samples to be analyzed for D/F TEQ and PCBs

Samples from any location with visual observations of contamination (i.e., sheen, odors, etc.) will be submitted for analysis of D/F TEQ, PCBs, and cPAHS.

3.1.1 Surface Sediment Grab Sampling

- The boat captain will navigate the vessel as close as possible to the target sampling location using an onboard differential global positioning system (DGPS). Prior to collecting each sample, the depth to mudline will be determined using a calibrated fathometer or lead line.
- The Van Veen or comparable grab sampler will be lowered over the side of the boat using a winch and davit connected to a cable at an approximate speed of 0.3 foot per second. The sampler will be weighted as necessary to help achieve the target penetration depth and acceptance criteria.
- When the sampler reaches the mudline, the sampler will be closed, and DGPS coordinates will be recorded. The depth to mudline will be determined using a calibrated fathometer or lead line.
- The sampler will be retrieved aboard the vessel and evaluated for acceptance based on the following criteria:
  - Overlying water is present, and the turbidity does not visually suggest disturbance of the mudline.
  - The sampler is not overfilled.
  - The sediment surface appears visually undisturbed.
  - There are no visual signs of winnowing or leaking from the sampling device.
  - At least 1 foot of material is recovered.

Grab samples not meeting these criteria will be rejected and the sample collection steps will be repeated until the acceptance criteria are met, but no more than three attempts will occur at each location, and the attempt with the highest recovery will be retained. Alternatively, short cores may be used as described in Section 3.1.2.

The following protocols will be used to process surface sediment samples:

- Siphon-off water overlying the mudline, taking care not to remove sediment.
- Take digital photographs of each grab with a label indicating project, sample location, and date.
- Record the sample description on the grab sample log form, including, but not limited to, the following observations as appropriate:
  - Physical soil description in accordance with the Unified Soil Classification System (ASTM D2488 – Standard Practice for Description and Identification of Soils [Visual Manual Procedures]) including soil type, density/consistency, color, and other similar descriptors

  - Presence of signs of petroleum contamination (e.g., sheens)
  - Odor (e.g., hydrogen sulfide, petroleum)
  - Presence of organic material (e.g., vegetation, roots, or twigs)
  - Anthropogenic debris
  - Biological activity (e.g., shells, tubes, bioturbation, or organisms)
  - Any other distinguishing characteristics or features
- Do not subsample materials more than 2 inches in diameter or debris into sample containers.
- Collect the upper 1 foot of sediment without touching the sidewalls using a decontaminated stainless-steel trowel or equivalent. Place the sediment into a single decontaminated stainless-steel bowl and homogenize until uniform color and texture are achieved.
- Using a decontaminated stainless-steel spoon, fill pre-labeled, laboratory-provided sample containers for all proposed analyses. Samples will be run for analytes or archived as described in Table 1a. Immediately place filled and sealed sample containers in a cooler with ice to maintain temperature at approximately 4ºC until delivered to the project laboratory while following the handling and COC procedures described in Section 4.3 and 4.4.

3.1.2 Surface Sediment Short Core Collection

If site conditions (debris, etc.) make grab sampling untenable, surface samples may also be collected using 3-foot short cores, where only the top 1 foot is processed and sampled for given analyses. Collection procedures for subsurface cores are detailed in Section 3.2.1, and processing and sampling procedures are detailed in Section 3.2.2.

3.1.3 Surface Sediment Bulkhead Composite Sampling

A total of nine surface sediment (0-to 0.5-foot) hand grabs will be taken behind the bulkheads in the Logway (Figure 4). Sediment hand sampling procedures are presented in Standard Operating Procedure (SOP) B.1 (Attachment B). Once sampled, material from SG-133 through SG-135 will be composited to represent the material behind the northern bulkhead, and material from SG-136 through SG-141 will be composited to represent the material behind the southern bulkhead. Compositing procedures are as follows:

- Using a stainless-steel spoon, add approximately equal volumes of the discreet samples to a single stainless-steel bowl.
- Homogenize with a stainless-steel spoon until a uniform color and consistency is reached.
- Using a decontaminated stainless-steel spoon, fill pre-labeled, laboratory-provided sample containers for all proposed analyses. Samples will be run for analytes or archived as described in Table 1a. Immediately place filled and sealed sample containers in a cooler with ice to maintain temperature at approximately 4ºC until delivered to the project laboratory, while following the handling and COC procedures described in Section 4.3 and 4.4.

3.2 Subsurface Sediment Chemistry Sampling

Subsurface sediment samples will be collected from 31 targeted marine area locations identified in the Step 2 PRDI WP. The purpose of this subsurface sediment sample collection is to inform the remedial design by further delineating the vertical extent of DF TEQ and PCBs in these remediation areas. Any surface (0- to 1-foot) samples from these locations are outlined in Section 3.1.

As described in the Step 2 PRDI WP, the following subsurface sediment samples, along with additional sample volumes to be archived for potential analysis following initial Step 2 data, will be collected:

Knoll Area – nine locations (Figure 2)

- Collecting and analyzing the 1- to 2-foot interval from 3-foot cores for DF TEQ at four locations
- Collecting and analyzing the 1- to 2-foot interval from 3-foot cores for PCBs at five locations
- Collecting and archiving the 2- to 3-foot interval from 3-foot cores at nine locations

South Shoreline – 16 locations (Figure 3)

- Collecting and analyzing the 3- to 4-foot interval from 6-foot cores for DF TEQ at 16 locations
- Collecting and archiving the 1- to 2-, 2- to 3-, 4- to 5-, and 5- to 6-foot intervals from 6-foot cores at 16 locations

Logway – six locations (Figure 4)

- Collecting and analyzing the 3- to 4-foot interval from 8-foot cores for DF TEQ at six locations
- Collecting and archiving the 1- to 2-, 2- to 3-, 4- to 5-, 5- to 6-, 6- to 7-, and 7- to 8-foot intervals from 8-foot cores at six locations

3.2.1 Subsurface Sediment Core Collection

- The boat captain will navigate the vessel as close as possible to the target sampling location using onboard DGPS. Prior to collecting each core, the depth to mudline will be determined using a calibrated fathometer or lead line.
- The vibracore will be deployed from the bow of the vessel using an A-frame and winch assembly. Once in position, the vibracore unit will be deployed, energized, and driven to target penetration depth or refusal.
- Once target penetration depth (refer to Table 1b) or refusal occurs, coordinates will be taken and the vibracore will be turned off and returned to the surface. The penetration depth will be evaluated based on data from the vessel's onboard penetration monitor or marker rings attached to the side of the vibracore base guiding rods that are pushed up on the guiding rods as the core barrel is driven into the sediments.
- Upon retrieving a core, the following information will be recorded:
  - Date and time the core was collected
  - Depth to mudline

- Total drive length
- Recovered length
- Condition of core surface (whether overlying water is present and the core surface is intact)
- Condition of core tube (whether the core tube is in good condition and not excessively bent)
- Preliminary assessment of sediment characteristics at the bottom of the tube
- Project name, location, and sampling date on an appropriately labeled photographed.

To determine whether a core is suitable for processing, the following acceptability criteria will be used:

- A core recovery of at least 70% of the length of core penetration will be targeted.
- Cored material did not extend out of the top of the core tube or contact any part of the sampling apparatus at the top of the core tube.
- There were no obstructions noted in the core catcher that might have blocked the subsequent entry of sediment into the core tube and resulted in incomplete core collection.
- If multiple core rejections (three attempts) occur within a 20-foot radius of the planned location, the core with the best recovery will be deemed acceptable and processed.
- Core tubes longer than 4 feet may be cut to facilitate upright storage and transport to the processing location. The cut tubes will be individually labeled and sealed with core caps taped over with duct tape to prevent material loss during transport. Core orientation will also be noted on each tube.
- Labels identifying the core section will be securely attached to the outside of the tube using tape and waterproof ink or by scribing the information into the core tube with a metal screwdriver. The core sections will be stored upright in the core storage box on the boat until transferred to the upland core processing area.
- Ice will be added to the core storage box on the boat if the core sections are kept on the boat for extended periods (e.g., not transferred in the middle of the day and at the end of each day). At the core processing area, the core sections will be stored approximately upright in iced containers, in the appropriate orientation until core processing is conducted.

3.2.2 Subsurface Sediment Core Processing

The following is a detailed account of the core processing procedures:

- Transport cores to an on-land processing station.
- Lay out the core tubes for the entire penetration depth for a sampling location. Cut the core tubes longitudinally using a circular saw or similar tool, setting the saw blade depth to minimize penetration and disturbance of the sediment during cutting.

- Record the description of the full length of the core sample on the core log form, including, but not limited to, the following observations, as appropriate:
  - Sample recovery (recovered sediment depth relative to penetration depth and percent compaction)
  - Physical soil description in accordance with the Unified Soil Classification System (including soil type, density/consistency, color, and other similar descriptors)
  - Presence of signs of petroleum contamination (e.g., sheens)
  - Odor (e.g., hydrogen sulfide or petroleum)
  - Presence of organic material (e.g., vegetation, roots, or twigs)
  - Anthropogenic debris
  - Biological activity (e.g., shells, tubes, bioturbation, or organisms)
  - Any other distinguishing characteristics or features
- Digital photographs will be taken of each 1-foot core interval with a label indicating the location and depth of the core interval.
- Using a decontaminated stainless-steel spoon, place a proportionate volume from every 1-foot sample interval into a single clean stainless-steel bowl or high-density polyethylene (HDPE) bucket and homogenize until uniform color and texture is achieved. Obvious contacts separating discrete lithologic layers will be noted on the log but will not be used to adjust the top or bottom of each 1-foot sample interval. Compaction correction is not required.
- Using a decontaminated stainless-steel spoon, fill pre-labeled, laboratory-provided sample containers for all proposed analyses. Samples will be run for analytes or archived as described in Table 1b. Immediately place filled and sealed sample containers in a cooler with ice to maintain temperature at approximately 4°C until delivered to the project laboratory, while following the handling and COC procedures described in Section 4.2 and 4.3.

3.3 Wood Volume Sieving Core Collection and Processing

Thirteen 3-foot cores will be collected for sieving for wood volume analysis (Figure 1). Three cores will be collected in the Logway, six in the South Shoreline, and four in the Knoll Area. Core collection procedures will follow those outlined in Section 3.2.1, and processing and volume calculation procedures can be found in SOP B.2 (Attachment B). At minimum, the top 1 foot of each core will be sieved for wood volume analysis. Additional intervals may be determined by the field team and described in the SOP.

3.4 Geotechnical Soil Sampling

Geotechnical soil samples will be collected from eight targeted upland area locations identified in the Step 2 PRDI WP and on Figures 2, 3, and 4 of this SAP. The purpose of this sample collection is to inform remedial excavation design and potential shoring requirements.

A combination of hollow-stem auger drilling and Shelby tube sampling will be employed, with sampling intervals to be determined in the field based on lithology. Sample containers per analysis are detailed in Table 1 of the QAPP. All borings will be advanced to at least 40 feet.

Shelby tube sampling procedures are detailed in SOP B.3 (Attachment B), and soil boring and sampling procedures are detailed in SOP B.4 (Attachment B). Planned analyses are as follows:

- Sixty-four samples for moisture content
- Sixteen samples for Atterberg Limits
- Sixteen samples bulk density
- Sixteen samples for grain size
- Sixteen samples for specific gravity
- Two consolidated undrained triaxial strength tests
- Two 1D consolidation tests

Station IDs and coordinates are presented in Table 1a through d.

3.5 Porewater Sampling

Porewater samples will be collected at target locations identified in Figures 2, 3, and 4. The purpose of this sample collection is to confirm that capping areas in SMA-3 and a small portion of SMA-2 in the Knoll Area will not be recontaminated by porewater in the underlying sediment and that caps will be fully protective of benthic health. The following ex situ solid-phase microextraction (SPME) samples will be collected:

- **Knoll Area:** One SPME for DF TEQ and one SPME for PCB congener analysis (Figure 2)
- **Southern Shoreline:** Two SPMEs for DF TEQ analysis (Figure 3)
- **Logway:** Two SPMEs for DF TEQ analysis (Figure 4)

3.5.1 Ex Situ SPME Material Collection

Targeted subsurface core locations identified in Figures 2, 3, and 4 will have an additional core (advanced to approximately 3 feet) for ex situ material. The 2- to 3-foot interval from these additional cores will be homogenized and sampled per core processing procedures outlined in Section 3.2.2 and handled following procedures in Sections 4.3 and 4.4.

Laboratory staff at EGL will follow SPME deployment and processing procedures presented in SOP B.5 (Attachment B).

3.6 Sample Identification and Labels

Each sample will be assigned a unique alphanumeric identifier. The identifier will have the format of "Project Identifier-Station ID-Interval-Date." Samples will be identified according to the following procedure:

- The project identifier will be "JW" to denote JELD-WEN.
- The station ID will correspond to sample locations shown in Figures 1 through 4. The bulkhead composites will have the station IDs "SG-COMP-N" for the northern bulkhead and "SG-COMP-S" for the southern bulkhead. Ex situ volumes collected for SPMEs will have the station ID number of the corresponding sediment sample, proceeded by "PW" to denote porewater analysis. The interval will indicate the depth below ground surface in feet, if applicable.
- Date of collection, in the form of YYYYMMDD.
- For field QA/QC samples, the station ID will be "FB" for field blanks and "RB" for rinse blanks, followed by the date collected. For field duplicates, 1000 will be added to the station ID of the sample being duplicated, and all other portions of the ID will be consistent between the two samples.
- For example, a surface sediment sample collected on April 24, 2024, from station SG-133 will have an ID of JW-SG-133-0-1-20240424; a field duplicate of 3-to 4-foot subsurface sediment core sample collected on April 26, 2024, from station SC-06 will have an ID of JWSC-1006-3-4-20240426; a volume collected from 2 to 3 feet from sediment core 029 for porewater SPME analysis on April 25, 2024, will have an ID of JW-PW-029-2-3-20240425; the northern bulkhead composite sample collected on April 26, 2024, will have an ID of JW-SG-COMP-N-20240426; and a rinse blank collected on April 24, 2024, will have and ID of JW-RB-20240424.

Each sample will have an adhesive plastic or waterproof paper label affixed to the container or bag and will be labeled at the time of collection. The following information will be recorded on the container label at the time of collection:

- Project name
- Sample identifier
- Date and time of sample collection
- Analysis to be performed
- Initials of sampler(s)

3.7 Station Positioning

A handheld or boat-mounted DGPS will be used to navigate to the planned sampling locations. DGPS coordinates for each sampling and sub-sampling station are provided in Table 1. Collection at the sampling location will be guided by the navigation system, with an accuracy of ±10 feet.

Locations may be adjusted based on accessibility or observations by the field team. If a position is adjusted from the target, the actual sampling coordinates will be recorded in latitude and longitude, in decimal degrees, to five decimal places. Positions will be relative to the Washington State Plane Coordinates, North; North American Datum 1983.

3.8 Field Quality Assurance/Quality Control Samples

Field QA/QC samples will be collected and used to evaluate the variability resulting from sample handling and the efficiency of field decontamination procedures (Section 4.2). All field QC samples will be documented in the project field logbook. A summary of the field QA/QC sample analysis is presented in Table 3 of the QAPP.

3.8.1 Field Duplicates

Field duplicates (i.e., homogenization duplicates) will be collected at a frequency of one per 20 samples for each relevant parameter, as shown in Table 3 of the QAPP. The field duplicates will be prepared by dividing aliquots of the homogenate (during surface sediment or sediment core processing) into two distinct samples for the laboratory (the original sample and a duplicate). The samples will be processed in the same way as the original sample and will be submitted to the laboratory as blind samples for the same analyses as the parent sample.

3.8.2 Field and Rinse Blanks

Field and rinse blank samples will be collected at the start of each sampling program to evaluate the efficiency of field decontamination procedures. Rinse blanks will be collected at a frequency of one per 20 samples per sampling subarea. The rinse blanks will consist of rinsing down the sediment collection equipment with distilled water after sample collection and decontamination and collecting the rinsate. One field blank will be collected by pouring distilled water directly into the sampling containers during the sampling program. The field blank and rinse blank samples will be submitted to the laboratory as blind samples for DF and PCB analysis in the Logway, DF analysis in the South Shoreline, and DF, cPAH, and PCB analysis in the Knoll Area.

4 Field Documentation, Decontamination, Sample Handling, and Waste Management

4.1 Field Documentation

A complete record of field activities will be maintained. Documentation necessary to meet data quality objectives for this project includes field notes and field forms, sample container labels, and COC forms. The field documentation will provide descriptions of all sampling activities, sampling personnel, and weather conditions; and it will record all modifications, decisions, and/or corrective actions to the study design and procedures identified in this SAP.

A field logbook made of water-resistant paper will be maintained during field operations. All entries will be made legibly, in indelible ink, and will be signed and dated daily. Information recorded will include the following:

- Date, time, place, and location of sampling
- On-site personnel and visitors
- Daily safety discussion and any safety issues
- Field measurements (depth of sediment sample) and their units
- Observations about site, location, and samples (weather, odors, appearance, etc.)
- Equipment decontamination verification

Field logbooks are intended to provide sufficient data and observations to enable participants to reconstruct events that occur during project field activities. Entries will be factual, detailed, and objective. Unless restricted by weather conditions, all original data recorded in field logbooks and on sample identification tags, COC records, and field forms will be written in waterproof ink. If an error is made, the individual responsible may make corrections simply by crossing out the error with a single line and adjacently recording the correct information, with their initials and the date of correction. The erroneous information must not be obliterated. All documentation, including voided entries, will be maintained within project files.

4.2 Equipment Decontamination

The following general decontamination procedures will be followed for field sampling equipment:

- Pre-wash rinse with tap or site water.
- Wash with a solution of tap water or site water and phosphate-free soap (e.g., Alconox).
- Rinse three times with distilled water.
- Cover (no contact) all decontaminated items with aluminum foil.
- Store in a clean, closed container for next use.

4.3 Sample Storage and Delivery

Sample container requirements, holding times, and preservation requirements are outlined in Table 1 of the QAPP. Sample containers, instruments, working surfaces, technician protective gear, and other items that may come into contact with sample material must meet high standards of cleanliness. All equipment and instruments that will be used and are in direct contact with various media collected for chemical analyses must be made of glass, stainless steel, or high-density polyethylene, and will be cleaned prior to each day's use and between sampling events.

4.4 Chain-of-Custody Procedures

COC procedures will be followed for all samples throughout the collection, handling, and analysis processes. The principal document used to track possession and transfer of samples is the COC form. Each sample will be represented on a COC form the day it is collected. All manual data entries will be made using an indelible ink pen. Corrections will be made by drawing a single line through the error, writing in the correct information, and then dating and initialing the change. Blank lines and spaces on the COC form will be lined out, dated, and initialed by the individual maintaining custody. Electronic COC forms generated from a custom field application will be emailed directly to the laboratory and QA managers.

A COC form will accompany each shipment of samples to the analytical laboratory. Each person in custody of samples will sign the COC form and ensure the samples are not left unattended unless properly secured. Copies of all COC forms will be retained in the project files.

All samples will be shipped or hand delivered to the analytical laboratory no later than 1 day after collection. Samples collected on Friday may be held until the following Monday for shipment, provided that this delay does not jeopardize any holding time requirements.

Specific sample shipping procedures are as follows:

- Coolers or containers containing samples for analysis may be shipped via overnight delivery to the laboratory. In the event that Saturday delivery is required, the field coordinator will contact the analytical laboratory before 3 p.m. on Friday to ensure that the laboratory is aware of the number of containers shipped and the airbill tracking numbers for those containers. Following each shipment, the field coordinator will call the laboratory and verify that the shipment from the day before has been received and is in good condition.
- Coolant ice will be sealed in separate plastic bags and placed in the shipping containers.
- Individual sample containers will be placed in a sealable plastic bag, packed to prevent breakage, and transported in a sealed ice chest or other suitable container.
- Glass jars will be separated in the shipping container by shock-absorbent material (e.g., bubble wrap) to prevent breakage.

- The shipping containers will be clearly labeled with sufficient information (name of project, time and date container was sealed, person sealing the container, and consultant's office name and address) to enable positive identification.
- COC forms will be enclosed in a plastic bag and taped to the inside lid of the cooler.
- A minimum of two signed and dated custody seals will be placed on adjacent sides of each cooler prior to shipping.
- Each cooler will be wrapped securely with strapping tape, labeled "Glass – Fragile" and "This End Up," and will be clearly labeled with the laboratory's shipping address and the consultant's return address.

Upon transfer of sample possession to the analytical laboratory, the person(s) transferring custody of the sample container will sign the COC form. Upon receipt of samples at the laboratory, the custody seals will be broken, and the receiver will record the condition of the samples on a sample receipt form. COC forms will be used internally in the laboratory to track sample handling and final disposition.

4.5 Waste Management

Upon the completion of sample collection during Step 2, excess soil and sediment collected and not needed for analysis and any water generated during decontamination activities will be secured in a labeled Department of Transportation approved drum on site for later characterization and disposal, with the exception of power grab excess material, which will be returned in situ from the vessel after sampling. All disposable sampling materials and personal protective equipment used in sample collection and processing (e.g., disposable gloves and paper towels) will be placed in heavy-duty garbage bags for disposal in the municipal waste. No hazardous materials will be used during fieldwork for this study.

5 Chemical and Physical Testing

Samples will be initially analyzed for parameters detailed in Table 1. Analytical methods and expected reporting limits (RLs) for each parameter are included in Table 2 of the QAPP (Attachment B of the Step 2 PRDI WP). Samples will be submitted to ARL, SGS, and an appropriate geotechnical laboratory for analyses. The laboratories will be responsible for the following:

- Analyze the samples following the methods described in the QAPP and laboratory Standard Operating Procedures
- Follow documentation and custody procedures
- Meet all RL requirements
- Meet QA/QC frequency and data quality objective requirements described in the QAPP
- Deliver electronic data files as specified in the QAPP
- Meet turnaround times for deliverables as described in the QAPP
- Allow Ecology and the QA/QC contractor to perform laboratory and data audits

6 Field Sampling Schedule

The field sampling program described in this SAP is projected to begin in Q2 2024, following Ecology approval of the Final PRDI WP and associated documents. The field sampling program is expected to be completed within 30 days. The actual start and end dates for the sampling event will depend on Ecology's approval of the project plans and coordination with subcontractors. Other conditions that may affect the sampling schedule are weather, contractor availability, and equipment availability.

7 Reference

Ecology (Washington State Department of Ecology), 2023. *Final Cleanup Action Plan, Jeld Wen Site*. Exhibit F to the Second Amendment to the Agreed Order No. 5095. August 2023.

Table

Table 1a

Sediment Grab Sampling Approach (Areas, Locations, and Analyses)

Area	Location ID	Easting	Northing	Interval	Dioxin/ Furans	PCBs	cPAHs	Archive (Analyses Pending Initial Step 2 Data)
Knoll Area	SG-117	1302546.6	372830.8	0 –1 foot	--	--	--	✓
	SG-118	1302672.5	372782.7	0 –1 foot	--	--	--	✓
	SG-119	1302757.6	372416.7	0 –1 foot	--	--	--	✓
	SG-120	1302757.6	372360.0	0 –1 foot	--	--	--	✓
	SG-121	1302708.1	372385.7	0 –1 foot	--	--	--	✓
	SG-122	1302561.1	372532.8	0 –1 foot	--	--	--	✓
	SG-123	1302741.1	372041.5	0 –1 foot	--	--	--	✓
	SG-124	1302744.4	372001.3	0 –1 foot	--	--	--	✓
	SG-125	1302305.2	372262.4	0 –1 foot	--	--	--	✓
	SG-126	1302584.2	371930.8	0 –1 foot	✓	--	--	✓
	SG-127	1302584.2	371734.3	0 –1 foot	✓	--	--	✓
	SG-128	1302536.0	371559.5	0 –1 foot	✓	--	--	✓
	SG-129	1302462.8	371506.1	0 –1 foot	✓	--	--	✓
	SG-130	1302503.7	371449.4	0 –1 foot	✓	--	--	✓
	SG-131	1302357.3	371547.0	0 –1 foot	--	--	--	✓
	SG-132	1302353.4	371132.9	0 –1 foot	--	--	--	✓
	SG-142	1302763.4	372495.5	0 –1 foot	--	--	✓	✓
	SG-144	1302671.3	372275.8	0 –1 foot	--	--	✓	✓
	SG-143	1302419.0	372142.8	0 –1 foot	--	--	✓	✓
	SG-145	1302735.7	371982.5	0 –1 foot	--	--	✓	✓
	SG-146	1302695.1	371739.4	0 –1 foot	--	--	✓	✓
	SG-147	1302473.2	371634.6	0 –1 foot	--	--	✓	✓
Logway[2]	SG-133	1303143.6	373789.0	0 – 0.5 foot	✓	✓	--	✓
	SG-134	1303199.3	373735.7	0 – 0.5 foot				✓
	SG-135	1303260.2	373677.7	0 – 0.5 foot				✓
	SG-136	1303383.2	373537.6	0 – 0.5 foot	✓	✓	--	✓
	SG-137	1303435.7	373484.0	0 – 0.5 foot				✓
	SG-138	1303409.4	373511.8	0 – 0.5 foot				✓
	SG-139	1303462.4	373456.6	0 – 0.5 foot				✓
	SG-140	1303487.5	373430.1	0 – 0.5 foot				✓
	SG-141	1303507.2	373410.0	0 – 0.5 foot				✓

Notes:

1. Easting and northing in NAD83 State Plane Washington North (U.S. Survey Feet)

2. Composite samples will be taken from SG-133 through -135 and SG-136 through -141 to characterize sediment behind the Logway bulkheads

--: not applicable

cPAH: carcinogenic polycyclic aromatic hydrocarbon

NAD83: North American Datum of 1983

PCB: polychlorinated biphenyl

Table 1b
Sediment Chemistry Core Sampling Approach (Areas, Locations, and Analyses)

Area	Location ID	Easting	Northing	Interval	Dioxin/ Furans	PCBs	Ex Situ SPME Material[2]	Archive (Analyses Pending Initial Step 2 Data)
South Shoreline	SC-001	1302237.7	373720.4	0 – 1 foot	✓	--	--	✓
				1 – 2 feet	--	--	--	✓
				2 – 3 feet	--	--	--	✓
				3 – 4 feet	✓	--	--	✓
				4 – 5 feet	--	--	--	✓
				5 – 6 feet	--	--	--	✓
	SC-002	1302243.2	373679.8	0 – 1 foot	✓	--	--	✓
				1 – 2 feet	--	--	--	✓
				2 – 3 feet	--	--	--	✓
				3 – 4 feet	✓	--	--	✓
				4 – 5 feet	--	--	--	✓
				5 – 6 feet	--	--	--	✓
	SC-003	1302273.6	373684.4	0 – 1 foot	✓	--	--	✓
				1 – 2 feet	--	--	--	✓
				2 – 3 feet	--	--	--	✓
				3 – 4 feet	✓	--	--	✓
				4 – 5 feet	--	--	--	✓
				5 – 6 feet	--	--	--	✓
	SC-004	1302317.2	373647.0	0 – 1 foot	✓	--	--	✓
				1 – 2 feet	--	--	--	✓
				2 – 3 feet	--	--	--	✓
				3 – 4 feet	✓	--	--	✓
				4 – 5 feet	--	--	--	✓
				5 – 6 feet	--	--	--	✓
	SC-005	1302317.8	373601.0	0 – 1 foot	✓	--	--	✓
				1 – 2 feet	--	--	--	✓
				2 – 3 feet	--	--	--	✓
				3 – 4 feet	✓	--	--	✓
				4 – 5 feet	--	--	--	✓
				5 – 6 feet	--	--	--	✓
	SC-007	1302386.3	373564.4	0 – 1 foot	✓	--	--	✓
				1 – 2 feet	--	--	--	✓
				2 – 3 feet	--	--	--	✓
				3 – 4 feet	✓	--	--	✓
				4 – 5 feet	--	--	--	✓
				5 – 6 feet	--	--	--	✓
	SC-008	1302370.3	373500.0	0 – 1 foot	✓	--	--	✓
				1 – 2 feet	--	--	--	✓
				2 – 3 feet	--	--	--	✓
				3 – 4 feet	✓	--	--	✓
				4 – 5 feet	--	--	--	✓
				5 – 6 feet	--	--	--	✓
	SC-009	1302445.5	373505.2	0 – 1 foot	✓	--	--	✓
				1 – 2 feet	--	--	--	✓
				2 – 3 feet	--	--	--	✓
				3 – 4 feet	✓	--	--	✓
				4 – 5 feet	--	--	--	✓
				5 – 6 feet	--	--	--	✓
	SC-011	1302545.2	373399.3	0 – 1 foot	✓	--	--	✓
				1 – 2 feet	--	--	--	✓
				2 – 3 feet	--	--	--	✓
				3 – 4 feet	✓	--	--	✓
				4 – 5 feet	--	--	--	✓
				5 – 6 feet	--	--	--	✓
	SC-012	1302540.0	373348.7	0 – 1 foot	✓	--	--	✓
				1 – 2 feet	--	--	--	✓
				2 – 3 feet	--	--	--	✓
				3 – 4 feet	✓	--	--	✓
				4 – 5 feet	--	--	--	✓
				5 – 6 feet	--	--	--	✓
	SC-013	1302591.6	373349.3	0 – 1 foot	✓	--	--	✓
				1 – 2 feet	--	--	--	✓
				2 – 3 feet	--	--	✓	✓
				3 – 4 feet	✓	--	--	✓
				4 – 5 feet	--	--	--	✓
				5 – 6 feet	--	--	--	✓
	SC-014	1302587.3	373298.4	0 – 1 foot	✓	--	--	✓
				1 – 2 feet	--	--	--	✓
				2 – 3 feet	--	--	--	✓
				3 – 4 feet	✓	--	--	✓
				4 – 5 feet	--	--	--	✓
				5 – 6 feet	--	--	--	✓

Table 1b
Sediment Chemistry Core Sampling Approach (Areas, Locations, and Analyses)

Area	Location ID	Easting	Northing	Interval	Dioxin/ Furans	PCBs	Ex Situ SPME Material[2]	Archive (Analyses Pending Initial Step 2 Data)
South Shoreline (cont.)	SC-017	1302691.9	373238.5	0 – 1 foot	✓	--	--	✓
				1 – 2 feet	--	--	--	✓
				2 – 3 feet	--	--	--	✓
				3 – 4 feet	✓	--	--	✓
				4 – 5 feet	--	--	--	✓
				5 – 6 feet	--	--	--	✓
	SC-018	1302692.5	373168.5	0 – 1 foot	✓	--	--	✓
				1 – 2 feet	--	--	--	✓
				2 – 3 feet	--	--	--	✓
				3 – 4 feet	✓	--	--	✓
				4 – 5 feet	--	--	--	✓
				5 – 6 feet	--	--	--	✓
	SC-019	1302766.5	373167.6	0 – 1 foot	✓	--	--	✓
				1 – 2 feet	--	--	--	✓
				2 – 3 feet	--	--	✓	✓
				3 – 4 feet	✓	--	--	✓
				4 – 5 feet	--	--	--	✓
				5 – 6 feet	--	--	--	✓
	SC-020	1302731.5	373132.0	0 – 1 foot	✓	--	--	✓
				1 – 2 feet	--	--	--	✓
				2 – 3 feet	--	--	--	✓
				3 – 4 feet	✓	--	--	✓
				4 – 5 feet	--	--	--	✓
				5 – 6 feet	--	--	--	✓
Knoll Area	SC-024	1302962.4	372431.3	0 – 1 foot	--	✓	--	✓
				1 – 2 feet	--	✓	--	✓
				2 – 3 feet	--	--	--	✓
	SC-025	1302876.5	372412.8	0 – 1 foot	--	✓	--	✓
				1 – 2 feet	--	✓	--	✓
				2 – 3 feet	--	--	✓	✓
	SC-026	1302737.5	372386.8	0 – 1 foot	--	✓	--	✓
				1 – 2 feet	--	✓	--	✓
				2 – 3 feet	--	--	--	✓
	SC-027	1302777.7	372187	0 – 1 foot	--	✓	--	✓
				1 – 2 feet	--	✓	--	✓
				2 – 3 feet	--	--	--	✓
	SC-028	1302627	372188.6	0 – 1 foot	✓	--	--	✓
				1 – 2 feet	✓	--	--	✓
				2 – 3 feet	--	--	--	✓
	SC-029	1302567	372127.3	0 – 1 foot	✓	--	--	✓
				1 – 2 feet	✓	--	--	✓
				2 – 3 feet	--	--	✓	✓
	SC-030	1302478.7	372148.4	0 – 1 foot	✓	--	--	✓
				1 – 2 feet	✓	--	--	✓
				2 – 3 feet	--	--	--	✓
	SC-031	1302520.9	372198.5	0 – 1 foot	✓	--	--	✓
				1 – 2 feet	✓	--	--	✓
				2 – 3 feet	--	--	--	✓
	SC-032	1302774.2	372013	0 – 1 foot	--	✓	--	✓
				1 – 2 feet	--	✓	--	✓
				2 – 3 feet	--	--	--	✓

Table 1b
Sediment Chemistry Core Sampling Approach (Areas, Locations, and Analyses)

Area	Location ID	Easting	Northing	Interval	Dioxin/ Furans	PCBs	Ex Situ SPME Material[2]	Archive (Analyses Pending Initial Step 2 Data)
Logway	SC-036	1302750.5	374219.4	0 – 1 foot	✓	--	--	✓
				1 – 2 feet	--	--	--	✓
				2 – 3 feet	--	--	✓	✓
				3 – 4 feet	✓	--	--	✓
				4 – 5 feet	--	--	--	✓
				5 – 6 feet	--	--	--	✓
				6 – 7 feet	--	--	--	✓
				7 – 8 feet	--	--	--	✓
	SC-038	1303060.3	373895.8	0 – 1 foot	✓	--	--	✓
				1 – 2 feet	--	--	--	✓
				2 – 3 feet	--	--	--	✓
				3 – 4 feet	✓	--	--	✓
				4 – 5 feet	--	--	--	✓
				5 – 6 feet	--	--	--	✓
				6 – 7 feet	--	--	--	✓
				7 – 8 feet	--	--	--	✓
	SC-040	1303184.3	373767.9	0 – 1 foot	✓	--	--	✓
				1 – 2 feet	--	--	--	✓
				2 – 3 feet	--	--	--	✓
				3 – 4 feet	✓	--	--	✓
				4 – 5 feet	--	--	--	✓
				5 – 6 feet	--	--	--	✓
				6 – 7 feet	--	--	--	✓
				7 – 8 feet	--	--	--	✓
	SC-041	1303206.2	373746.5	0 – 1 foot	✓	--	--	✓
				1 – 2 feet	--	--	--	✓
				2 – 3 feet	--	--	✓	✓
				3 – 4 feet	✓	--	--	✓
				4 – 5 feet	--	--	--	✓
				5 – 6 feet	--	--	--	✓
				6 – 7 feet	--	--	--	✓
				7 – 8 feet	--	--	--	✓
	SC-043	1303481.4	373459	0 – 1 foot	✓	--	--	✓
				1 – 2 feet	--	--	--	✓
				2 – 3 feet	--	--	--	✓
				3 – 4 feet	✓	--	--	✓
				4 – 5 feet	--	--	--	✓
				5 – 6 feet	--	--	--	✓
				6 – 7 feet	--	--	--	✓
				7 – 8 feet	--	--	--	✓
	SC-044	1303502.8	373439.1	0 – 1 foot	✓	--	--	✓
				1 – 2 feet	--	--	--	✓
				2 – 3 feet	--	--	--	✓
				3 – 4 feet	✓	--	--	✓
				4 – 5 feet	--	--	--	✓
				5 – 6 feet	--	--	--	✓
				6 – 7 feet	--	--	--	✓
				7 – 8 feet	--	--	--	✓

Notes:
1. Easting and northing in NAD83 State Plane Washington North (U.S. Survey Feet)
2. Core will be re-drilled for extra material from the stated intervals and samples submitted to the EGL for ex situ SPME processing. EGL will then submit sample media for dioxin/furan and PCB porewater analysis.

--: not applicable
EGL: Environmental Geochemistry Laboratory
NAD83: North American Datum of 1983
PCB: polychlorinated biphenyl

Table 1c
Wood Volume Analysis Sieving Core Sampling Approach (Areas and Locations)

Area	Location ID	Easting	Northing	Interval	Wood Volume Analysis[2]
Logway	SV-01	1302679.1	374315.6	0–1 foot	✓
				1–2 feet	--
				2–3 feet	--
	SV-02	1303142.3	373815.6	0–1 foot	✓
				1–2 feet	--
				2–3 feet	--
	SV-03	1303464.2	373464.3	0–1 foot	✓
				1–2 feet	--
				2–3 feet	--
South Shoreline	SV-04	1302336.4	373555.1	0–1 foot	✓
				1–2 feet	--
				2–3 feet	--
	SV-05	1302483.7	373346.4	0–1 foot	✓
				1–2 feet	--
				2–3 feet	--
	SV-06	1302460.6	373170.8	0–1 foot	✓
				1–2 feet	--
				2–3 feet	--
	SV-07	1302555.1	373077.5	0–1 foot	✓
				1–2 feet	--
				2–3 feet	--
	SV-08	1302636.2	372994.0	0–1 foot	✓
				1–2 feet	--
				2–3 feet	--
	SV-09	1302696.7	373075.3	0–1 foot	✓
				1–2 feet	--
				2–3 feet	--
Knoll Area	SV-10	1302674.2	372738.6	0–1 foot	✓
				1–2 feet	--
				2–3 feet	--
	SV-11	1302678.5	372012.3	0–1 foot	✓
				1–2 feet	--
				2–3 feet	--
	SV-12	1302576.6	371871.3	0–1 foot	✓
				1–2 feet	--
				2–3 feet	--
	SV-13	1302506.7	371631.9	0–1 foot	✓
				1–2 feet	--
				2–3 feet	--

Notes:
1. Easting and northing in NAD83 State Plane Washington North (U.S. Survey Feet)
2. Additional intervals may be sieved for wood volume analysis pending field observations
--: not applicable
NAD83: North American Datum of 1983

Table 1d

Geotechnical Soil Core Sampling Approach (Areas, Locations, and Analyses)

Area	Location ID	Easting	Northing	Boring Depth[2]	Intervals/Analyses
Southern Shoreline	GT-001	1302442.4	373558.6	40 feet	Subject to field observations. A total of 64 samples will be taken for moisture content, 16 for Atterberg limits, 16 for bulk density, 16 for grain size, 16 for specific gravity, 2 for consolidated undrained triaxial strength, and 2 for 1D consolidation.
	GT-002	1302666.8	373334.3	40 feet	
	GT-003	1302821.0	373184.8	40 feet	
Knoll Area	GT-004	1302860.4	372733.2	40 feet	
Logway	GT-005	1302707.5	374200.0	40 feet	
	GT-006	1302996.5	373888.9	40 feet	
	GT-007	1303210.6	373687.1	40 feet	
	GT-008	1303483.1	373389.2	40 feet	

Notes:

1. Easting and northing in NAD83 State Plane Washington North (U.S. Survey Feet)
2. Borings will be advanced to a minimum of 40 feet below ground surface but may be advanced deeper based on field observations.

NAD83: North American Datum of 1983

Figures

DRAFT

LEGEND:

- Marine Site Boundary
- Parcel
- Proposed 3-Foot Core for Sieving (Co-located with 1-Foot Recovery Location from Step 1)
- Proposed 3-Foot Core for Sieving (Co-located with <1-Foot Recovery Location from Step 1)

NOTE:
1. Aerial imagery: Esri (2022)

0 300
Feet

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ANCHOR QEA

Figure 1
Wood Volume Measurement - Sieving Core Locations
Step 2 Pre-Remedial Design Investigation Sampling and Analysis Plan
Jeld Wen Site

DRAFT

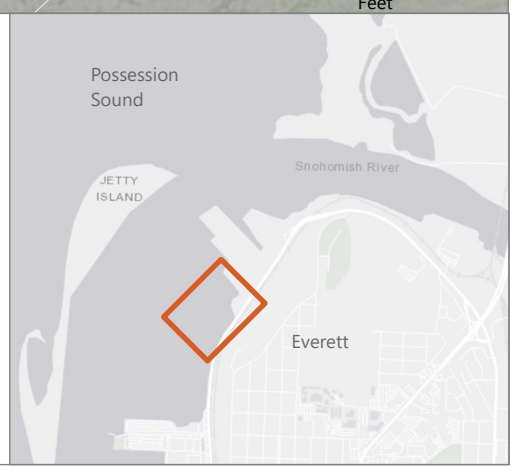
LEGEND:

- Marine Site Boundary
- Parcel
- Ex Situ Solid Phase Microextraction (SPME) Sample Location

Proposed Sampling Locations

- 3-Foot Short Core (D/F)
- 3-Foot Short Core (PCBs)
- Archived Power Grab or Short Core (D/F and PCBs)
- Power Grab or Short Core (D/F)
- Shoreline Geotechnical Boring
- Proposed 3-Foot Core or Power Grab for cPAH Analysis

NOTES:
1. Aerial imagery: Esri (2022)
2. Base map: Esri Light Gray Canvas



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ANCHOR QEA

Figure 2
Surface and Subsurface Sediment Chemistry and Geotechnical Sample Locations (Knoll Area)
Step 2 Pre-Remedial Design Investigation Sampling and Analysis Plan
Jeld Wen Site

DRAFT

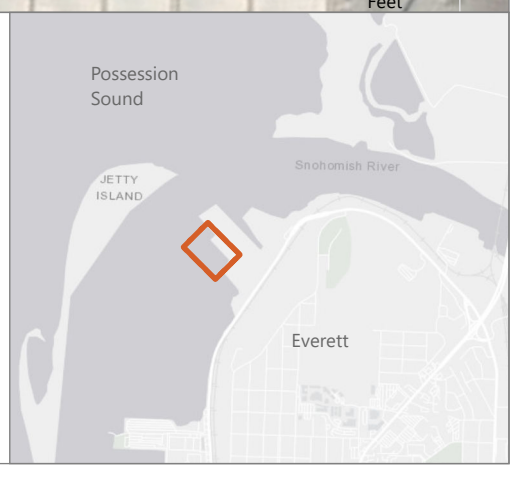
LEGEND:

- Marine Site Boundary
- Parcel
- Ex Situ Solid Phase Microextraction (SPME) Sample Location

Proposed Sampling Locations

- 6-Foot Short Core (D/F)
- Shoreline Geotechnical Boring

NOTES:
1. Aerial imagery: Esri (2022)
2. Base map: Esri Light Gray Canvas



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ANCHOR QEA

Figure 3
Surface and Subsurface Sediment Chemistry and Geotechnical Sample Locations (South Shoreline)
Step 2 Pre-Remedial Design Investigation Sampling and Analysis Plan
Jeld Wen Site

DRAFT

LEGEND:

- Marine Site Boundary
- Parcel
- Ex Situ Solid Phase Microextraction (SPME) Sample Location

Proposed Sampling Locations

- 8-Foot Short Core (D/F)
- Surface Grab Sample for PCBs and D/F (0-0.5 Feet) Aliquot for Composites SG-136 through SG-141 and SG-133 through SG-135
- Shoreline Geotechnical Boring

NOTES:
1. Aerial imagery: Esri (2022)
2. Base map: Esri Light Gray Canvas

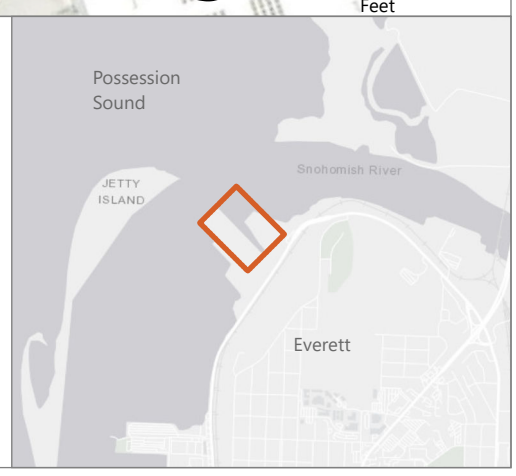

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Figure 4
Surface and Subsurface Sediment Chemistry and Geotechnical Sample Locations (Logway)
Step 2 Pre-Remedial Design Investigation Sampling and Analysis Plan
Jeld Wen Site

Attachment A
Inadvertent Discovery Plan

INADVERTENT DISCOVERY PLAN

PLAN AND PROCEDURES FOR THE DISCOVERY OF CULTURAL RESOURCES AND HUMAN SKELETAL REMAINS

To request ADA accommodation, including materials in a format for the visually impaired, call Ecology at 360-407-6000 or visit https://ecology.wa.gov/accessibility. People with impaired hearing may call Washington Relay Service at 711. People with a speech disability may call TTY at 877-833-6341.

Site Name(s): JELD-WEN/Former Nord Door Location: 300 West Marine View Drive, Everett, WA 98201

Project Lead/Organization: Jason Cornetta, Anchor QEA County: Snohomish

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

1. 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, as part of Agency Terms and Conditions 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 21-02 or Section 106).

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

2. CULTURAL RESOURCE DISCOVERIES

A cultural resource discovery could be prehistoric or historic. 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. 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 Project and Washington Department of Ecology (Ecology) contacts.

Project Lead Contacts

Primary Contact		Alternate Contact	
Name:	Jason Cornetta	Name:	Nathan Soccorsy
Organization:	Anchor QEA	Organization:	Anchor QEA
Phone:	253-241-0071	Phone:	480-272-2805
Email:	jcornetta@anchorqea.com	Email:	nsoccorsy@anchorqea.com

Ecology Contacts (completed by Ecology Project Manager)

Ecology Project Manager		Alternate or Cultural Resource Contact	
Name:	Frank Winslow	Name:	Josh Morman
Program:	Toxics Cleanup Program	Program:	Toxics Cleanup Program
Phone:	509 424-0543	Phone:	360-480-3289
Email:	Frank.Winslow@ecy.wa.gov	Email:	josh.morman@ecy.wa.gov

STEP E: Ecology will notify DAHP.

Once notified, the Ecology Cultural Resource Contact or the Ecology Project Manager will contact DAHP to report and confirm the discovery. To avoid delay, the Project Lead/Organization will contact DAHP if they are not able to reach Ecology.

DAHP will provide the steps to assist with identification. DAHP, Ecology, and Tribal representatives may coordinate a site visit following any necessary safety protocols. DAHP may also inform the Project Lead/Organization and Ecology 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.

DAHP Contacts:

Name: Rob Whitlam, PhD
Title: State Archaeologist
Cell: 360-890-2615
Email: Rob.Whitlam@dahp.wa.gov
Main Office: 360-586-3065

Human Remains/Bones:

Name: Guy Tasa, PhD
Title: State Anthropologist
Cell: 360-790-1633 (24/7)
Email: Guy.Tasa@dahp.wa.gov

4. TRIBAL CONTACTS

In the event cultural resources are discovered, the following tribes will be contacted. See Section 10 for Additional Resources.

Tribe:	Tulalip	Tribe:	
Name:	Gene Enick	Name:	
Title:	Assistant Historical Preservation Officer	Title:	
Phone:	360-716-2653	Phone:	
Email:	genick@tulaliptribes-nsn.gov	Email:	
Tribe:		Tribe:	
Name:		Name:	
Title:		Title:	
Phone:		Phone:	
Email:		Email:	

Please provide contact information for additional tribes within your project area, if needed, in Section 11.

5. FURTHER CONTACTS (if applicable)

If the discovery is confirmed by DAHP as a cultural or archaeological resource, or as human remains, and there is a partnering federal or state agency, Ecology or the Project Lead/Organization will ensure the partnering agency is immediately notified.

Federal Agency:		State Agency:	
Agency:		Agency:	
Name:		Name:	
Title:		Title:	
Phone:		Phone:	
Email:		Email:	

6. SPECIAL PROCEDURES FOR THE DISCOVERY OF HUMAN SKELETAL MATERIAL

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 below. **Do not call 911** unless it is the only number available to you.

   Enter contact information below (required):
   - Local Medical Examiner or Coroner name and phone: J. Matthew Lacy, 425-438-6200
   - Local Law Enforcement main name and phone: Everett Police Department, 425-257-8400
   - Local Non-Emergency phone number (911 if without a non-emergency number): 425-407-3999
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, RCW 68.50, and RCW 68.60, DAHP will have jurisdiction over non-forensic human remains. Ecology staff will participate in consultation. Organizations 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, RCW 68.50, and RCW 68.60.
- 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 Lead/Organization will comply with applicable state and federal laws, and the above protocol.

7. DOCUMENTATION OF ARCHAEOLOGICAL MATERIALS

Archaeological resources discovered during construction are protected by state law RCW 27.53 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 assessment are made of all discovered cultural resources in cooperation with all parties: the federal agencies (if any), DAHP, Ecology, affected tribes, and the archaeologist.

The 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, Ecology, 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 Ecology, 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**.

8. 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), Ecology, and the federal agencies (if any) determine that compliance with state and federal laws is complete.

9. 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 sites 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.

10. ADDITIONAL RESOURCES

Informative Video

Ecology recommends that all project staff, contractors, and volunteers view this informative video 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

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

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

11. ADDITIONAL INFORMATION

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

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).*

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, workboot 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.*

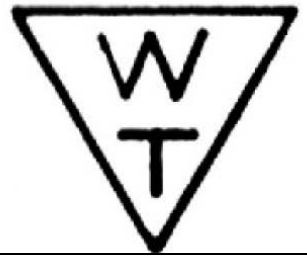
Right, from Top to Bottom: *Coins, token, spectacles and Montgomery Ward pitchfork toy discovered during Seattle Smith Cove shantytown (45-KI-1200) excavation.*

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…

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 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...

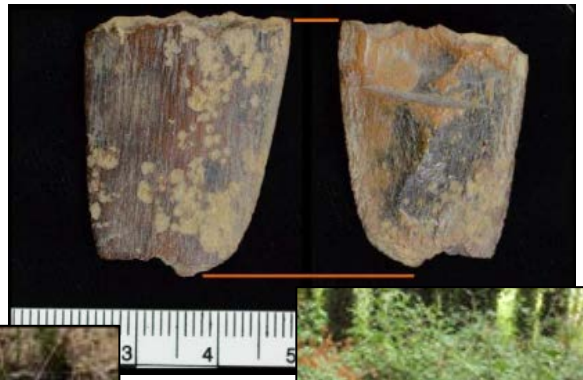
Potential human remains.

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.

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

Other images (Top Right, Bottom Left, and Bottom) Center: Courtesy of DAHP.



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!*

Attachment B
Standard Operating Procedures

Standard Operating Procedure B.1 – Sediment Grab Sampling with Hand Tools

DRAFT

Standard Operating Procedure B.1 – Sediment Grab Sampling with Hand Tools

Standard Operating Procedure Acknowledgment Form

Project Number: 230909-01.01 Project Name: Jeld Wen PRDI

My signature below certifies that I have read and understand the procedures specified in this Standard Operating Procedure.

Date	Name (print)	Signature	Company

Purpose

The purpose of this Standard Operating Procedure (SOP) is to establish uniform procedures for the collection of sediment samples using various grab methods. The following steps outline the general procedure for the collection of sediment samples, regardless of the specific grab sampler used.

This SOP describes the equipment, field procedures, materials, and documentation procedures necessary to perform the activities described in the previous paragraph. The details within this SOP should be used in conjunction with the associated project planning documents, such as the field Sampling Analysis Plan (SAP), Quality Assurance Project Plan (QAPP), and other project-specific SOPs.

Scope and Application

This SOP is applicable to the collection of sediment samples using various grab methods. Substantive deviations from the procedures detailed in this SOP will be recorded in the field log book or Daily Log and in a SOP Deviation Form.

Health and Safety Warnings

Health and safety issues for the work associated with this SOP, including physical, chemical, and biological hazards, are addressed in the project Health and Safety Plan (HASP). The HASP will be followed during all activities conducted by Anchor QEA staff.

Staff Qualifications

Field staff executing these procedures will have read, must be familiar with, and must comply with the requirements of this SOP and all associated project planning documents, such as the SAP, QAPP, and other project-specific SOPs. Field staff will be under the direct supervision of qualified professionals who are experienced in performing the tasks described in this SOP, as approved by the project manager.

Field Records

The field records associated with the activities described in this SOP are critical project documents that will be used in data interpretation. Field logs may be included in the subsequent reports presenting the results of the field program.

Field team members will keep a daily record of significant events, observations, and measurements in the field logs. The required field logs and records are included in Attachment B.1-1 and are described as follows:

- Daily Log (or field log book)
- Surface Sediment Collection Log
- Field Deviation Form

Equipment and Supplies

The following is a list of equipment that may be necessary to carry out the activities in this SOP. Additional equipment may be required, depending on field conditions.

- Approved project-specific planning documents, including work plan, HASP, SAP, QAPP, and other project SOPs
- Appropriate personal protective equipment and clothing as defined in the HASP
- Decontamination equipment
- Stainless-steel bowls and spoons or trowels for processing
- Clam gun, rigid polyethylene tubing (and well fitting nonreactive cap or stopper), or shovel/hand trowel
- Tarps or poly sheeting
- GPS with coordinates and map
- SAP and HASP
- Camera
- Whiteboard and marker
- Ruler or measuring tape
- Trash bags
- Paper towels
- Data log forms
- Sample jars
- Sample labels
- Coolers and ice

Grab Sample Collection Procedures

1. Determine the appropriate equipment to be used for sediment collection requirements prior to field mobilization.
2. Locate the target sample location with using GPS. The exact location may be adjusted to avoid large debris or rocks.
3. Collect the sample as appropriate for the method:
    a. For clam gun: measure and mark the desired interval on the exterior of the gun, push to the desired interval, cover the suction hole, and lift the sample.
    b. For shovel/trowel: dig to the desired interval, confirming the depth of the hole with a ruler or tape.
    c. For polyethylene tube: measure and mark the desired interval on the exterior of the tube, push to the desired interval, cap or stop the tube, and lift the sample. Remove sediment from the exterior of the tube and confirm the total depth recovery with a ruler or tape.

4. Place the entire sample into a stainless-steel bowl, cover with aluminum foil and label for characterization and homogenization on solid ground. If there is insufficient volume for sampling after one attempt, repeat step 3 adjacent to the first hole.
5. Backfill the sample hole with native material or other suitable materials.
6. Record sample depths and GPS location and obtain a photograph of the pre-homogenized sample.
7. Characterize the sample by recording physical descriptions based on the Unified Soil Classification System (USCS); approximate density and moisture, approximate grain size (fine, medium, and coarse), odor, natural or anthropogenic debris, biotic activity, and color.
8. Homogenize the sample in the stainless-steel bowl with a stainless steel spoon or trowel until a uniform color and consistency is obtained. Remove gravels and debris greater than 0.25 inch as practicable.
9. Fill appropriate sample containers, cap and label.
10. Store filled samples in a cooler on ice until they are shipped to the laboratory.

Quality Assurance/Quality Control

It is the responsibility of the field team leader to periodically check and ensure sediment processing procedures are in conformance with those stated in this SOP.

References

PSEP (Puget Sound Estuary Program), 1997. *Recommended Guidelines for Sampling Marine Sediment, Water Column, and Tissue in Puget Sound*. Prepared for U.S. Environmental Protection Agency, Region 10. April 1997.

Attachments

Attachment B.1-1 Required Field Logs

- Daily Log (or field log book)
- Surface Sediment Collection Log
- Field Deviation Form

Attachment B.1-1
Required Field Logs

Daily Log

ANCHOR QEA

PROJECT NAME: **DATE:**

SITE ADDRESS: **PERSONNEL:**

WEATHER: **WIND FROM:**

N	NE	E	SE	S	SW	W	NW	LIGHT	MEDIUM	HEAVY

SUNNY	CLOUDY	RAIN	?

TEMPERATURE: ° F . ° C

[Circle appropriate units]

TIME	COMMENTS

Signature: _____

Surface Sediment Collection Log

Job: Station:

Job No: Date:

Field Staff: Sample Method:

Contractor: Proposed Coordinates: Lat.

Long.

Water Height

DTM Depth Sounder: _____

DTM Lead Line: _____

Mudline Elevation (datum): calculated after sampling

Tide Measurements

Time: _____

Height: _____

Sample Acceptability Criteria:

1) Overlying water is present
2) Water has low turbidity
3) Sampler is not overfilled
4) Surface is flat
5) Desired penetration depth

Notes: _____

Grab #	Time	Confirmed Coordinates (datum)		Sample Accept (Y/N)	Recovery Depth (in)	Comments: jaws close, good seal, winnowing, overlying water, surface intact, etc
		NAD 83 (N)	NAD 83 (E)			

Sample Description: MAJOR CONSTITUENT GROUP NAME. Moisture content, density/consistency, color, major constituent (%), minor constituents (%), plasticity. Amount and shape of minor constituents (e.g., wood, shells). Biota. Sheen, odor. Structure descriptions

Sample Depth:

Sample Containers:

Analyses:

ANCHOR QEA

Field Deviation Form

Form No. _

Deviation subject:

-

Project name:

-

Standard procedure for field activity:

-

Reason for deviation:

-

Description of deviation:

-

Special equipment, materials, or personnel required:

-

Initiator's name:	Date:
Project Manager:	Date:

Standard Operating Procedure B.2 – Wood Volume Analysis– Sediment Core Method

DRAFT

Standard Operating Procedure – Wood Volume Analysis– Sediment Core Method

Standard Operating Procedure Acknowledgment Form

Project Number: 230909-01.01 Project Name: JELD-WEN Step 2 PRDI

My signature below certifies that I have read and understand the procedures specified in this Standard Operating Procedure.

Date	Name (print)	Signature	Company

Purpose

The purpose of this Standard Operating Procedure (SOP) is to establish uniform procedures for conducting wood volume analysis in concert with sediment coring. Additional information regarding conducting wood volume analysis while collecting sediment cores can be found in the associated Sampling and Analysis Plan (SAP).

This SOP describes the equipment, field procedures, materials, and documentation procedures necessary to perform the activities described in the previous paragraph. The details within this SOP should be used in conjunction with the associated project planning documents, such as the SAP, Quality Assurance Project Plan (QAPP), and other project-specific SOPs.

Scope and Application

This SOP is applicable to conducting wood volume analysis in concert with collecting sediment cores. Substantive deviations from the procedures detailed in this SOP will be recorded in the field logbook or Daily Log and in a Field Deviation Form.

Health and Safety Warnings

Health and safety hazards for the work associated with this SOP, including physical, chemical, and biological hazards, are addressed in the project Health and Safety Plan (HASP). The HASP will be followed during all activities conducted by Anchor QEA staff.

Staff Qualifications

Field staff executing these procedures will have read, must be familiar with, and must comply with the requirements of this SOP and all associated project planning documents, such as the SAP, QAPP, and other project-specific SOPs. Field staff will be under the direct supervision of qualified professionals who are experienced in performing the tasks described in this SOP, as approved by the project manager.

Field Records

The field records associated with the activities described in this SOP are critical project documents that will be used in data interpretation. Field logs may be included in the subsequent reports presenting the results of the field program.

Field team members will keep a daily record of significant events, observations, and measurements in the field logs. The required field logs and records are included in Attachment B.2-1 and are described as follows:

- Daily Log (or field logbook, as dictated by project planning documents)
- Sediment Core Collection and Processing Logs

- Field Deviation Form
- Wood Volume Measurement Calculation Sheet

Equipment and Supplies

The following is a list of equipment that may be necessary to carry out the activities in this SOP. Additional equipment may be required, depending on field conditions.

- Approved project-specific planning documents, including work plan, HASP, FSP, QAPP, and other project SOPs
- Appropriate personal protective equipment (PPE) and clothing as defined in the HASP
- Decontamination equipment
- Sampling vessel equipped with necessary navigation and communication equipment
- Digital camera
- Water pump and hoses
- Appropriate field sieving equipment
- Surgical forceps
- Handheld magnifying glass
- Whiteboard and marker
- Calipers with +/- 0.2 millimeter accuracy to measure the inside diameter of the sediment core tube
- Ruler or tape measure
- Field logbook, field data collection form, and pens
- Personal protective equipment (safety glasses, steel-toed boots, work gloves, and any other items required by the project-specific HASP)
- Decontamination equipment

Sample and Survey Procedures

This section provides step-by-step procedures for the collection of sediment core samples associated with the wood volume analysis. Wood volume samples will be collected using the same equipment and generally the same procedures as for the sediment core collection and processing activities associated with samples for chemical analysis. Sediment cores for wood volume analysis will be collected from a 0- to 3-foot interval. Cores with less than 3 feet of penetration or less than 70% recovery will be recollected (up to a total of three attempts), and the station with the deepest penetration and percent recovery will be used. The dimensions of the core tubes will be recorded for use in the volume calculations.

Core Collection

Follow standard sediment vibracore collection procedures.

Collection of Wood from the Core

- Log core per sediment core processing procedures.
- After recording qualitative characteristics of the sample, wash sediment from the 0- to 1-foot interval through a 1-mm sieve nested over a 0.5-mm sieve, or into a container (if sieving with the 0.5-millimeter sieve will be done as a separate step). The 0.5- and 1-millimeter range has been established to catch fine wood at wood waste sites per Washington State Department of Ecology (Ecology) publication 09-09-044. Note: this size range matches coarse-grained sand.
- Sediment adhering to the outside of the sampler should not be mixed with the sample.
- When being sieved, sediments may be gently sprayed with water from above, gently agitated by hand in a washtub of water, or washed using a combination of these techniques.
- If rocks or non-organic anthropogenic debris are caught in the sieve, rinse thoroughly over the sieve, carefully remove from the sample, and document on the sample log.
- Once initial sieving is completed, hold the screen box at an angle and gently wash the remaining material gently into one corner/edge.
- Assess material retained by the 0.5- or 1-millimeter sieve to determine whether it is wood. Determination of fine wood relative to other similar sized materials (i.e., sand) may include the following:
  - Visual appearance using a magnifying glass
  - Texture or color (sand grains should feel more granular or gritty when rubbed between the fingers as opposed to fine wood material; wood may have a distinct color)
  - Hardness (firm or stiff vs. soft or spongy)
- The identification of wood will be subject to the judgement of the field team. Anchor QEA and Ecology field staff (when present) will confer in the field and agree on which material is wood and therefore to be included in the volumetric measurement described below.
- Remove remaining material determined not to be wood.
- Carefully rinse and transfer the clean separated wood material (including all size ranges greater than 0.5-millimeter) to an appropriately sized graduated cylinder (should be larger in volume than a 1-foot section of core liner).
- Be sure to check the screen carefully for wood fragments trapped in the mesh wires, using forceps if needed, taking care not to damage the screen.
- If nested over a 0.5-millimeter sieve, repeat previous steps. If nested over a container, transfer material to a 0.5-millimeter sieve positioned over another container and repeat previous steps.
- All sediment post-sieving will be collected and stored per investigation derived waste (IDW) procedures for the project.

Volumetric Measurement of Wood

- Calculate the volume of a 1-foot (304.8-millimeter) section of core tube based on the dimensions (length and width or diameter), as follows:
  - Area of 1-foot cylindrical core liner = cross-sectional area [3.14 × (1/2 inside diameter)^2] × height [304.8 millimeters] = cubic millimeters
  - Area of 1-foot square tube core liner = cross-sectional area [inside length X inside width] × height [304.8 millimeters] = cubic millimeters
  - To convert cubic millimeters to milliliters, divide by 1,000.
- Add a volume of potable water [A] (equivalent to the volume of a 1-foot section of the core liner – calculated above) to the graduated cylinder containing the separated wood.
- Record total volume of the cylinder [B], reading from the bottom of a concave meniscus (some plastic graduated cylinders have a flat meniscus) and ensuring that all wood is submerged in the water (use a spoon, trowel, or similar tool to submerge the wood if needed).
- Subtract the volume of water added to the wood [A] (equivalent to a 1-foot section of core liner) from the total recorded volume [B] (wood and water). This is the approximate volume of wood in the sample interval [C].
- Divide the volume of wood by the volume of water added to determine what percentage of the interval is wood by volume.
  - (volume of wood [C])/ (volume or wood and equivalent volume 1-section of core [A]) = percent wood by volume
- Once the percent wood by volume measurement has been made for the 0- to 1-foot section of core, determine the need to sieve the 1- to 2-foot and 2- to 3-foot intervals:
  - If the 0- to 1-foot interval is greater than 15% wood by volume and either of the other two intervals visually appear to be equal to or possibly greater than the 0 to 1-foot interval, that interval(s) will also be sieved for wood volume analysis.
  - If the 0- to 1-foot interval is less than 15% wood by volume and either of the other two intervals visually appear to be equal to or less than the 0- to 1-foot interval, that interval(s) will not be sieved for wood volume analysis.
  - If either of the other two intervals visually appear to be significantly different in amount (higher) or type of wood, that interval(s) will also be sieved for wood volume analysis.
  - If any 1-foot interval has greater than 25% wood by volume, the interval below it will also be sieved for wood volume analysis.
  - The Anchor QEA and Ecology field staff will confer in the field and agree on which additional intervals to sieve.

Once wood volume measurements are complete, all wood will be added to the project IDW.

Quality Assurance/Quality Control

It is the responsibility of the field team leader to periodically check and ensure that sample collection and processing procedures are in conformance with those stated in this SOP.

References

Washington Department of Ecology, 2013. Wood Waste Cleanup: Identifying, Assessing, and Remediating Wood Waste in Marine and Freshwater Environments. Publication No. 09-09-044. September 2013.

Attachment B.2-1 Required Field Logs

- Daily Log (or field logbook, as dictated by project planning documents)
- Sediment Core Collection and Processing Logs
- Field Deviation Form
- Wood Volume Measurement Calculation Sheet

Attachment B.2-1
Required Field Logs

Daily Log

ANCHOR QEA

PROJECT NAME: **DATE:**

SITE ADDRESS: **PERSONNEL:**

WEATHER: **WIND FROM:**

N	NE	E	SE	S	SW	W	NW	LIGHT	MEDIUM	HEAVY

SUNNY	CLOUDY	RAIN	?

TEMPERATURE: ° F . ° C

[Circle appropriate units]

TIME	COMMENTS

Signature: _____

Sediment Core Collection Log

Job:	**Station ID:**
Job No:	**Attempt No.**
Field Staff:	**Date:**
Contractor:	**Logged By:**
Vertical Datum:	**Horizontal Datum: NAD83 WA State Plane North, feet**

Field Collection Coordinates:

Lat/Northing: Long/Easting:

A. Water Depth

DTM Depth Sounder:

DTM Lead Line:

B. Water Level Measurements

Time:

Height:

Source:

C. Mudline Elevation

Recovery Measurements (prior to cuts)

Core Collection Recovery Details:

Core Accepted: Yes / No

Core Tube Length:

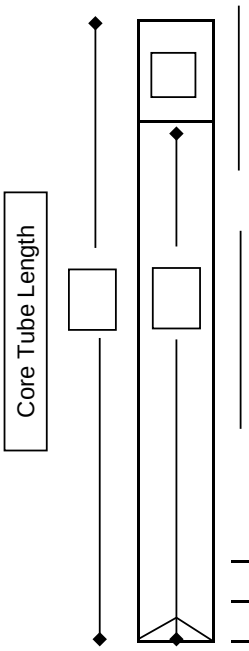
Drive Penetration:

Headspace Measurement:

Recovery Measurement:

Recovery Percentage:

Total Length of Core To Process:



Sections To Process:

A:

B:

C:

D:

Drive Notes:

Core Field Observations and Description:

Sediment type, moisture, color, minor modifier, MAJOR modifier, other constituents, odor, sheen, layering, anoxic layer, debris, plant matter, shells, biota

Notes:

Sediment Core Processing Log

ANCHOR QEA

Job:	Station ID:
Job No.	Date/Time:
No. of Sections:	Core Logged By:
Drive Length:	Attempt #:
Recovery:	Type of Core ☐ Mudmole ☐ Vibracore ☐ Diver Core
% Recovery:	Diameter of Core (inches)
Notes:	

Recovered Length (ft)	Size % Gravel	Size % Sand	Size % Fines	**Classification and Remarks** (Density, Moisture, Color, Minor Constituent, MAJOR Constituent, with Additional Constituents, Sheen, Odor)	Recovered Length (ft)	PID	Sample	Summary Sketch

ANCHOR QEA

Field Deviation Form

Form No. _

Deviation subject:

-

Project name:

-

Standard procedure for field activity:

-

Reason for deviation:

-

Description of deviation:

-

Special equipment, materials, or personnel required:

-

Initiator's name:	Date:
Project Manager:	Date:

Wood Volume Measurement Calculation Sheet

Core Liner Type

Round			
Square			

Core Liner Dimensions (round)

Diameter (mm)	(d)		Measured with calipers to 0.2 mm
Height of 1-foot core liner (mm)		304.8	1 inch = 25.4 mm
Volume (mm^3) of 1-foot core liner	(v)		$3.14 \times [(0.5) \times (d)]^2 \times 304.8$
Volume (mL) of 1-foot core liner	**A**		=(v)/1,000

Core Liner Dimensions (square)

Cross-section length (mm)	(l)		Measured with calipers to 0.2 mm
Cross-section width (mm)	(w)		Measured with calipers to 0.2 mm
Height of 1-foot core liner (mm)		304.8	1 inch = 25.4 mm
Volume (mm^3) of 1-foot core liner	(v)		(l) × (w) × (304.8)
Volume (mL) of 1-foot core liner	**A**		=(v)/1,000

Volume of sieve-separated wood material plus **A** (measured in graduated cylinder when A [mL] added to wood)	**B**		
Volume of wood (mL)	**C**		**B - A**
% Wood in 1-foot interval	**D**		(**C** / **A**) × 100

Wood Volume Measurement Calculation Sheet
4-Inch-Square Example

Core Liner Type

Round		--	
Square		X	

Core Liner Dimensions (round)

Diameter (mm)	(d)	--	Measured with calipers to 0.2 mm
Height of 1-foot core liner (mm)		304.8	1 inch = 25.4 mm
Volume (mm^3) of 1-foot core liner	(v)	--	$3.14 \times [(0.5) \times (d)]^2 \times 304.8$
Volume (mL) of 1-foot core liner	**A**	--	=(v)/1,000

Core Liner Dimensions (square)

Cross-section length (mm)	(l)	101.6	Measured with calipers to 0.2 mm
Cross-section width (mm)	(w)	101.6	Measured with calipers to 0.2 mm
Height of 1-foot core liner (mm)		304.8	1 inch = 25.4 mm
Volume (mm^3) of 1-foot core liner	(v)	3,146,316.3	(l) × (w) × (304.8)
Volume (mL) of 1-foot core liner	**A**	3146.3	=(v)/1,000

Volume of sieve-separated wood material plus **A** (measured in graduated cylinder when A [mL] added to wood)	**B**	3946.3	
Volume of wood (mL)	**C**	800.0	**B - A**
% Wood in 1-foot interval	**D**	25 %	(**C** / **A**) × 100

Wood Volume Measurement Calculation Sheet
4-Inch-Round Example

Core Liner Type

Round		X	
Square		--	

Core Liner Dimensions (round)

Diameter (mm)	(d)	--	Measured with calipers to 0.2 mm
Height of 1-foot core liner (mm)		304.8	1 inch = 25.4 mm
Volume (mm^3) of 1-foot core liner	(v)	--	$3.14 \times [(0.5) \times (d)]^2 \times 304.8$
Volume (mL) of 1-foot core liner	**A**	--	=(v)/1,000

Core Liner Dimensions (square)

Cross-section length (mm)	(l)	101.6	Measured with calipers to 0.2 mm
Cross-section width (mm)	(w)	101.6	Measured with calipers to 0.2 mm
Height of 1-foot core liner (mm)		304.8	1 inch = 25.4 mm
Volume (mm^3) of 1-foot core liner	(v)	3,146,316.3	(l) × (w) × (304.8)
Volume (mL) of 1-foot core liner	**A**	3146.3	=(v)/1,000

Volume of sieve-separated wood material plus **A** (measured in graduated cylinder when A [mL] added to wood)	**B**	3946.3	
Volume of wood (mL)	**C**	800.0	**B - A**
% Wood in 1-foot interval	**D**	25 %	(**C** / **A**) × 100

Standard Operating Procedure B.3 – Thin-Walled (Shelby Tube) Sampling

DRAFT

Standard Operating Procedure B.3 – Thin-Walled (Shelby Tube) Sampling

Standard Operating Procedure Acknowledgment Form

Project Number: 230909-01.01 Project Name: Jeld Wen Step 2 PRDI

My signature below certifies that I have read and understand the procedures specified in this Standard Operating Procedure.

Date	Name (print)	Signature	Company

Purpose

The purpose of this Standard Operating Procedure (SOP) is to establish uniform procedures for the collection of undisturbed soil samples using thin-walled samplers, otherwise known as Shelby tube samplers.

This SOP describes the equipment, field procedures, materials, and documentation procedures necessary to perform the activities described in the previous paragraph. The details within this SOP should be used in conjunction with the associated project planning documents, such as the Field Sampling Plan (FSP), Quality Assurance Project Plan (QAPP), and other project-specific SOPs.

Scope and Application

This SOP is applicable to the collection of undisturbed soil samples using a thin-walled or Shelby tube sampler. Substantive deviations from the procedures detailed in this SOP will be recorded in the field log book or Daily Log and in a Field Deviation Form.

Health and Safety Warnings

Health and safety issues for the work associated with this SOP, including physical, chemical, and biological hazards, are addressed in the project Health and Safety Plan (HASP). The HASP will be followed during all activities conducted by Anchor QEA staff.

For all drilling activities, underground utility clearance will be conducted in accordance with project-specific planning documents. In addition, prior to any drilling, field crews will manually clear the uppermost 5 feet at each drill location with shovels or post-hole diggers or via non-intrusive methods such as an air knife or soil vacuum. The objective of the manual clearing is to visually inspect the uppermost 5 feet as a final check for buried utilities not identified during the public mark-out or private utility locate. Once the location has been manually cleared and verified by the Anchor QEA field team, then the borehole can be drilled, or the center of the cleared hole can be marked and backfilled to be drilled later.

Staff Qualifications

Field staff executing these procedures will have read, must be familiar with, and must comply with the requirements of this SOP and all associated project planning documents, such as the FSP, QAPP, and other project-specific SOPs. Field staff will be under the direct supervision of qualified professionals who are experienced in performing the tasks described in this SOP, as approved by the project manager.

Field Records

The field records associated with the activities described in this SOP are critical project documents that will be used in data interpretation. Field logs may be included in the subsequent reports presenting the results of the field program.

Field team members will keep a daily record of significant events, observations, and measurements in the field logs. The required field logs and records are included in Attachment B.3-1 and are described as follows:

- Daily Log (or field log book, as dictated by project planning documents)
- Boring Log
- Utility Clearance Checklist
- SOP Deviation Log

Equipment and Supplies

The following is a list of equipment that may be necessary to carry out the activities in this SOP. Additional equipment may be required, depending on field conditions.

- Approved project-specific planning documents, including work plan, HASP, FSP, QAPP, and other project SOPs
- Appropriate personal protective equipment (PPE) and clothing as defined in the HASP
- Decontamination equipment
- Indelible ink pen
- Tape measure (ideally with engineer scale)
- Putty knife or other tools for inspection of recovered soil samples
- Camera
- Whiteboard with erasable markers
- Air monitoring equipment, as defined by the HASP
- Soil description aids (e.g., Munsell color chart and Unified Soil Classification System [USCS] grain or size charts)
- Field log book; field records included in Attachment B.3-1
- Safety knife or scissors
- Field table (recommended)

Procedures

Introduction

Soils can be sampled in a variety of ways. One way is with the use of a thin-walled (also known as a Shelby tube) sampler advanced by hand or hydraulically pushed from a land- or water-based drill rig. Thin-walled sampling is generally used to collect undisturbed soil cores of 24 to 36 inches in length.

A series of consecutive cores may be extracted with a thin-walled sampler to give a complete soil column profile, or an auger may be used to drill down to the desired depth for sampling. The thin-walled sampler is then pushed to its sampling depth through the bottom of the augured hole and the core extracted. A thin-walled sampler is ideal for collecting relatively undisturbed subsurface geotechnical samples for advanced geotechnical laboratory testing. When thin-walled sampling is performed to gain geologic information, all work should be performed in accordance with ASTM International D1587, "Thin-Walled Tube Sampling of Fine-Grained Soils for Geotechnical Purposes" (ASTM 2016). This SOP describes the collection of soil samples using the thin-walled sampler.

Thin-Walled Sample Collection and Processing

The following procedures are used for collecting soil samples with a thin-walled sampler:

1. Assemble the sampler by attaching the driving head to the sampling tube.
2. Place the sampler in a perpendicular position on the sample material. Where a drill rig is used, this step is performed by the drilling contractor.
3. Use a smooth, continuous push to advance the tube. Do not drive past the bottom of the sample length. Where a drill rig is used, this step is performed by the drilling contractor.
4. Record in the site log book or on field data sheets the length of the tube used to penetrate the material being sampled, as well as the detailed information described in this SOP.
5. Withdraw the sampler and remove the drive head. The amount of recovery and soil type should be measured recording the depth to soil from both the top and bottom of the sample tube. Note any aberrations such as rocks or other objects visible in the drive end of the sampler.
6. Store sample upright in a protected and dry location outside of direct sunlight.

Required Information on Boring Logs

Boring logs shall include the following information, at a minimum, to describe the drilling work:

1. Date and time of collection of each sample
2. Names of field personnel collecting and handling the samples
3. Type of sampling equipment used (i.e., split-spoon diameter, hammer weight, free fall height, and hammer deployment method)
4. Observations made during sample collection, including weather conditions, complications, and other details associated with the sampling effort
5. The sample station identification
6. Length and depth intervals of each sample and measured recovery
7. Qualitative notation of apparent resistance during driving
8. Any deviation from the project-specific planning documents

Thin-Walled Sample Handling

Thin-walled tube samples do not allow for direct observation or logging in the field. When recovered from the boring, the tubes will be measured for amount of recovery and checked to ensure the tube was not dented or damaged while driving or removing. The tubes will then be quickly cleaned, sealed with a plastic cap and duct tape on both ends, and labeled with boring name, sample name, date, approximate depth, and the location of the top of the sample with respect to the orientation it was removed from the subsurface. Every effort will be made to store and transport the Shelby tubes with minimal disturbance in the upright, vertical position.

Attachment B.3-1 to this SOP contains Project-specific standard terminology for field logs.

Quality Assurance/Quality Control

It is the responsibility of the field team leader to periodically check and ensure that sediment core processing procedures are in conformance with those stated in this SOP.

Reference

ASTM (ASTM International), 2016. *Standard Practice for Thin-Walled Tube Sampling of Fine-grained Soils for Geotechnical Purposes*, D1587/D1587M-15. December 27, 2016.

Attachments

Attachment B.3-1 Required Field Logs

- Daily Log (or field log book, as dictated by project planning documents)
- Boring Log
- Utility Contact Prevention Checklist
- Field Deviation Form

Attachment B.3-1
Required Field Logs

Daily Log

ANCHOR QEA

PROJECT NAME: **DATE:**

SITE ADDRESS: **PERSONNEL:**

WEATHER: **WIND FROM:**

N	NE	E	SE	S	SW	W	NW	LIGHT	MEDIUM	HEAVY

SUNNY	CLOUDY	RAIN	?

TEMPERATURE: ° F . ° C

[Circle appropriate units]

TIME	COMMENTS

Signature: _____

PROJECT:	Log of Boring No.	
BORING LOCATION:	ELEVATION AND DATUM:	
DRILLING CONTRACTOR:	DATE STARTED:	DATE COMPLETED:
DRILLING METHOD:	TOTAL DEPTH:	MEASURING POINT:
DRILLING EQUIPMENT:	DEPTH TO FIRST WATER ATD:	DEPTH TO FREE WATER ATC:
SAMPLING METHOD:	LOGGED BY:	
BOREHOLE DIAMETER:	HAMMER TYPE/SYSTEM:	

DEPTH (feet)	SAMPLES		PID Reading (ppm)	DESCRIPTION (den., moist., color, minor, MAJOR, non-soil, odor, etc.)	FIELD-ESTIMATED %						SAMPLE ID OTHER REMARKS
					Gravel		Sand			Fines	
	Recovery	Blows/ 6 inches			Coarse	Fine	Coarse	Medium	Fine		

Utility Contact Prevention Checklist

NOTE: Utility mark-out requirements vary from state to state; consult state authorities before beginning work.

Purpose: This form is intended to help the Field Lead confirm that underground or overhead utilities are identified to the extent practicable and consistent with applicable regulations **PRIOR** to site work.

INVESTIGATIONS MUST NOT OCCUR UNTIL MULTIPLE LINES OF EVIDENCE INDICATE THAT SUBSURFACE OR OVERHEAD UTILITIES ARE NOT PRESENT IN THE WORK AREA

Project Name/No: _____ **Date:** _____

Field Lead: _____ **Project Address:** _____

Project Manager: _____ **Health & Safety Officer:** _____

Emergency Contact Information for One Call: _____

Duration/Summary of Work to be Performed: _____

_____

_____

Consideration	Check		Explanation	Initial
Has the state One Call been contacted?	☐ Yes	☐ No		
Has the property owner or client been contacted for local knowledge of utilities, as applicable?	☐ Yes	☐ No		
Does the property owner or client have specific utility contact prevention procedures and, if so, have they been completed?	☐ Yes	☐ No		
Are any as-built drawings available? If so, do they show any utilities?	☐ Yes	☐ No		
Has a visual inspection of the work area(s) been completed?	☐ Yes	☐ No		
Has the potential presence of in-water utilities been assessed (shore markers, streets dead-ending at water's edge, etc.)	☐ Yes	☐ No		
Is evidence of electrical utilities present? (electric meters on structures, conduits, overhead lines, light poles, etc.)	☐ Yes	☐ No		
Is evidence of water/sewer utilities present? (water meter, hydrants, restrooms, grates in ground, etc.)	☐ Yes	☐ No		
Is evidence of telecommunications utilities present? (fiber optic warning signs, conduits from utility poles, wall-mounted boxes, etc.)	☐ Yes	☐ No		
Is other evidence of utilities present? (unknown ground markings, manholes or valve covers, "Call Before You Dig" signs, linear asphalt or concrete repair characteristics, liner subsidence of ground surface, pin flags or stakes, etc.)	☐ Yes	☐ No		

Utility Contact Prevention Checklist

NOTE: Utility mark-out requirements vary from state to state; consult state authorities before beginning work.

Consideration	Check		Explanation	Initial
Has a private locating service been contacted?	☐ Yes	☐ No		
Were any utilities identified and marked out through a private locating service? If so, duplicate mark-outs on site drawings.	☐ Yes	☐ No		
Are there any fiber optic cables, fuel lines, or high-pressure lines within 50 feet of work locations?	☐ Yes	☐ No		
If fiber optic cables, fuel lines, or high-pressure lines are within 50 feet, has an agreement with the utility owner been established?	☐ Yes	☐ No		
Can a test borehole be advanced by hand digging, probing, post-hole digging, and/or air knifing to 5 feet below ground surface (bgs)?	☐ Yes	☐ No		
If hand digging, probing, post-hole digging, and/or air knifing to 5 feet bgs is not possible, can a non-invasive geophysical investigation be conducted? If not, why?	☐ Yes	☐ No		
Other considerations:				

NOTE: Please fill in second page and attach additional reports, drawings, or other information, as necessary.

Confirmation Number: _____

Contact Name: _____ **Organization:** _____

Contact Date: _____ **Contact Time:** _____

Response: _____

_____

_____

_____

Completed by:

_____ _____ _____

Printed Name Signature Date

Contractor:

_____ _____ _____

Printed Name Signature Date

ANCHOR QEA

Field Deviation Form

Form No. _

Deviation subject:

-

Project name:

-

Standard procedure for field activity:

-

Reason for deviation:

-

Description of deviation:

-

Special equipment, materials, or personnel required:

-

Initiator's name:	Date:
Project Manager:	Date:

Attachment B.3-2
Example Soil Visual Description Key

SOIL/SEDIMENT CLASSIFICATION FIELD GUIDE

ANCHOR QEA

SOIL/SEDIMENT DESCRIPTION COMPONENTS: USCS name (USCS symbol): density/consistency, moisture, color, list gravel/silt/sand by %; additional remarks

Density of Coarse-grained (Cohesionless) Soils	
Density	***Standard Penetration (N; blows/foot)***
Very Loose	0 to 4
Loose	4 to 10
Medium Dense	10 to 30
Dense	30 to 50
Very Dense	More than 50

Consistency of Fine-grained (Cohesive) Soils			
Consistency	***Standard Penetration (N; blows/foot)***	***Unconfined Compressive Strength (tsf)***	***Manual Penetration Test***
Very Soft	0 to 2	<0.25	Thumb will penetrate soil more than 1 inch
Soft	2 to 4	0.25 to 0.5	Thumb will penetrate soil about 1 inch
Medium Stiff	4 to 8	0.5 to 1	Molded by moderate to firm finger pressure
Stiff	8 to 15	1 to 2	Readily indented by thumb, difficult to penetrate
Very Stiff	15 to 30	2 to 4	Readily indented by thumbnail
Hard	More than 30	>4	Indented with difficulty by thumbnail

Gray

Gray-brown

Olive-brown

Olive

Olive-gray

Dark brown

Red-gray

Red-brown

Brown

Red

Light brown

Tan

Yellow-brown

Red-yellow

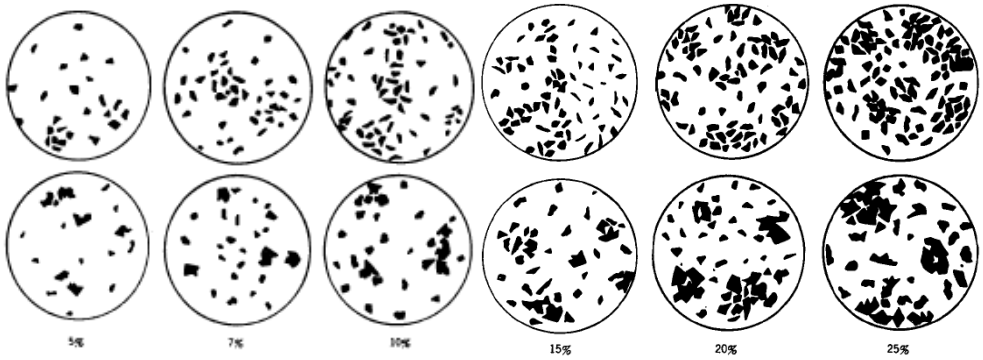
Yellow

Moisture Content	
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp, but no visible water
Wet	Visible, free water

Particle Shape/Angularity	
Description	***Criteria***
Rounded	Near-spherical or oval
Sub-rounded	Primarily rounded corners and edges
Sub-angular	Slightly rounded corners and edges
Angular	Sharp corners and edges

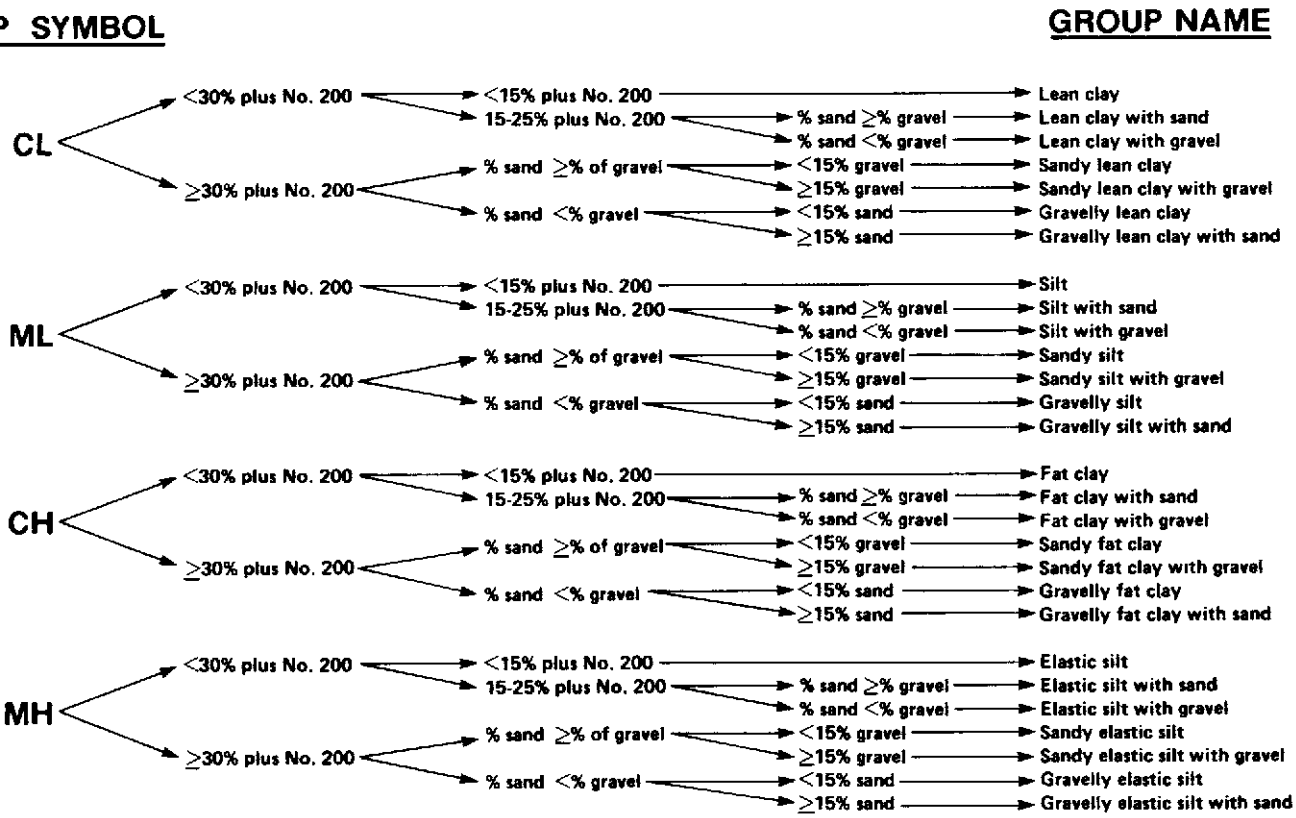
Grain Size				
Soil Component		***Anthropogenic Component***	***Size Range (U.S. Standard Sieve)***	***Approximate Size***
Boulders		Blocks	>12 inches	larger than basketball
Cobbles		Pieces	3 to 12 inches	fist to basketball
Gravel	Coarse	Fragments	3/4 to 3 inches	thumb to fist
	Fine		#4 to 3/4 inches	pea to thumb
Sand	Coarse	Particles	#10 to #4	rock salt to pea
	Medium		#40 to #10	sugar to rock salt
	Fine		#200 to #40	flour to sugar
Fine Grained	Silt	Specks	Pass #200	finer than flour
	Clay			

Charts for Estimating Percentages (After Compton, 1962)



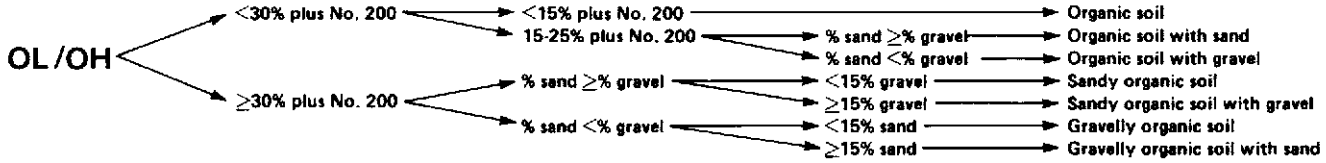
Index of Plasticity	
Description	***Criteria***
Non-plastic	A 1/8 inch (3 mm) thread cannot be rolled at any water content. Has definite structure but can easily be separated or crumbled. Is readily rinsed off sampling equipment. Breaks easily when pieces are dried.
Low Plasticity	A thread can barely be rolled.
Medium Plasticity	A thread is easily rolled. Stays together relatively well when molded (i.e., behaves like Play-Doh). Can be washed off sampling equipment easily. Requires some effort to break when pieces are dried.
High Plasticity	A threat is easily rolled, and can be rerolled several times. Can be easily molded and stays together very well, but takes effort to rinse off of sampling equipment. Difficult to break when pieces are dried.

Criteria for Describing Soil Structure	
Decomposed	Visible signs of breakdown, applicable to organic matter and rock.
Homogeneous	Same color and appearance throughout.
Interbedded	Alternating soil layers of different composition.
Lens	A very thin cohesive layer, less than .5-inch thick.
Layer	A general term for material lying essentially parallel to the surfaces against which it was formed (.5-inch to 12-inch thick).
Varved	A cyclic sedimentary couplet consisting of a coarser and a finer layer, representing variation in depositional energy.
Washed	Material missing in core tube due to loss through the bottom of sampler due to improper closing.



NOTE 1—Percentages are based on estimating amounts of fines, sand, and gravel to the nearest 5 %.

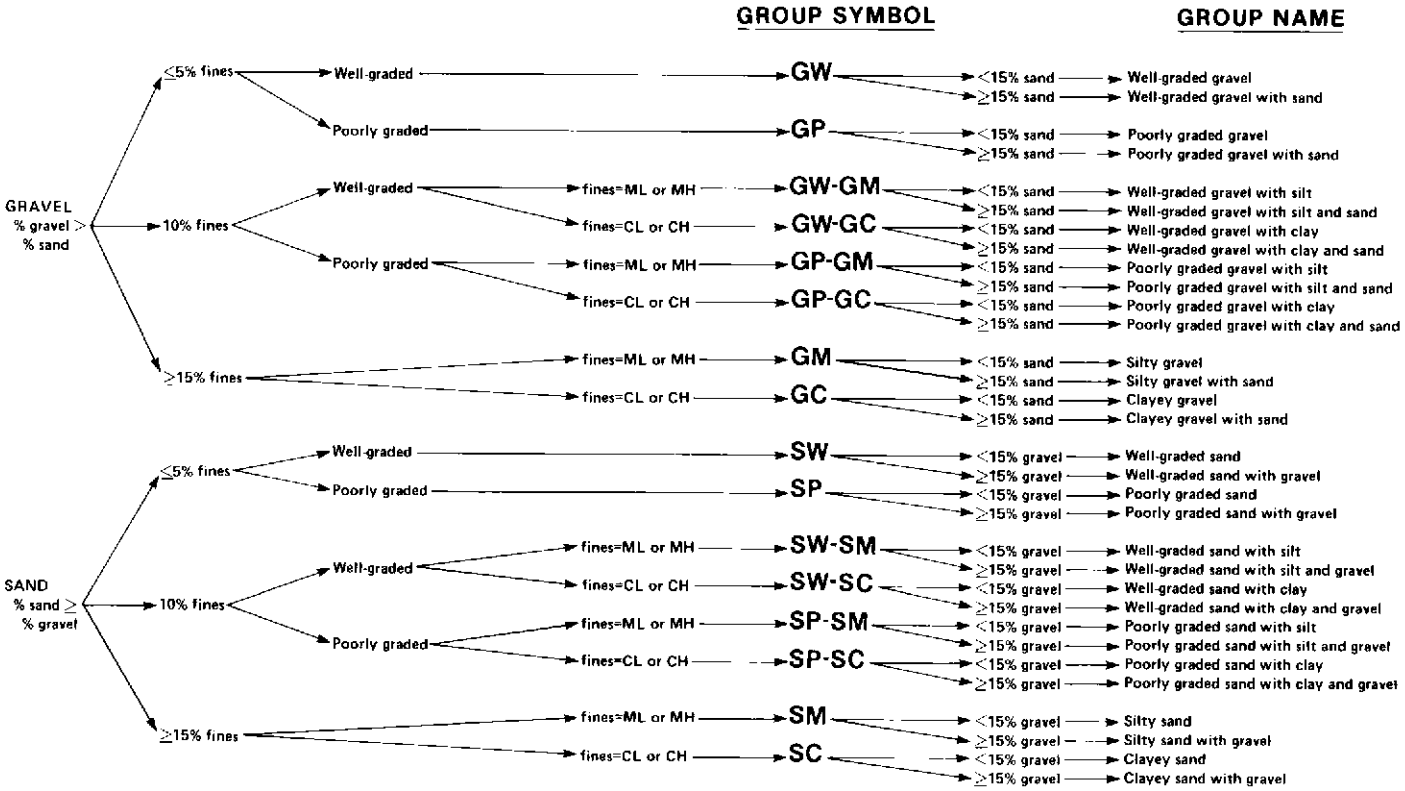
FIG. 1a Flow Chart for Identifying Inorganic Fine-Grained Soil (50 % or more fines)



NOTE 1—Percentages are based on estimating amounts of fines, sand, and gravel to the nearest 5 %.

FIG. 1 b Flow Chart for Identifying Organic Fine-Grained Soil (50 % or more fines)

SOIL/SEDIMENT CLASSIFICATION FIELD GUIDE



NOTE 1—Percentages are based on estimating amounts of fines, sand, and gravel to the nearest 5 %.

FIG. 2 Flow Chart for Identifying Coarse-Grained Soils (less than 50 % fines)

⚠ **NOTE: The following terminology is optional, and should be used with caution. Consult the Anchor QEA Project Manager prior to field use. Use caution when describing odors, sheens, and nonaqueous phase liquid (NAPL) to avoid exposure to potentially hazardous chemicals. Do not sniff the sample or bring it close to your face. If unexpected contamination is encountered, stop work, clear personnel from the area, and contact the Anchor QEA Project Manager for further instruction.**

Criteria for Describing Odors	
Relative Intensity	***Odor Types***
Trace (faint)	Petroleum-like (e.g., diesel, No. 2 fuel oil, kerosene, or gasoline)
	Hydrogen sulfide-like (H_2S-like)
Moderate (obvious)	Organic-like (e.g., septage)
	Solvent-like (e.g., alcohol)
Strong (overwhelming)	Tar-like (e.g., hot asphalt or roofing tar)

Criteria for Describing Sheens			
Relative Intensity	***Sheen Color***		***Description Components***
Trace, <25% of surface covered	Rainbow	Multicolored	1. Intensity 2. Sheen color 3. Sheen distribution (e.g., continuous, present as .5-inch spots) 4. Depth interval over which sheen is present **Distinguishing hydrocarbon-sheen from biological sheen:** If disturbed, a hydrocarbon sheen will typically coalesce, where an inorganic sheen will break apart and has a blocky appearance. Distinguish biological sheens if obvious.
Moderate, 25 to 75% of surface covered			
Heavy, >75% of surface covered	Silver or Metallic	Metallic, silver/gray-colored	

Criteria for Describing Nonaqueous Phase Liquid (NAPL) and/or Separate Phase Material (SPM)		
Relative Amounts and/or Distribution of NAPL/SPM		***Description Components***
Blebs	Describes the occurrence of discrete droplets of separate phase liquid, but for the most part, the sediment matrix does not contain NAPL. Describe the estimated size and number of blebs.	1. Relative amount of NAPL 2. Color 3. Viscosity 4. Distribution of NAPL 5. Density 6. Depth interval over with NAPL is present
Coated	NAPL present as a coating on the sediment grains; may be present in the pore space, but not as a free separate phase liquid. The degree of coating should be described as light, moderate, or heavy.	
Wetted	NAPL is present on the sediment surface and in the pore spaces. NAPL appears as a liquid on the surface of the sample when the sample is disturbed. Depending on viscosity, NAPL may freely drain from the sample.	

Standard Operating Procedure B.4 – Subsurface Soil Investigation

DRAFT

Standard Operating Procedure B.4 – Subsurface Soil Investigation

Standard Operating Procedure Acknowledgment Form

Project Number: 230909-01.01 Project Name: Jeld Wen Step 2 PRDI

My signature below certifies that I have read and understand the procedures specified in this Standard Operating Procedure.

Date	Name (print)	Signature	Company

Purpose

The purpose of this Standard Operating Procedure (SOP) is to establish uniform procedures for the drilling and sampling of fill and unconsolidated soils for site characterization purposes.

This SOP describes the equipment, field procedures, materials, and documentation procedures necessary to perform the activities described in the previous paragraph. The details within this SOP should be used in conjunction with the associated project planning documents, such as the Field Sampling Plan (FSP), Quality Assurance Project Plan (QAPP), and other project-specific SOPs.

Scope and Application

This SOP is applicable to the collection and description of soil samples. Substantive deviations from the procedures detailed in this SOP will be recorded in the field log book or Daily Log and in a Field Deviation Form.

Health and Safety Warnings

Health and safety issues for the work associated with this SOP, including physical, chemical, and biological hazards, are addressed in the project Health and Safety Plan (HASP). The HASP will be followed during all activities conducted by Anchor QEA staff.

Underground utility clearance will be conducted in accordance with project-specific planning documents. In addition, prior to any drilling, field crews will manually clear the uppermost 5 feet at each drill location with shovels or post-hole diggers or via non-intrusive methods such as an air knife or soil vacuum. The objective of the manual clearing is to visually inspect the uppermost 5 feet as a final check for buried utilities not identified during the public mark-out or private utility locate. Once the location has been manually cleared and verified by the Anchor QEA field team, then the borehole can be drilled, or the center of the cleared hole can be marked and backfilled to be drilled later.

Staff Qualifications

Field staff executing these procedures will have read, must be familiar with, and must comply with the requirements of this SOP and all associated project planning documents, such as the FSP, QAPP, and other project-specific SOPs. Field staff will be under the direct supervision of qualified professionals who are experienced in performing the tasks described in this SOP, as approved by the project manager.

Field Records

The field records associated with the activities described in this SOP are critical project documents that will be used in data interpretation. Field logs may be included in the subsequent reports presenting the results of the field program.

Field team members will keep a daily record of significant events, observations, and measurements in the field logs. The required field logs and records are included in Attachment B.4-1 and are described as follows:

- Daily Log (or field log book, as dictated by project planning documents)
- Boring Log
- Utility Contact Prevention Checklist
- Field Deviation Form

Equipment and Supplies

The following is a list of equipment that may be necessary to carry out the activities in this SOP. Additional equipment may be required, depending on field conditions.

- Approved project-specific planning documents, including work plan, HASP, FSP, QAPP, and other project SOPs
- Appropriate personal protective equipment (PPE) and clothing as defined in the HASP
- Decontamination equipment
- Indelible ink pen
- Tape measure (ideally with engineer scale)
- Putty knife or other tools for inspection of recovered soil samples
- Camera
- Whiteboard with erasable markers
- Air monitoring equipment, as defined by the HASP
- Soil description aids (e.g., Munsell color chart and Unified Soil Classification System [USCS] grain or size charts)
- Field log book; field records included in Attachment B.4-1
- Safety knife or scissors
- Field table (recommended)
- Stainless steel bowls and spoons

Soil Boring, Logging, and Sampling Procedures

The subsurface soil investigation procedures are outlined as follows:

1. The drill rig (for example, direct push or hollow stem auger rig) will be positioned at each target station for soil investigation.
2. The borehole should be drilled as close to vertical as possible. Prior to beginning any drilling or sampling, ensure the rig is level by checking with a plumb bob or level. Deviation from plumb should be within 1° per 50 feet of depth.
3. As previously described, the uppermost 5 feet of each boring will be excavated via hand digging or air knifing techniques prior to any intrusive work.

4. Once the uppermost 5 feet has been cleared, the boring will be advanced, and soil samples will be collected at depth intervals in accordance with project-specific planning documents. Soil samples/cores may be collected with a variety of samplers including split spoons or a dual tube sampling system equipped with core liners.
5. For the dual tube soil core collection, both the outer and inner drill rods are advanced simultaneously. The outer rods will prevent the borehole walls from collapsing and will allow for continuous soil extraction and sampling via the inner drill rods. The process for dual tube sampling is generally described as follows:
    a. Once positioned, the initial soil core will be collected by advancing both the inner and outer drill rods the length of the core barrel (typically 4 or 5 feet).
    b. The inner drill rods can then be removed to inspect collected soil samples while the outer casing (4.5-inch outer diameter and 3.75-inch inner diameter) remains in place to stabilize the borehole walls.
6. Once the sample is retrieved, a visual description of the soil will be recorded onto a Boring Log (Attachment B.4-1). A Soil Visual Description Key applicable to the project may be used. (An example is provided in Attachment B.4-2). In accordance with project-specific planning documents, the cores may be screened with an air monitor (for example, a photoionization detector), and results will be recorded in the field notes or Boring Log. For each core segment, a representative photograph will be taken with a place card of the sample station and the date. A ruler will be visible in the photograph.
7. These steps will be repeated until target depth is reached or until refusal.
8. After description and field screening, volatile organic compound samples (if required to be collected) will be collected from the center of the soil core interval (avoiding the sidewalls) and placed into the laboratory-provided container until full (with zero headspace remaining).
9. Other samples will be collected into stainless-steel bowls and homogenized as relevant and then placed into pre-labeled containers. Only pre-cleaned stainless-steel instruments will be used to collect sample material.
10. Each sample container will be filled completely with soil, allowing minimal headspace. Samples will be stored on ice in the dark at 4°C plus or minus 2°C.
11. All material from processed cores, decontamination fluids, and used PPE will be containerized as investigation-derived waste (IDW) and disposed of according to project planning documents and associated SOPs.
12. Once borehole termination is reached, the borehole will be backfilled with bentonite chips or neat-cement grout in accordance with project planning documents.

Quality Assurance/Quality Control

It is the responsibility of the field team leader to periodically check and ensure that sediment core processing procedures are in conformance with those stated in this SOP.

Attachments

Attachment B.4-1 Required Field Logs

- Daily Log (or field log book, as dictated by project planning documents)
- Boring Log
- Utility Contact Prevention Checklist
- Field Deviation Form

Attachment B.4-2 Example Soil Visual Description Key

Attachment B.4-1
Required Field Logs

Daily Log

ANCHOR QEA

PROJECT NAME: **DATE:**

SITE ADDRESS: **PERSONNEL:**

WEATHER: **WIND FROM:**

N	NE	E	SE	S	SW	W	NW	LIGHT	MEDIUM	HEAVY

SUNNY	CLOUDY	RAIN	?

TEMPERATURE: ° F . ° C

[Circle appropriate units]

TIME	COMMENTS

Signature: _____

Log of Boring No.

PROJECT:	Log of Boring No.	
BORING LOCATION:	ELEVATION AND DATUM:	
DRILLING CONTRACTOR:	DATE STARTED:	DATE COMPLETED:
DRILLING METHOD:	TOTAL DEPTH:	MEASURING POINT:
DRILLING EQUIPMENT:	DEPTH TO FIRST WATER ATD:	DEPTH TO FREE WATER ATC:
SAMPLING METHOD:	LOGGED BY:	
BOREHOLE DIAMETER:	HAMMER TYPE/SYSTEM:	

DEPTH (feet)	SAMPLES		PID Reading (ppm)	DESCRIPTION (den., moist., color, minor, MAJOR, non-soil, odor, etc.)	FIELD-ESTIMATED %						SAMPLE ID OTHER REMARKS
					Gravel		Sand			Fines	
	Recovery	Blows/ 6 inches			Coarse	Fine	Coarse	Medium	Fine		

Project No.	ANCHOR QEA	Page 1 of __

Utility Contact Prevention Checklist

NOTE: Utility mark-out requirements vary from state to state; consult state authorities before beginning work.

Purpose: This form is intended to help the Field Lead confirm that underground or overhead utilities are identified to the extent practicable and consistent with applicable regulations **PRIOR** to site work.

INVESTIGATIONS MUST NOT OCCUR UNTIL MULTIPLE LINES OF EVIDENCE INDICATE THAT SUBSURFACE OR OVERHEAD UTILITIES ARE NOT PRESENT IN THE WORK AREA

Project Name/No: _____ **Date:** _____

Field Lead: _____ **Project Address:** _____

Project Manager: _____ **Health & Safety Officer:** _____

Emergency Contact Information for One Call: _____

Duration/Summary of Work to be Performed: _____

_____

_____

Consideration	Check		Explanation	Initial
Has the state One Call been contacted?	☐ Yes	☐ No		
Has the property owner or client been contacted for local knowledge of utilities, as applicable?	☐ Yes	☐ No		
Does the property owner or client have specific utility contact prevention procedures and, if so, have they been completed?	☐ Yes	☐ No		
Are any as-built drawings available? If so, do they show any utilities?	☐ Yes	☐ No		
Has a visual inspection of the work area(s) been completed?	☐ Yes	☐ No		
Has the potential presence of in-water utilities been assessed (shore markers, streets dead-ending at water's edge, etc.)	☐ Yes	☐ No		
Is evidence of electrical utilities present? (electric meters on structures, conduits, overhead lines, light poles, etc.)	☐ Yes	☐ No		
Is evidence of water/sewer utilities present? (water meter, hydrants, restrooms, grates in ground, etc.)	☐ Yes	☐ No		
Is evidence of telecommunications utilities present? (fiber optic warning signs, conduits from utility poles, wall-mounted boxes, etc.)	☐ Yes	☐ No		
Is other evidence of utilities present? (unknown ground markings, manholes or valve covers, "Call Before You Dig" signs, linear asphalt or concrete repair characteristics, liner subsidence of ground surface, pin flags or stakes, etc.)	☐ Yes	☐ No		

Utility Contact Prevention Checklist

NOTE: Utility mark-out requirements vary from state to state; consult state authorities before beginning work.

Consideration	Check		Explanation	Initial
Has a private locating service been contacted?	☐ Yes	☐ No		
Were any utilities identified and marked out through a private locating service? If so, duplicate mark-outs on site drawings.	☐ Yes	☐ No		
Are there any fiber optic cables, fuel lines, or high-pressure lines within 50 feet of work locations?	☐ Yes	☐ No		
If fiber optic cables, fuel lines, or high-pressure lines are within 50 feet, has an agreement with the utility owner been established?	☐ Yes	☐ No		
Can a test borehole be advanced by hand digging, probing, post-hole digging, and/or air knifing to 5 feet below ground surface (bgs)?	☐ Yes	☐ No		
If hand digging, probing, post-hole digging, and/or air knifing to 5 feet bgs is not possible, can a non-invasive geophysical investigation be conducted? If not, why?	☐ Yes	☐ No		
Other considerations:				

NOTE: Please fill in second page and attach additional reports, drawings, or other information, as necessary.

Confirmation Number: _____

Contact Name: _____ **Organization:** _____

Contact Date: _____ **Contact Time:** _____

Response: _____

_____

_____

_____

Completed by:

_____ _____ _____

Printed Name Signature Date

Contractor:

_____ _____ _____

Printed Name Signature Date

ANCHOR QEA

Field Deviation Form

Form No. _

Deviation subject:

-

Project name:

-

Standard procedure for field activity:

-

Reason for deviation:

-

Description of deviation:

-

Special equipment, materials, or personnel required:

-

Initiator's name:	Date:
Project Manager:	Date:

Attachment B.4-2
Example Soil Visual Description Key

SOIL/SEDIMENT CLASSIFICATION FIELD GUIDE

ANCHOR QEA

SOIL/SEDIMENT DESCRIPTION COMPONENTS: USCS name (USCS symbol): density/consistency, moisture, color, list gravel/silt/sand by %; additional remarks

Density of Coarse-grained (Cohesionless) Soils	
Density	***Standard Penetration (N; blows/foot)***
Very Loose	0 to 4
Loose	4 to 10
Medium Dense	10 to 30
Dense	30 to 50
Very Dense	More than 50

Consistency of Fine-grained (Cohesive) Soils			
Consistency	***Standard Penetration (N; blows/foot)***	***Unconfined Compressive Strength (tsf)***	***Manual Penetration Test***
Very Soft	0 to 2	<0.25	Thumb will penetrate soil more than 1 inch
Soft	2 to 4	0.25 to 0.5	Thumb will penetrate soil about 1 inch
Medium Stiff	4 to 8	0.5 to 1	Molded by moderate to firm finger pressure
Stiff	8 to 15	1 to 2	Readily indented by thumb, difficult to penetrate
Very Stiff	15 to 30	2 to 4	Readily indented by thumbnail
Hard	More than 30	>4	Indented with difficulty by thumbnail

Gray

Gray-brown

Olive-brown

Olive

Olive-gray

Dark brown

Red-gray

Red-brown

Brown

Red

Light brown

Tan

Yellow-brown

Red-yellow

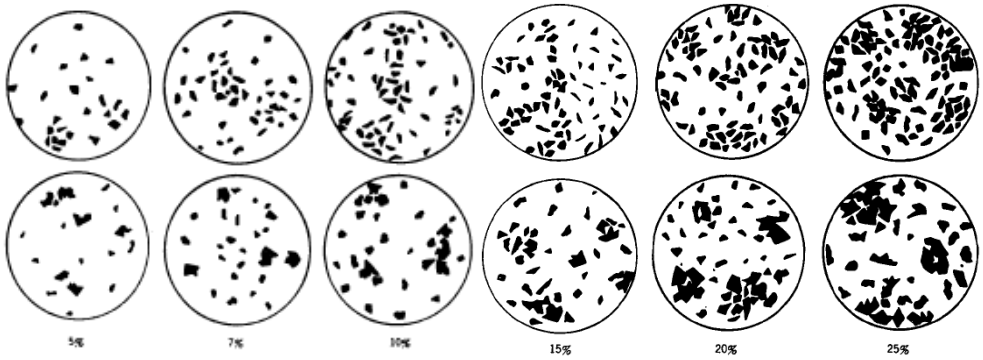
Yellow

Moisture Content	
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp, but no visible water
Wet	Visible, free water

Particle Shape/Angularity	
Description	***Criteria***
Rounded	Near-spherical or oval
Sub-rounded	Primarily rounded corners and edges
Sub-angular	Slightly rounded corners and edges
Angular	Sharp corners and edges

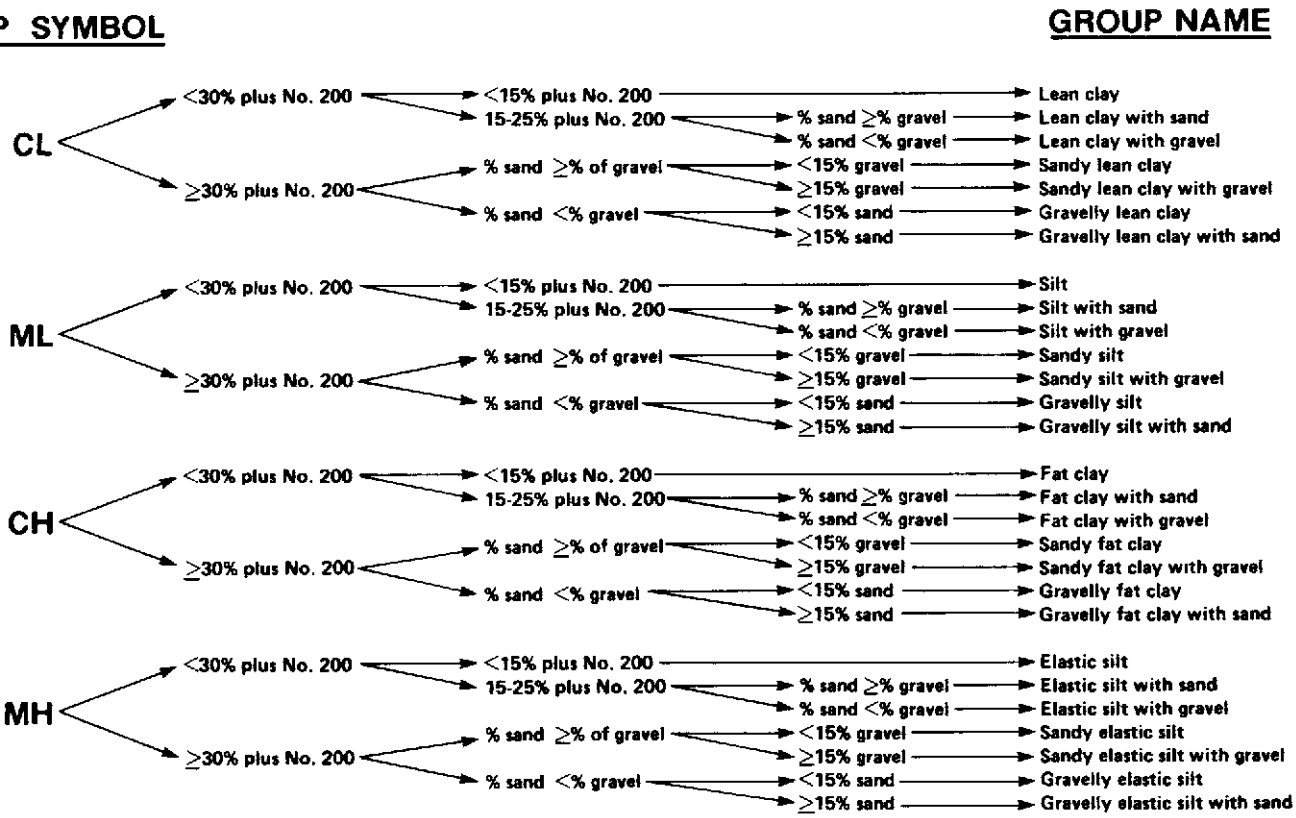
Grain Size				
Soil Component		***Anthropogenic Component***	***Size Range (U.S. Standard Sieve)***	***Approximate Size***
Boulders		Blocks	>12 inches	larger than basketball
Cobbles		Pieces	3 to 12 inches	fist to basketball
Gravel	Coarse	Fragments	3/4 to 3 inches	thumb to fist
	Fine		#4 to 3/4 inches	pea to thumb
Sand	Coarse	Particles	#10 to #4	rock salt to pea
	Medium		#40 to #10	sugar to rock salt
	Fine		#200 to #40	flour to sugar
Fine Grained	Silt	Specks	Pass #200	finer than flour
	Clay			

Charts for Estimating Percentages (After Compton, 1962)



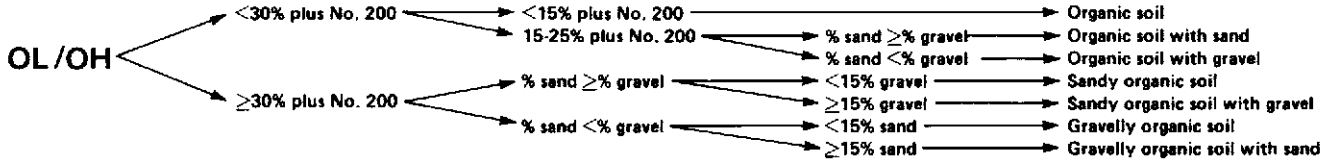
Index of Plasticity	
Description	***Criteria***
Non-plastic	A 1/8 inch (3 mm) thread cannot be rolled at any water content. Has definite structure but can easily be separated or crumbled. Is readily rinsed off sampling equipment. Breaks easily when pieces are dried.
Low Plasticity	A thread can barely be rolled.
Medium Plasticity	A thread is easily rolled. Stays together relatively well when molded (i.e., behaves like Play-Doh). Can be washed off sampling equipment easily. Requires some effort to break when pieces are dried.
High Plasticity	A threat is easily rolled, and can be rerolled several times. Can be easily molded and stays together very well, but takes effort to rinse off of sampling equipment. Difficult to break when pieces are dried.

Criteria for Describing Soil Structure	
Decomposed	Visible signs of breakdown, applicable to organic matter and rock.
Homogeneous	Same color and appearance throughout.
Interbedded	Alternating soil layers of different composition.
Lens	A very thin cohesive layer, less than .5-inch thick.
Layer	A general term for material lying essentially parallel to the surfaces against which it was formed (.5-inch to 12-inch thick).
Varved	A cyclic sedimentary couplet consisting of a coarser and a finer layer, representing variation in depositional energy.
Washed	Material missing in core tube due to loss through the bottom of sampler due to improper closing.



NOTE 1—Percentages are based on estimating amounts of fines, sand, and gravel to the nearest 5 %.

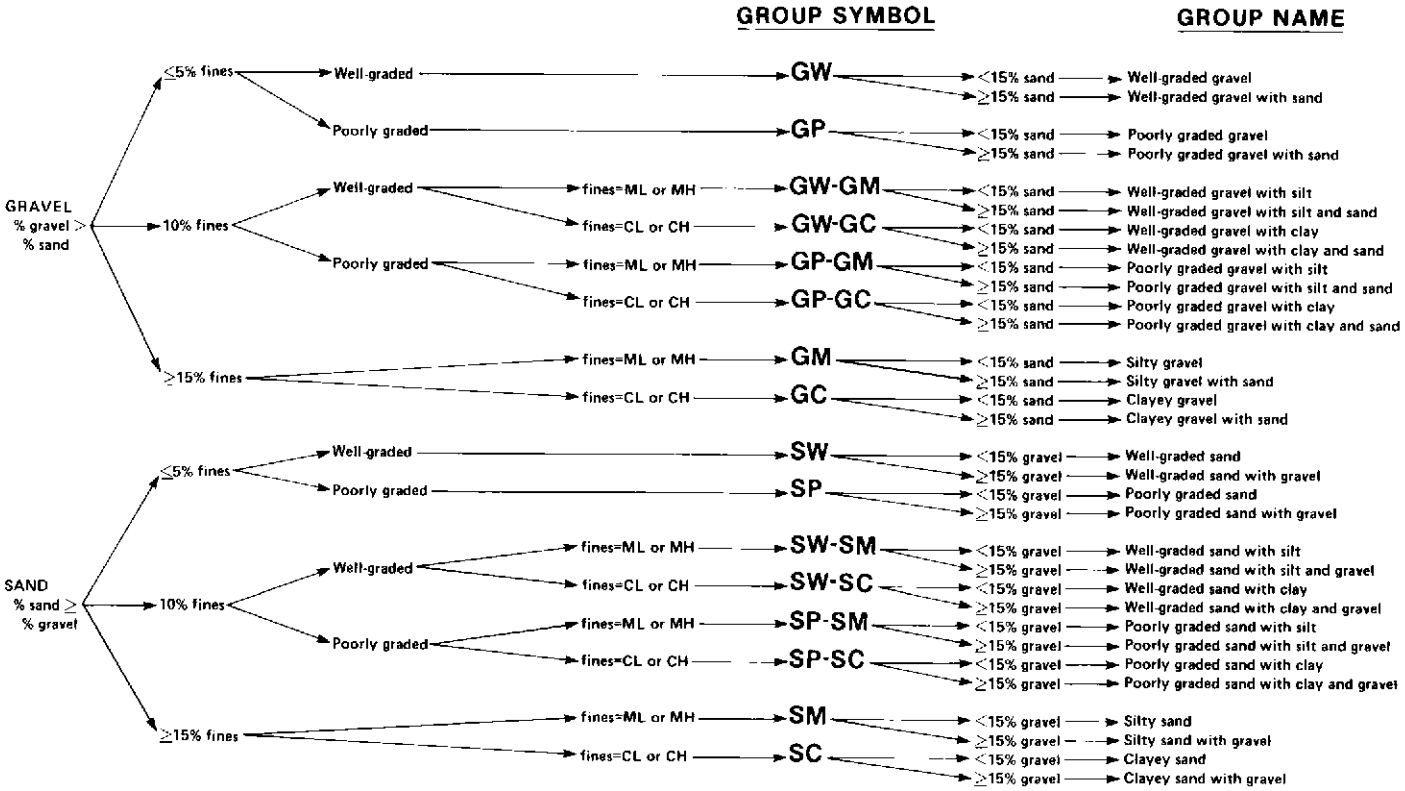
FIG. 1a Flow Chart for Identifying Inorganic Fine-Grained Soil (50 % or more fines)



NOTE 1—Percentages are based on estimating amounts of fines, sand, and gravel to the nearest 5 %.

FIG. 1 b Flow Chart for Identifying Organic Fine-Grained Soil (50 % or more fines)

SOIL/SEDIMENT CLASSIFICATION FIELD GUIDE



NOTE 1—Percentages are based on estimating amounts of fines, sand, and gravel to the nearest 5 %.

FIG. 2 Flow Chart for Identifying Coarse-Grained Soils (less than 50 % fines)

⚠ **NOTE: The following terminology is optional, and should be used with caution. Consult the Anchor QEA Project Manager prior to field use. Use caution when describing odors, sheens, and nonaqueous phase liquid (NAPL) to avoid exposure to potentially hazardous chemicals. Do not sniff the sample or bring it close to your face. If unexpected contamination is encountered, stop work, clear personnel from the area, and contact the Anchor QEA Project Manager for further instruction.**

Criteria for Describing Odors	
Relative Intensity	***Odor Types***
Trace (faint)	Petroleum-like (e.g., diesel, No. 2 fuel oil, kerosene, or gasoline)
	Hydrogen sulfide-like (H_2S-like)
Moderate (obvious)	Organic-like (e.g., septage)
	Solvent-like (e.g., alcohol)
Strong (overwhelming)	Tar-like (e.g., hot asphalt or roofing tar)

Criteria for Describing Sheens			
Relative Intensity	***Sheen Color***		***Description Components***
Trace, <25% of surface covered	Rainbow	Multicolored	1. Intensity 2. Sheen color 3. Sheen distribution (e.g., continuous, present as .5-inch spots) 4. Depth interval over which sheen is present **Distinguishing hydrocarbon-sheen from biological sheen:** If disturbed, a hydrocarbon sheen will typically coalesce, where an inorganic sheen will break apart and has a blocky appearance. Distinguish biological sheens if obvious.
Moderate, 25 to 75% of surface covered			
Heavy, >75% of surface covered	Silver or Metallic	Metallic, silver/gray-colored	

Criteria for Describing Nonaqueous Phase Liquid (NAPL) and/or Separate Phase Material (SPM)		
Relative Amounts and/or Distribution of NAPL/SPM		***Description Components***
Blebs	Describes the occurrence of discrete droplets of separate phase liquid, but for the most part, the sediment matrix does not contain NAPL. Describe the estimated size and number of blebs.	1. Relative amount of NAPL 2. Color 3. Viscosity 4. Distribution of NAPL 5. Density 6. Depth interval over with NAPL is present
Coated	NAPL present as a coating on the sediment grains; may be present in the pore space, but not as a free separate phase liquid. The degree of coating should be described as light, moderate, or heavy.	
Wetted	NAPL is present on the sediment surface and in the pore spaces. NAPL appears as a liquid on the surface of the sample when the sample is disturbed. Depending on viscosity, NAPL may freely drain from the sample.	

EGL Sequential Measurement of Hydrophobic Organic Contaminants in Sediment Porewater by Ex Situ Solid-Phase Microextraction

Scope and Application

This Environmental Geochemistry Laboratory (EGL) standard operating procedure (SOP) is applicable to the ex situ measurement of porewater concentrations of hydrophobic organic carbons (HOCs) such as polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), polychlorinated dibenzo(p)dioxins (PCDDs)/ polychlorinated dibenzofurans (PCDFs), and pesticides in sediment porewater with solid-phase microextraction (SPME). In this method, polydimethylsiloxane (PDMS)-coated glass fiber (i.e., SPME fiber) is inserted into the sediment for sufficient time to allow uptake and equilibration of target analytes in freely dissolved phase with the PDMS coating, as described by Mayer et al. (2000).

At equilibrium, the dissolved porewater concentrations (C_w) can be estimated from the measured concentration absorbed to the fiber (C_{PDMS}) and the PDMS-water partition coefficient (K_{PDMS-w}), as shown in Equation 1. PRCs are used to determine if equilibrium is achieved (Fernandez et al. 2009). Procedures outlined in this SOP will be followed, and any deviations must be noted.

Equation 1

$$C_w = \frac{C_{PDMS}}{K_{PDMS-w} \times f_e}$$

where:

C_w	=	concentration in sediment porewater (nanogram per liter [ng/L])
C_{PDMS}	=	concentration of PDMS polymer (nanogram per kilogram [ng/kg])
K_{PDMS-w}	=	PDMS-water partitioning coefficient (liter per kilogram [L/kg])
f_e	=	fraction of equilibrium (-)

Health and Safety

All laboratory work will be performed in accordance with the EGL Chemical Hygiene Plan (CHP) by staff approved by the laboratory manager and chemical hygiene officer. Approval to work in the EGL requires orientation to laboratory safety procedures and potential hazards under the guidance of the laboratory manager, as specified in the CHP. Hazards associated with project-specific samples are addressed in the Project Safety Analysis document for a project.

Hazards Associated with this Standard Operating Procedure

- Volatilization of chemicals in sediments
- Handling of flammable organic solvents,
- Handling of thin SPME fibers, which have sharp edges.

Engineering Controls

- Use an operational fume hood when handling flammable organic solvents and sediment samples that have volatile or semivolatile organic contaminants.

Administrative Controls

- Review CHP.
- Refer to the Chemical Safety Data Sheets (SDSs) section herein.
- Review project safety analysis (PSA) if additional personal protective equipment (PPE) may be required.
- Complete sodium azide training through Health and Safety prior to performing this work.

Personal Protective Equipment

- Laboratory coat
- Safety glasses
- Nitrile/neoprene gloves (Microflex 93-260)
- Fire-resistant laboratory coat (when working with flammable organic solvents and sodium azide)
- Facial shield (when working with sodium azide)

Chemical Safety Data Sheets

The following SDSs must be reviewed prior to beginning the procedure:

- Methanol
- Hexane
- Sodium azide
- Performance reference compounds (PRCs)
  * Check with analytical laboratory which PRCs need to be used not to interfere their analysis
    - PAHs
    - PCBs
    - PCDD/PCDFs

Standard Operating Procedure B.5 – EGL Sequential Measurement of Hydrophobic Organic Contaminants in Sediment Porewater by Ex Situ Solid-Phase Microextraction

Equipment and Supplies

The following is a list of equipment that may be necessary to carry out the procedures contained in this SOP; additional equipment may be required:

- PDMS-coated glass fiber (i.e., SPME fiber) (Polymicro Technologies, FSS500570)
- Heavy-duty aluminum foil
- Ceramic fiber cutter
- Ruler
- 1-liter (L) EPA pre-cleaned glass jars with polytetrafluroethylene (PTFE)-lined caps
- Sodium azide (note: review SDS prior to handling sodium azide, used only when measuring PAHs)
- Glass cylinder with PTFE cap (2-inch diameter, 20-inch length)
- Methanol (high-performance liquid chromatography [HPLC]-grade), 1 L
- Acetone (HPLC-grade), 1 L
- Hexane (HPLC-grade), 1 L
- Water (HPLC-grade), 4 L
- Properly labeled solvent squirt bottles
- Organic solvent waste container (and label)
- Laboratory shaker table
- PRCs
- 2-milliliter (mL) amber glass vials for PRC storage
- Micropipetter and tips (10 to 1,000 microliters [µL])
- Analytical balance
- Stainless-steel mesh envelope to enclose SPME fibers
- Alconox, Liquinox, or equivalent industrial detergent
- Kimwipes
- Pre-cleaned 60-mL amber glass volatile organic carbon (VOC) vials with labels
- Mylar barrier bags
- Cooler and ice

Procedure

Sediment Sampling and Preparation

1. Sediment samples are collected in the field and filled in 1-L or 2-L glass jars with PTFE-lined caps. Sediment samples should be thoroughly homogenized. It is recommended to use sufficiently large sample jars to limit variation caused by small-scale heterogeneity. Field duplicate samples are collected at a rate of 1 per 20 samples to assess field precision and SPME analysis precision. The reproducibility will be determined by calculating RPD as described below. Sediment jars are shipped on ice in coolers to the EGL.

2. Upon arrival, the sediment jars are stored in a refrigerator until further analysis. Holding time limit is 14 days for PAHs in soil and sediment samples stored at less than 4°C. The sediment jars should be stored in the dark to reduce the chance of photodegradation of target contaminants.
3. Prior to the deployment of SPME fibers, coarse particles that might potentially damage SPME fibers should be removed. This should be limited to coarse sieving (e.g., 500 microns [µm]) for removal of non-sorbing constituents like stones, because potentially any manipulation may cause changes in the sediment composition, leading to a matrix that does not fully reflect the in situ conditions.
4. A quantity of the biocide sodium azide (NaN_3) should be added to sediments to produce a concentration of 100 mg/L water to inhibit biological activity during experiments.

SPME Fiber Selection

The SPME fiber is obtained from Polymicro Technologies, Inc., in Phoenix, Arizona (part number: 1068020127, FSS500570). It consists of a 500-µm-diameter inert glass core coated with 35 µm of PDMS.

Detection Limit Calculation

The mass of PDMS polymer needed depends on the detection limit of the chosen analytical method (e.g., regular gas chromatography [GC]/electron capture detector or GC/mass spectrometry [MS] versus high-resolution GC/high-resolution MS), anticipated porewater concentrations, and the PDMS-water partition coefficients estimated (K_{PDMS-W}). The length of the SPME fiber can be determined to achieve the desired method detection limit. By default, 200 centimeter (cm) SPME fiber is deployed in a 2-L sediment jar to achieve sufficient method detection limits for target analytes with a wide range of K_{ow}. With K_{PDMS-W} and the laboratory reported detection limits for HOCs, the detection limits for water concentrations by SPME can be estimated by Equation 2.

Equation 2

$$C_{det,SPME} = \frac{n_{det}/V_{PDMS}}{K_{PDMS-w} \times f_e}$$

where:

$C_{det,SPME}$ = method detection limit by SPME (ng/L)
n_{det} = mass detected by the analytical method (ng)
V_{PDMS} = volume of PDMS in SPME fiber (L)
K_{PDMS-w} = PDMS-water partitioning coefficient (L/kg)
f_e = fraction of equilibrium (-)

SPME Fiber Preparation

Fiber Cutting and Cleaning

1. Determine the length of SPME fiber needed in each sample to achieve target detection limits using Equation 2 (see Detection Limit Calculation section).
2. Handling of fibers requires clean nitrile gloves. All work surfaces should be covered with clean, heavy-duty aluminum foil. Fiber processing should be performed in a manner that minimizes background contamination.
3. Cut the total length of fiber needed into 40-cm sections to fit into a glass cylinder:
    a. Wash the ceramic fiber cutter with water, methanol, and n-hexane.
    b. Cut the fiber by gently scratching a line on the fiber and then bending along the line.
4. Wash the glass cylinder with water, methanol, acetone, and hexane to remove background contaminants.
5. Transfer the cut fibers to the clean glass cylinder.
6. Wash the fibers with HPLC-grade hexane, methanol, and water in the following order:
    a. Fill the cylinder about one-third with hexane.
    b. Agitate for approximately 24 hours in hexane.
    c. Discard hexane in a waste container and evaporate residual hexane by opening one of the PTFE caps of the glass cylinder in a fume hood for 1 hour.
    d. Make sure hexane in the glass cylinder is completely evaporated.
    e. Fill the cylinder about one-third with methanol.
    f. Agitate for approximately 24 hours in methanol.
    g. Discard methanol in the waste container and rinse with HPLC-grade water a few times.
    h. Fill the cylinder one-third with HPLC-grade water and agitate for 24 hours to remove methanol swelled in PDMS polymer.
    i. Discard water.

7. Take out a method blank SPME and wrap with aluminum foil and store in a heat-sealed Mylar bag.
8. Just before deploying SPME fibers into sediment jars, transfer the method blank SPME in a pre-weighed VOC amber glass sample vial. The SPME fibers may need to be cut if needed to fit into the vial. The vial of the method blank SPME will be shipped to an analytical laboratory together with the PRC-spiked reproducibility standards.

Spiking Performance Reference Compounds

1. Place the cleaned SPME fibers in the glass cylinder.
2. Prepare a mixture of methanol and water (approximately 300 mL) in a glass beaker and spike PRCs in the methanol and water mixture. The mixing ratio of methanol and water need to be adjusted for different target analytes (e.g., PAHs and PCBs) to optimize PRC spiking.
3. Add the PRC spiked methanol and water mixture to the glass cylinder and mix well by gently shaking the glass cylinder. Rinse the beaker with a small volume methanol and add the rinsate to the glass cylinder. Seal the cylinder.
4. Agitate to equilibrate for 14 days on a shaker table.
5. After 14 days of agitation, transfer the PRC spiking solution to a different glass container and temporarily store the container in the solvent waste cabinet.
6. Fill the glass cylinder with HPLC-grade water and leave on a shaker table for 1 hour to remove swelled methanol from PDMS polymer.
7. Remove the fibers from the glass cylinder and blot dry with Kimwipes.
8. Cut to the desired length for deployment.
9. Collect the PRC-loaded passive sampler reproducibility standards in 60-mL amber glass vials (n = 5) and send to an analytical laboratory immediately. When collected, record the masses of the SPME samples. Fibers may be cut if needed to fit into the vial.

SPME Fiber Deployment

1. Insert PRC-spiked fibers into sediment with a gloved hand. Leave approximately 5 mm of fiber above the sediment surface to facilitate retrieval.
2. Seal the jars and place into a Mylar bag to reduce the chance of photodegradation of some target contaminants.
3. Agitate the sediment jars on a shaker table at 60 rpm for a minimum of 30 days.

SPME Fiber Retrieval

1. Withdraw the fibers from the sediment with pre-cleaned metal tweezers or with gloved hand.
2. Wipe retrieved fibers with damp Kimwipe a few times to remove attached sediment particles.
3. Using a new set of clean gloves, wipe the fibers again with dry Kimwipe and transfer to a prelabeled, pre-weighed amber glass sample vial. Fibers may be cut if needed to fit into the vial.

4. Any color changes on the surface of the fiber should be documented. In particular, surface coating of nonaqueous phase liquid (NAPL) onto the fibers can exaggerate freely dissolved concentrations. Breakage of fibers should be recorded. Any observances of color change and odor of the passive sampling material or solid support should be documented. Changes in color may be due to changes in the biogeochemistry of the sediment or the presence of NAPL, which can also be detected by odor.
5. Measure the total mass of the glass vial containing the fibers using an analytical balance and convert to the length. Seal sample vials immediately and ship to the analytical laboratory on ice.

Data Analysis

Water concentrations (C_w) are calculated as fiber concentrations (C_{PDMS}) divided by the PDMS-water partition coefficients (K_{PDMS-W}) as shown by Equation 1. Fiber concentrations are defined as the mass of contaminants absorbed by the fiber (ng) to the volume of PDMS (L). PDMS-water partition coefficients of target analytes are estimated from correlation with K_{OW} based on literature K_{PDMS-W} and K_{OW} values of PAHs, PCBs, and organochloride pesticides (Equation 3).

Equation 3

$$logK_{PDMS-W} = 0.903 \times logK_{ow} - 0.159$$

$$R^2 = 0.94$$

where:

K_{PDMS-W} = PDMS-water partitioning coefficient (L/kg)
K_{OW} = fraction of equilibrium (-)

Log K_{OW} of PAHs are taken from the U.S. Environmental Protection Agency document on sediment benchmarks for PAHs (USEPA 2003). Log coefficient (K) of PCBs are values of Hawker and Connell (1988) adjusted based on a regression with De Bruijn et al. (1989). Log K_{OW} of PCDD/PCDF are cited from Govers and Krop (1998). The database of K_{OW} and K_{PDMS} prepared by Anchor QEA is available on the Fuji database.

If equilibrium is not achieved as indicated by the PRC dissipation rate, the porewater concentrations are corrected with the fraction to equilibrium (f_e) with PRC results in conjunction with the external resistance model (Lampert et al. 2015).

Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) samples are collected during the procedure. The QA/QC samples are described as follows:

- **Replicate Samples:** Duplicate or replicate samples will be analyzed at a rate of 1 per 20 samples, or at least one duplicate per analytical batch to assess reproducibility of SPME analysis at the laboratory.
- **SPME Fiber Blank:** A SPME fiber blank will be prepared to assess any residual, analytical background contaminants introduced during fiber cleaning and cutting. For the method blank, an SPME fiber will be cut and cleaned with other SPME fibers, wrapped with aluminum foil, and stored in an airtight bag in a refrigerator at 4°C until other SPME fibers will be deployed.
- **PRC-Loaded Passive Sampler Reproducibility Standard:** Low variability of PRC concentrations in the PRC-loaded passive sampler reproducibility standards is a key step in accurately characterizing the fraction of equilibrium of target analytes. PRC-spiked SPME samples should exhibit reproducible PRC concentrations (e.g., CV less than 20% [Ghosh et al. 2014]). After spiking PRCs, five of the PRC-loaded passive sampler reproducibility standards are immediately sent to the analytical laboratory to measure the initial PRC concentrations. The CV should be less than 20% (n = 5) at EGL and reported if otherwise.
- **Field Replicate Samples:** Field replicate samples are collected as close as possible to the same point in space and time in the field to assess the variability associated with field sampling. They are collected as two separate sediment samples from the same source, stored in separate containers, and analyzed independently at the laboratory.
- **Temperature Blank:** A temperature blank will be prepared to ensure that samples are maintained at an appropriate temperature (i.e., ~4°C) during shipping to the analytical laboratory.

Depletion Calculation

The deployment of SPME fibers in a sediment will inevitably start depleting porewater concentrations of HOCs, but desorption from the sediment will replenish the aqueous pool. For accurate measurement, the ratio of PDMS polymer mass and sediment organic carbon mass in a sediment jar must be controlled to ensure negligible depletion of porewater concentration due to the chemical uptake by SPME when equilibrium is reached. As a general rule, the depletion caused by SPME deployment should be less than 1% when equilibrium is reached. Assuming that sediment organic carbon and PDMS polymer have similar partitioning characteristics, a ratio of 1:100 PDMS polymer mass to sediment organic carbon mass should reduce any depletion to an acceptable value of <1%. For more details, please refer to Ghosh et al. (2014).

Reproducibility of SPME Analysis

Method replicate samples will be analyzed at a rate of 1 per 20 samples, or at least one duplicate per analytical batch. The reproducibility is determined for duplicate samples as shown in Equation 4.

Equation 4

$$RPD = \frac{(X_1 - X_2) \times 100}{(X_1 + X_2)/2}$$

where:

RPD = relative percent difference
X_1 = larger result value
X_2 = smaller result value

SPME Fouling

Upon retrieval, any color changes in the sampler should be documented. It may be due to changes in sediment biogeochemistry, indicating the potential that the fiber may have been in contact with NAPL or have bio-fouling on the surface of the fiber. The use of PRCs may aid in addressing potential artifacts of fouling. If NAPL appears to be present in a sediment sample or on a passive sampler, it should be recorded so that the resulting porewater concentrations will be recognized as potentially affected by artifacts.

Project Closeout

Residual solutions should not enter drains until a waste determination has been performed. Laboratory personnel and project managers will coordinate to characterize and dispose of the remaining materials from the experiment if necessary. The final products can be disposed of as described in Table 1.

Table 1
Disposal of Residual Solutions and Samples

Residual Solutions	Disposal Procedure
Rinse HPLC-grade water	Water will be disposed of in the drain as long as it does not contain any solvents.
Organic solvent rinse waste (hexane, methanol)	Organic solvent rinse wastes will be stored in a waste glass container and provided to a waste contractor for hazardous waste disposal.

Residual Solutions	Disposal Procedure
Residual PRC spiking solution	The PRC spiking solution is methanol-water mixture that contains trace-level PCBs, PAHs, and/or dioxins and furans. Those trace-level chemicals are determined to be non-regulated waste materials. Residual PRC spiking solution will be stored in a waste glass container and provided to a waste contractor for hazardous waste disposal.
Unused SPME fiber	Cleaned SPME fibers will be disposed as trash after wrapping carefully in a double-bag and indicated as "glass sharp waste." PRC-spiked SPME fibers will be rinsed with methanol and disposed as trash. Rinse methanol waste will be handled in the same manner as residual PRC spiking solution (see above).
Residual sediment	If a residual sediment does not contain more than 50 milligrams per kilogram of total PCBs and other contaminants of concern (such as arsenic, lead, and mercury), it will be disposed as hazardous waste and provided to a waste contractor for hazardous waste disposal. Otherwise, a residual sediment will be disposed as non-hazardous waste after dewatering with cement. Please consult with laboratory managers for disposal in case a residual sediment contains dioxins and furans derived from a unique source or other contaminants of concern.

References

De Bruijn, J., F. Busser, W. Seinen, and J. Hermens, 1989. "Determination of Octanol/Water Partition Coefficients for Hydrophobic Organic Chemicals with the ''Slow-Stirring'' Method." *Environmental Science and Technology* 8:499–512.

Fernandez, L.A., C.F. Harvey, and P.M. Gschwend, 2009. "Using Performance Reference Compounds in Polyethylene Passive Samplers to Deduce Sediment Porewater Concentrations for Numerous Target Chemicals." *Environmental Science and Technology* 43:8888–8894.

Ghosh U., S.K. Driscoll. R.M. Burgess, M.T.O Jonker, D. Reible, F. Gobas, Y. Choi, S.E. Apitz, K.A. Maruya, W.R. Gola, M. Mortimer, and C. Beegan, 2014. "Passive Sampling Methods for Contaminated Sediments: Practical Guidance for Selection, Calibration, and Implementation." *Integrated Environmental Assessment and Management* 10:210–223.

Govers, H.A.J., and H.B. Krop, 1998. "Partition Constants of Chlorinated Dibenzofurans and Dibenzo-p-dioxins." *Chemosphere* 37:2139–2152.

Hawker, D.W., and D.W. Connell, 1988. "Octanol-Water Partition Coefficients of Polychlorinated Biphenyl Congeners." *Environmental Science and Technology* 22:382–387.

Lampert, D.J., C. Thomas, and D.D. Reible, 2015. "Internal and External Transport Significance for Predicting Contaminant Transport Rates in Passive Samplers." *Chemosphere* 119:910–916.

Mayer, P., W.H.J. Vaes, F. Wijnker, K.C.H.M. Legierse, R.H. Kraaij, J. Tolls, and J.L.M. Hermens, 2000. "Sensing Dissolved Sediment Porewater Concentrations of Persistent and Bioaccumulative Pollutants Using Disposable Solid-Phase Microextraction Fibers." *Environmental Science and Technology* 34(24):5177–5183.

USEPA (U.S. Environmental Protection Agency), 2003. *Procedures for the Derivation of Equilibrium Partitioning Sediment Benchmarks (ESBs) for the Protection of Benthic Organisms: PAH Mixtures.* USEPA Office of Research and Development. EPA-600-R-013. November 2003.

Appendix B
Quality Assurance Project Plan

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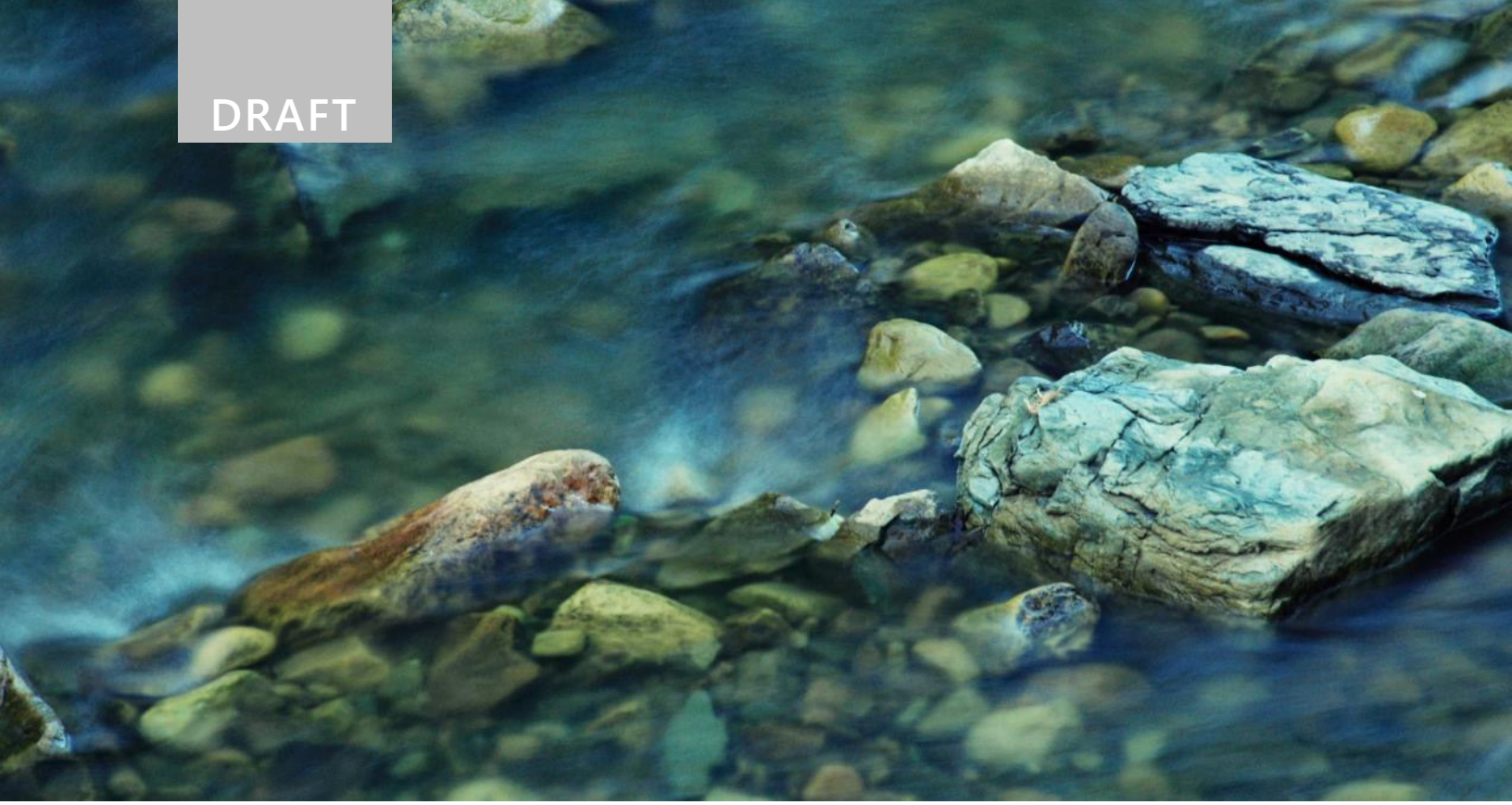

January 2024
Jeld Wen Site, Everett

ANCHOR QEA

Step 2 Pre-Remedial Design Investigation Quality Assurance Project Plan – Marine Areas of Jeld Wen Site

Prepared for JELD-WEN, Inc., and Washington State Department of Ecology

DRAFT

January 2024
Jeld Wen Site, Everett

Step 2 Pre-Remedial Design Investigation Quality Assurance Project Plan – Marine Areas of Jeld Wen Site

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TABLES

ABBREVIATIONS

ARL	Analytical Resources, LLC
ASTM	ASTM International
CAP	*Final Cleanup Action Plan, Jeld Wen Site*
COC	chain of custody
cPAH	carcinogenic polycyclic aromatic hydrocarbon
DQO	data quality objectives
Ecology	Washington State Department of Ecology
EDL	estimated detection limit
EPA	U.S. Environmental Protection Agency
MD	matrix duplicate
MDL	method detection limit
MS	matrix spike
MSD	matrix spike duplicate
PCB	polychlorinated biphenyl
PRC	performance reference compounds
PRDI	Pre-Remedial Design Investigation
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RL	reporting limit
RPD	relative percent difference
SAP	*Step 2 Pre-Remedial Design Investigation Sampling and Analysis Plan Marine Areas of Jeld Wen Site*
SGS	SGS North America, Inc.
Site	Jeld Wen Site
SPME	solid-phase microextraction
TEQ	toxicity equivalent
TEF	toxicity equivalent factor
WP	Work Plan

1 Introduction

This Quality Assurance Project Plan (QAPP) describes procedures for the laboratory analysis of surface sediments and data under the Step 2 Pre-Remedial Design (PRDI) Work Plan (WP). JELD-WEN, Inc., is implementing this work under the Second Amendment to Agreed Order Number DE 5095 entered in January 2008 between JELD-WEN and the Washington State Department of Ecology (Ecology) and the *Final Cleanup Action Plan, Jeld Wen Site* (CAP; Ecology 2023) for a portion of the Jeld Wen Site (Site) located in Everett, Washington. Specifically, this QAPP (Appendix B to the Step 2 PRDI WP) is for the marine areas depicted in Figure 1 of the Step 2 PRDI WP.

As discussed in the CAP (Ecology 2023), remedial design will begin with development of a PRDI WP and subsequent data analysis to inform future design documents. The purpose of the additional data collection conducted as part of the Step 2 PRDI WP and this QAPP is to address specific remaining data gaps needed to complete remedial design of the cleanup action for the marine areas of the Site. In accordance with the Step 2 PRDI WP, wood volume measurement sediment samples, surface and subsurface sediment samples, geotechnical shoreline soil samples, and ex situ sediment porewater samples will be collected and sieved for wood volume sieving measurement or analyzed for dioxin/furans, total polychlorinated biphenyls, carcinogenic polycyclic aromatic hydrocarbons, and wood waste via total volatile solids. Work will be conducted in accordance with the Model Toxics Control Cleanup Act and Sediment Management Standards administered by Ecology under Chapter 173-340 and 173-204, respectively, of the Washington Administrative Code.

1.1 Purpose and Objectives

The purpose of this QAPP is to provide confidence in the analytical results through a system of quality assurance (QA)/quality control (QC) performance checks with respect to sample collection methods, laboratory analyses, data reporting, and corrective action procedures to achieve compliance with established performance and data quality criteria. The QA/QC procedures are to ensure that the data derived from this investigation are defensible and usable for their intended purpose.

The analytical methods and QA procedures described here will be followed by JELD-WEN and its contractors during sample collection activities described in the Step 2 PRDI WP and the associated *Step 2 Pre-Remedial Design Investigation Sampling and Analysis Plan Marine Areas of Jeld Wen Site* (SAP; Appendix A to the PRDI WP). The objective of this QAPP is to ensure that data of sufficiently high quality are generated to support the project data quality objectives (DQOs).

2 Project Management

This section identifies key project personnel, identifies the studies to be performed, and outlines project DQOs and criteria.

2.1 Project Organization

Responsibilities of the team members, as well as laboratory project managers, are described in the following subsections. The pre-remedial design investigation (PRDI) being undertaken by JELD-WEN, as described in this QAPP and the associated SAP, was developed to support remedial design by filling the data gaps presented in the Step 2 PRDI WP.

2.1.1 Project Planning and Coordination

Frank Winslow of Ecology will serve as the government project manager and will conduct the overall project coordination, review reports, and coordinate with JELD-WEN and Anchor QEA. Jason Cornetta will serve as the Anchor QEA task and field manager and is responsible for executing the SAP by overseeing the collection and analysis of field samples and reporting the analytical results to Ecology. Lexus Sullivan and Nina Maas of Anchor QEA will serve as the field leads and are responsible for executing the SAP by overseeing the field sampling effort in terms of logistics, personnel, and field operations.

2.1.2 Field Sample Collection

The sampling will be completed by Anchor QEA and its subconsultants as described in the Step 2 PRDI WP and SAP. Subconsultants will follow the QA/QC and analytical protocols established in this QAPP.

2.1.3 Quality Assurance/Quality Control Management

Jennifer Marsalla of Anchor QEA will serve as the project chemist, QA manager, and laboratory coordinator. She is responsible for subcontracting the state-certified laboratory, ensuring observation of established protocols for sample processing, decontamination, sample preservation, holding times, chain-of-custody (COC) documentation, and data management. She will provide QA oversight of the field sampling, analytical, and data validation programs, ensuring that the chemistry data are valid and usable for their intended purpose and that all sample processing and analytical procedures meet the QC requirements identified in the QAPP.

2.1.4 Laboratory Project Managers

The laboratory project managers for the physical and chemical testing will oversee laboratory operations associated with the receipt of the environmental samples, chemical/physical analyses, and laboratory report and electronic deliverables preparation for this project. They will review the

laboratory reports and prepare case narratives describing any anomalies and exceptions that occurred during sample preparation and analyses. They will also notify the project QA manager of any QA/QC problems when they are identified to allow for quick resolution. Sediment samples collected by Anchor QEA for chemical analyses will be analyzed by Analytical Resources, LLC. (ARL), located in Tukwila, Washington. ARL is accredited by Ecology. Solid-phase microextraction (SPME) samples will be prepared at Anchor QEA's Environmental Geochemical Laboratory in Portland, Oregon, and submitted to SGS North America, Inc. (SGS), in Wilmington, North Carolina. All chemical testing will adhere to SW-846 QA/QC procedures and analysis protocols (EPA 1999) or follow the appropriate ASTM International (ASTM) or Standard Method protocols. The most current analytical methods available may be used so long as Ecology accreditation is maintained. Sue Dunihoo will serve as the laboratory project manager at ARL. Amy Boehm will serve as the laboratory project manager at SGS. The data validation project manager will be Stella Cuenco of Laboratory Data Consultants, Inc., who will serve as the primary contact and perform all applicable data validation.

2.2 Problem Definition and Background

The Step 2 PRDI WP describes the investigations that will be performed as part of the PRDI at the Site. A detailed project overview, site description, project figures, and supporting field sampling details are provided in the Step 2 PRDI WP and the SAP. See Step 2 PRDI WP Section 3 for the PRDI sampling scope of work and remedial design data gaps addressed by the PRDI. Sampling methods and details of sample locations and depths are included in Section 3.2 of the Step 2 PRDI WP and SAP Table 1. The sampling event is being implemented to collect additional site-specific data necessary to fill data gaps described in Section 3.3 of the Step 2 PRDI WP.

2.3 Data Quality Objectives and Criteria

The DQOs for this project are to develop and implement procedures that will ensure the collection of representative data of known, acceptable, and defensible quality to achieve the project objectives described in the Step 2 PRDI WP and SAP. The quality of the laboratory data is assessed by precision, accuracy, representativeness, comparability, completeness, and sensitivity (see Section 3.1).

3 Data Generation and Acquisition

Data generation and acquisition begins with the development of the rationale for locating and selecting environmental samples for analysis and ends with the generation and reporting of analytical data for those samples by the analytical laboratories.

3.1 Sampling Design

The sampling design, including the rationale for locating and selecting environmental samples for analyses, is detailed in the SAP.

3.2 Sampling Methods and Handling Requirements

Sample collection procedures are described in detail in the SAP. Sampling procedures are generally consistent with U.S. Environmental Protection Agency (EPA) protocols or other approved sample collection standards. Guidelines for sample handling and storage are presented in Table 1.

3.3 Analytical Methods

Analytical methods for chemical and physical analyses are listed in Table 2, corresponding to the surface sediment sample collection and analytical program described in the SAP.

In completing analyses for this project, the laboratories are expected to meet the following minimum requirements:

- Adhere to the methods outlined in this QAPP, including methods referenced for each analytical procedure.
- Follow documentation, custody, and sample tracking procedures.
- Notify the project QA manager of any QA/QC problems when they are identified.
- Provide a detailed discussion of any modifications made to approved analytical methods.
- Deliver Adobe PDF and electronic data as specified.
- Meet reporting requirements for deliverables.
- Meet turnaround times for deliverables.
- Implement QA/QC procedures, including the DQOs, laboratory QA requirements, and performance evaluation testing requirements.
- Allow laboratory and data audits to be performed, if deemed necessary.

Analytical methods, and target reporting limits (RLs) for sediment samples are presented in Table 2. Table 3 presents the field and laboratory QA/QC sample frequency requirements (e.g., field duplicates, matrix spikes [MSs], and laboratory control samples).

3.4 Measurements of Data Quality

The overall DQO for field sampling and laboratory analysis is to produce data of known and appropriate quality to support the project objectives. DQOs for the project are provided in Table 4. The quality of laboratory data is assessed by precision, accuracy, representativeness, comparability, completeness, and sensitivity. The definitions for the data quality indicators are discussed in the following sections.

3.4.1 Precision

Precision is the ability of an analytical method or instrument to reproduce its own measurement. It is a measure of the variability, or random error, in sampling, sample handling, and laboratory analysis. ASTM recognizes two levels of precision: repeatability—the random error associated with measurements made by a single test operator on identical aliquots of test material in a given laboratory, with the same apparatus, under constant operating conditions; and reproducibility—the random error associated with measurements made by different test operators, in different laboratories, using the same method but different equipment to analyze identical samples of test material (ASTM 2002).

In the laboratory, "within-batch" precision is measured using replicate sample or QC analyses and is expressed as the relative percent difference (RPD) between the measurements. The "batch-to-batch" precision is determined from the variance observed in the analysis of standard solutions or laboratory control samples from multiple analytical batches.

Field precision will be evaluated by the collection of blind field duplicates for chemistry samples at a frequency of 1 in 20 samples. Field chemistry duplicate precision will be screened against an RPD of 50% for sediment samples; however, no data will be qualified based solely on field duplicate precision.

Precision measurements can be affected by the nearness of a chemical concentration to the method detection limit (MDL), where the percent error (expressed as RPD) increases. The equation used to express precision is as follows (Equation 1):

Equation 1

$$\text{RPD} = \frac{(C1 - C2)\ x\ 100\%}{(C1 + C2)/2}$$

where:

RPD	=	relative percent difference
C1	=	larger of two values
C2	=	smaller of two values

3.4.2 Accuracy

Accuracy is a measure of the closeness of an individual measurement (or an average of multiple measurements) to the true or expected value. Accuracy is determined by calculating the mean value of results from ongoing analyses of laboratory control samples, standard reference materials, and standard solutions. In addition, spiked project samples are also measured; this indicates the accuracy or bias in the actual sample matrix. Accuracy is expressed as percent recovery of the measured value, relative to the true or expected value. If a measurement process produces results for which the mean is not the true or expected value, the process is said to be biased. Bias is the systematic error either inherent in a method of analysis (e.g., extraction efficiencies) or caused by an artifact of the measurement system (e.g., contamination). Analytical laboratories use several QC measures to eliminate analytical bias, including systematic analysis of method blanks, laboratory control samples, and independent calibration verification standards. Because bias can be positive or negative, and because several types of bias can occur simultaneously, only the net, or total, bias can be evaluated in a measurement.

Laboratory accuracy will be evaluated against quantitative laboratory control sample and MS recovery (where applicable) performance criteria outlined in Table 4. Surrogate spike recoveries will be evaluated against laboratory control limits, and internal standard recoveries will be evaluated against method criteria. Accuracy can be expressed as a percentage of the true or reference value or as a percentage of the spiked concentration. The equation used to express accuracy is as follows (Equation 2):

Equation 2

$$\%R = \frac{100\% \; x \; (S - U)}{Csa}$$

where:
%R = percent recovery
S = measured concentration of spiked aliquot
U = measured concentration of unspiked aliquot
Csa = actual concentration of spike added

Field accuracy will be controlled by adherence to sample collection procedures outlined in the SAP.

3.4.3 Representativeness

Representativeness expresses the degree to which data accurately and precisely represent an environmental condition. For the sampling program, the list of analytes has been identified to provide a comprehensive assessment of the known and potential contaminants at the Site.

3.4.4 Comparability

Comparability expresses the confidence with which one dataset can be evaluated in relation to another dataset. For this program, comparability of data will be established through the use of standard analytical methodologies, reporting formats, and the use of common traceable calibration standards and reference materials.

3.4.5 Completeness

Completeness is a measure of the amount of data that is determined to be valid in proportion to the amount of data collected. Completeness will be calculated as follows (Equation 3):

Equation 3

$$C = \frac{\text{(Number of acceptable data points) x 100}}{\text{(Total number of data points)}}$$

where:
C = Completeness (%)

The DQO for completeness for all components of this project is 95%. Data that have been qualified as estimated because the QC criteria were not met will be considered valid for the purpose of assessing completeness. Data that have been qualified as rejected will not be considered valid for the purpose of assessing completeness.

3.4.6 Sensitivity

Sensitivity is measured by the achievable laboratory detection and RLs. The MDL is defined as the minimum concentration at which a given target analyte can be measured and reported with 99% confidence that the analyte concentration is greater than zero. Laboratory RLs are defined as the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions. The estimated detection limit (EDL) is defined as the sample and analyte-specific detection limit achievable at the time of analysis.

The sample-specific EDL, MDL, and RL will be reported by the laboratory and will take into account any factors relating to the sample analysis that might decrease or increase the RL (e.g., dilution factor, percent moisture, or sample mass). In the event that the MDL and RL are elevated for a sample due to matrix interferences and subsequent dilution or reduction in the sample aliquot, the data will be evaluated by Anchor QEA and the laboratory to determine if an alternative course of action is required or possible. If this situation cannot be resolved readily (i.e., RLs less than criteria are achieved), Ecology will be contacted to discuss an acceptable resolution.

3.5 Laboratory Quality Control

Laboratory QC procedures, where applicable, include initial and continuing instrument calibrations, standard reference materials, laboratory control samples, matrix replicates, MSs, surrogate spikes (for organic analyses), and method blanks. Table 3 lists the frequency of analysis for laboratory QA/QC samples, and Table 4 summarizes the DQOs for precision, accuracy, and completeness.

Method blank results must be less than the reporting limit of each target analyte. If a laboratory method blank exceeds this criterion for any analyte, and the analyte is detected in any of the samples and is less than five times the concentration found in the blank (10 times for common contaminants), analyses must stop, and the source of contamination must be eliminated or reduced.

Results of the QC samples from each analytical batch will be reviewed by the analyst immediately after a sample group has been analyzed. The QC sample results will then be evaluated to determine if control limits have been exceeded. If control limits are exceeded in the sample group, the QA/QC manager may be contacted to determine if corrective action is required. Corrective action may include repreparation and/or reanalysis of affected samples or possible method modifications if the concern is determined to be due to method failure.

Performance reference compounds (PRCs) will be added to each SPME sample prior to deployment. The PRCs will be several deuterated congener compounds that will be quantified in the polychlorinated biphenyl (PCB) congener and dioxin/furan analysis to assist in the determination of equilibrium and ambient water concentrations. Between one and three representative PCB and dioxin PRC compounds will be used. PRCs may be deuterated compounds or PCBs and dioxins not expected to be present in the environment.

All chemistry analyses will be performed by an Ecology-accredited laboratory. In the event that the analytical laboratory identified in Section 2.1.4 cannot perform a particular method, Ecology will be consulted to identify an appropriate alternative.

3.6 Field Quality Control

Anchor QEA personnel will identify and label samples in a consistent manner to ensure that field samples are traceable and labels provide the information necessary for the laboratory to properly conduct the required analyses. Samples will be placed in appropriate containers and preserved for shipment to the laboratory. The analytical laboratories will provide certified pre-cleaned sample containers (Table 1). The laboratories will maintain documentation certifying the cleanliness of bottles and the purity of preservatives provided.

Field QA will consist of following procedures for acceptable practices for collection and handling of samples. Adherence to these procedures will be complemented by periodic and routine equipment inspection. Field QA samples will be collected along with the environmental samples. Field QA samples are useful in identifying possible problems resulting from sample collection or sample processing in the field. The collection of field QA samples includes equipment rinsate blanks, field blanks, and field duplicates as specified in Table 3. Adequacy of decontamination procedures will be evaluated by rinsate blank chemistry results. Results will be compared to associated samples, and the project QA manager's best professional judgment will be used to evaluate whether decontamination procedures should be modified.

Field duplicate samples will be collected at a frequency of one per sampling event or 1 in 20 samples collected, whichever is more frequent.

Field QA samples will also include the collection of additional sample volume or mass to ensure that the laboratory has a sufficient sample amount to analyze the method and program-required analytical QA/QC (matrix duplicate [MD]/MS/matrix spike duplicate [MSD]) samples as specified in Table 3. Additional sample volume or mass to meet this requirement will be collected at a frequency of one per sampling event or 1 in 20 samples processed, whichever is more frequent. The sample collection team will confirm with the laboratory the appropriate extra volume or mass required for these analyses. The samples designated for MD/MS/MSD analyses should be clearly marked on the COC form.

Field QA samples will be documented on the field forms or in a log book and verified by the project QA manager or designee. Procedures for collecting field duplicates, field blanks, and rinse blanks are included in Sections 3.7.1 and 3.7.2 of the SAP.

4 Data Validation and Usability

Data generated in the field and at the laboratories will be verified and validated according to methods and procedures described in this section.

4.1.1 Data Review, Validation, and Verification

The process will be repeated for each analytical data package. During the validation process, analytical data will be evaluated for QAPP, method, and laboratory QC compliance, and their validity and applicability for program purposes will be determined. Based on the findings of the validation process, data validation qualifiers may be assigned. The validated project data, including qualifiers, will be entered into the project database, thus enabling this information to be retained or retrieved, as needed.

4.1.2 Validation and Verification Methods

Field and laboratory data for this task will undergo a formal verification and validation process. All entries into the database will be verified. All errors found during the verification of field data, laboratory data, and the database will be corrected prior to release of the final data. Data verification includes a review for completeness and accuracy by the field coordinator and laboratory manager; review by the data manager for outliers and omissions; and the use of performance criteria to identify laboratory QC sample outliers. Data verification will be conducted manually by Anchor QEA staff or by an external validator.

For this program, analytical data will undergo a Stage 2B data validation (EPA 2009) conducted following national functional guidelines for data validation (EPA 2020a, 2020b, 2020c), this QAPP, and professional judgment. Initially, 10% of the dioxin/furan and PCB congener data of each analytical data package will undergo a Stage 4 validation. If the QA manager determines significant issues are identified during validation, remaining data will undergo Stage 4 validation for these parameters or as discussed with Ecology. If there are no issues identified during initial 10% validation, the remaining 90% will undergo a Stage 2B data validation. Data will be reviewed at a minimum with regard to the following, as appropriate to the particular analysis:

- Completeness
- Holding times
- Method RLs, MDLs, and EDLs
- Laboratory control samples
- MSs/MSDs/MDs
- Standard reference materials
- Internal standard area counts
- Surrogate recoveries

- Column confirmation results
- Method, rinsate, and field blanks
- Initial calibration data
- Continuing calibration data
- Instrument performance checks

A data validation report will be generated to document any issues with data quality, and any qualifications applied to data and this report will be peer reviewed prior to finalization. All validated data will be entered into the database established for this program, and a final data file will be exported. Verification of the database export against the PDF data report will be performed by the QA manager or designee. Any errors found in the data file export will be corrected in the database and reviewed for systemic reporting errors.

4.1.3 Reconciliation with User Requirements

The QA manager will review data at the completion of the task to determine if DQOs have been met. If data do not meet the project's specifications, the QA manager will review the errors and determine if the problem is due to calibration/maintenance, sampling techniques, or other factors and will suggest corrective action, if appropriate. The problem will be corrected by retraining, revising techniques, or replacing supplies/equipment if possible; if not, the DQOs will be reviewed for feasibility. If specific DQOs are not achievable, the QA manager will recommend appropriate modifications. If matrix interference is suspected to be the cause of the exceedance, adequate laboratory documentation must be presented to demonstrate that instrument performance or laboratory technique did not bias the result. In cases where the DQOs have been exceeded and corrective actions did not resolve the outlier, data will be qualified per EPA national functional guidelines (EPA 2020a, 2020b, 2020c). In these instances, the usability of data will be determined by the extent of the exceedance. Rejected data will be assigned an "R" qualifier and will not be used for any purposes.

5 Data Analysis, Recordkeeping, and Reporting Requirements

This section describes the data analysis, recordkeeping, and data reporting elements of the QAPP.

5.1 Analysis of Chemistry Data

The chemical results will be processed using the data management rules presented in Section 3. Dioxin/furan and carcinogenic polycyclic aromatic hydrocarbon (cPAH) toxicity equivalence (TEQ) will be calculated by multiplying the sample concentrations by their respective Toxic Equivalent Factor (TEF) values and summing the results (Cal-EPA 2005). Results below detection will be included in the summation by multiplying the TEF by one-half the MDL for total cPAH TEQ or one-half the EDL for total dioxin/furan TEQ and total PCB congener TEQ.

5.2 Recordkeeping and Data Report

This project will require central project files to be maintained at Anchor QEA for a minimum of 10 years. Project records will be stored and maintained in a secure manner. Electronic data will be maintained in the Anchor QEA central database and backed up regularly as part of routine file maintenance. At the conclusion of the data acquisition and validation, all records, including field records, laboratory data reports, data validation reports, and other relevant documentation, will be provided to Ecology in a data report. The data report will include the following:

- A description of field events
- Deviations from sample, analysis, and validation described in this QAPP
- Field and laboratory records, including laboratory COC forms
- Chemical and physical testing results, sampling depth, and final data qualifiers
- A summary of the sampling results relative to pre-construction results
- A summary of data quality and usability
- Laboratory reports

When the testing results are validated and finalized, they will be loaded into Ecology's Environmental Information Management database under study ID AODE5095.

6 References

Cal-EPA (California Environmental Protection Agency), 2005. Technical Support Document for Describing Available Cancer Potency Factors. May 2005.

Ecology (Washington State Department of Ecology), 2023. *Final Cleanup Action Plan, Jeld Wen Site*. Exhibit F to the Second Amendment to the Agreed Order No. 5095. August 2023.

EPA (U.S. Environmental Protection Agency), 1999. USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review. U.S. Environmental Protection.

EPA, 2009. Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use. EPA-540-R08-005. January 2009.

EPA, 2020a. National Functional Guidelines for Superfund Organic Methods Data Review. Office of Superfund Remediation and Technology Innovation. EPA-540-R-20-005. November 2020.

EPA, 2020b. National Functional Guidelines for Inorganic Superfund Methods Data Review. Office of Superfund Remediation and Technology Innovation. EPA-542-R-20-006. November 2020.

EPA 2020c. National Functional Guidelines for High Resolution Superfund Methods Data Review. Office of Superfund Remediation and Technology Innovation. EPA 542-R-20-007. November 2020.

Tables

Table 1
Guidelines for Sample Handling and Storage

Parameter	Container Size and Type[1]	Holding Time	Sample Preservation Technique
Sediment Samples			
cPAHs	8-oz glass amber jar	14 days until extraction; 40 days post extraction; 1 year until extraction	Cool 0°C–6°C, Freeze -18°C
PCB Aroclors		None for extraction[2]; 40 days post extraction	Cool 0°C–6°C, Freeze -18°C
Dioxin/furans		1 year until extraction; 1 year after extraction	Cool 0°C–6°C, Freeze -18°C
Geotechnical Soil Samples			
Moisture Content	1-gallon in zip-top bags	None	None
Specific Gravity			
Atterberg Limits			
Grain Size			
1D Consolidation	Largest practicable undisturbed sample in Shelby Tube	None	None
Bulk Density			
Constrained Undrained Triaxial Strength			
Water Samples			
cPAHs	500 mL amber glass bottle (2x)	7 days to extraction; 40 days to analysis	Cool <6°C
PCB Aroclors	1 L amber glass bottle (2x)	None[2]	Cool <6°C
Dioxin/furans	1 L amber glass bottle (2x)	1 year until extraction; 40 days to analysis	Cool <6°C
SPME			
PCB congeners	40 mL VOA vial	1 year until extraction; 1 year after extraction	Cool 0°C–6°C
Dioxin/furans	40 mL VOA vial	1 year until extraction; 1 year after extraction	Cool 0°C–6°C

Notes:

1. Container size, type, and sample size required may change based on program and laboratory guidance.
2. Per Chapter 2 of EPA SW-846 (EPA 2007) there is no pre-extraction holding time for PCBs.

cPAH: carcinogenic polycyclic aromatic hydrocarbon
EPA: U.S. Environmental Protection Agency
mL: milliliter
L: liter
oz: ounce
PCB: polychlorinated biphenyl
SPME: solid-phase microextraction
VOA: volatile organic analysis

Table 2

Sediment Analyte List, Analytical Methods, and Target Reporting Limits

Parameter	Recommended Analytical Method	MDL/EDL[4]	Reporting Limit	Minimum Requirement
Sediments/Soils				
Conventionals and Physical Tests				
Total solids (%)	SM 2540 B	--	0.01	--
cPAHs (µg/kg dw)				
2-Methylnaphthalene	EPA 8270E-SIM	1.1	5	--
Acenaphthene	EPA 8270E-SIM	0.571	5	--
Acenaphthylene	EPA 8270E-SIM	1.08	5	--
Anthracene	EPA 8270E-SIM	0.871	5	--
Benzo(a)pyrene	EPA 8270E-SIM	0.614	5	--
Benzo(a)anthracene	EPA 8270E-SIM	0.824	5	--
Benzo(b)fluoranthene	EPA 8270E-SIM	1.37	5	--
Benzo(g,h,i)perylene	EPA 8270E-SIM	1.06	5	--
Benzo(k)fluoranthene	EPA 8270E-SIM	0.76	5	--
Benzo(j)fluoranthene	EPA 8270E-SIM	0.68	5	--
Chrysene	EPA 8270E-SIM	1.05	5	--
Dibenzo(a,h)anthracene	EPA 8270E-SIM	0.891	5	--
Fluoranthene	EPA 8270E-SIM	0.47	5	--
Fluorene	EPA 8270E-SIM	0.631	5	--
Indeno(1,2,3-c,d)pyrene	EPA 8270E-SIM	1.05	5	--
Naphthalene	EPA 8270E-SIM	1.28	5	--
Phenanthrene	EPA 8270E-SIM	0.718	5	--
Pyrene	EPA 8270E-SIM	0.626	5	--
Total cPAH TEQ (U = 1/2 MDL)	EPA 8270E-SIM		--	21 [2]
PCB Aroclors (µg/kg dw)				
Aroclor 1016	EPA 8082A	1.56	4	--
Aroclor 1221	EPA 8082A	1.56	4	--
Aroclor 1232	EPA 8082A	1.56	4	--
Aroclor 1242	EPA 8082A	1.56	4	--
Aroclor 1248	EPA 8082A	1.56	4	--
Aroclor 1254	EPA 8082A	1.56	4	--
Aroclor 1260	EPA 8082A	0.589	4	--
Total PCB Aroclors (U = 0)			--	30 [2]
Dioxin/Furans (ng/kg dw)				
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	EPA 1613B	0.15	1.0	--
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	EPA 1613B	0.17	1.0	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	EPA 1613B	0.17	1.0	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	EPA 1613B	0.18	1.0	--
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	EPA 1613B	0.22	1.0	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	EPA 1613B	0.56	2.5	--
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	EPA 1613B	4.6	10	--

Table 2

Sediment Analyte List, Analytical Methods, and Target Reporting Limits

Parameter	Recommended Analytical Method	MDL/EDL[4]	Reporting Limit	Minimum Requirement
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	EPA 1613B	0.058	1.0	--
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	EPA 1613B	0.24	1.0	--
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	EPA 1613B	0.22	1.0	--
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	EPA 1613B	0.28	1.0	--
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	EPA 1613B	0.2	1.0	--
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	EPA 1613B	0.19	1.0	--
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	EPA 1613B	0.17	1.0	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	EPA 1613B	0.21	1.0	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	EPA 1613B	0.24	1.0	--
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	EPA 1613B	1.1	2.5	--
Total Tetrachlorodibenzo-p-dioxin (TCDD)	EPA 1613B	--	1	--
Total Pentachlorodibenzo-p-dioxin (PeCDD)	EPA 1613B	--	1	--
Total Hexachlorodibenzo-p-dioxin (HxCDD)	EPA 1613B	--	1	--
Total Heptachlorodibenzo-p-dioxin (HpCDD)	EPA 1613B	--	1	--
Total Tetrachlorodibenzofuran (TCDF)	EPA 1613B	--	1	--
Total Pentachlorodibenzofuran (PeCDF)	EPA 1613B	--	1	--
Total Hexachlorodibenzofuran (HxCDF)	EPA 1613B	--	1	--
Total Heptachlorodibenzofuran (HpCDF)	EPA 1613B	--	1	--
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2 EDL)				5 [2]
SPME				
Dioxin/Furans (pg)				
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	EPA 1613B	--	10	--
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	EPA 1613B	--	100	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	EPA 1613B	--	50	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	EPA 1613B	--	50	--
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	EPA 1613B	--	50	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	EPA 1613B	--	50	--
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	EPA 1613B	--	100	--
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	EPA 1613B	--	10	--
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	EPA 1613B	--	50	--
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	EPA 1613B	--	50	--
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	EPA 1613B	--	50	--
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	EPA 1613B	--	50	--
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	EPA 1613B	--	50	--
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	EPA 1613B	--	50	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	EPA 1613B	--	50	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	EPA 1613B	--	50	--
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	EPA 1613B	--	100	--
Total Tetrachlorodibenzo-p-dioxin (TCDD)	EPA 1613B	--	--	--
Total Pentachlorodibenzo-p-dioxin (PeCDD)	EPA 1613B	--	--	--
Total Hexachlorodibenzo-p-dioxin (HxCDD)	EPA 1613B	--	--	--
Total Heptachlorodibenzo-p-dioxin (HpCDD)	EPA 1613B	--	--	--
Total Tetrachlorodibenzofuran (TCDF)	EPA 1613B	--	--	--

Table 2

Sediment Analyte List, Analytical Methods, and Target Reporting Limits

Parameter	Recommended Analytical Method	MDL/EDL[4]	Reporting Limit	Minimum Requirement
Total Pentachlorodibenzofuran (PeCDF)	EPA 1613B	--	--	--
Total Hexachlorodibenzofuran (HxCDF)	EPA 1613B	--	--	--
Total Heptachlorodibenzofuran (HpCDF)	EPA 1613B	--	--	--
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2 EDL)				5 [2]
PCB Congeners[3] (pg)				
PCB 001-209	EPA 1668C	--	20	--

Notes:

1. Actual MDLs and MRLs may vary based on sample aliquot size, moisture content, and required dilution factor.
2. Compliance is evaluated on a surface weighted average concentration (SWAC) basis, not point-by-point.
3. Congeners will be reported individually or as coelutions. Reporting limits will vary based on number of coeluting congeners and partitioning factors.
4. EDL applicable t o high resolution analyses

--: not applicable
µg/kg: microgram per kilogram
cPAH: carcinogenic polycyclic aromatic hydrocarbon
dw: dry weight basis
EDL: estimated detection limit; sample-specific
EPA: U.S. Environmental Protection Agency
MDL: method detection limit
ng/kg: nanogram per kilogram
RL: reporting limit
PCB: polychlorinated biphenyl
pg: picogram
SIM: selected ion monitoring
SPME: solid-phase microextraction
TEQ: toxic equivalency

Table 3

Field and Laboratory Quality Assurance/Control Sample Analysis Summary

Analysis Type	Rinsate Blanks	Field Blank	Field Duplicates	Initial Calibration	Ongoing Calibration	LCS/SRM[1]	Laboratory Duplicate	Matrix Spikes	Method Blanks	Surrogate Spikes
Total solids[5]	--	--	--	--	--	--	--	--	--	--
cPAHs	1 per 20 samples per location	1 per program	1 per 20 samples	As needed[3]	Every 12 hours	1 per 20 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	Every sample
PCB Aroclors	1 per 20 samples per location	1 per program	1 per 20 samples	As needed[3]	1 per 10 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	Every sample
PCB congeners	--	--	1 per 20 samples	As needed[3]	Every 12 hours	1 per 20 samples	--	--[4]	1 per 20 samples	Every sample
Dioxin/furans	1 per 20 samples per location	1 per program	1 per 20 samples	As needed[3]	Every 12 hours	1 per 20 samples	--	--[4]	1 per 20 samples	Every sample

Notes:

1. When an SRM is available, it may be used in lieu of an LCS.

2. Calibration and certification of drying ovens and weighing scales are conducted biannually.

3. Initial calibrations are considered valid until the ongoing continuing calibration no longer meets method specifications. At that point, a new initial calibration is performed.

4. Isotope dilution is required by the method.

5. Total solids are performed and reported in conjunction with PAH, PCB, and dioxin/furan methods

--: not applicable

cPAH: carcinogenic polycyclic aromatic hydrocarbon

LCS: laboratory control sample

PCB: polychlorinated biphenyl

SRM: standard reference material

Table 4
Data Quality Objectives

Parameter	Precision (Duplicate RPD)	Accuracy (Spike Recoveries)	Completeness
Sediment			
Total solids	± 20% RPD	--	95%
PAHs, PCBs, dioxin/furans	± 35% RPD	50 to 150% R	95%
SPME			
PCB congeners, dioxin/furans	± 50% RPD	50%–150% R	95%

Notes:
--: not applicable
PAH: polycyclic aromatic hydrocarbons
PCB: polychlorinated biphenyl
RPD: relative percent difference
R: recovery

Appendix C
Health and Safety Plan

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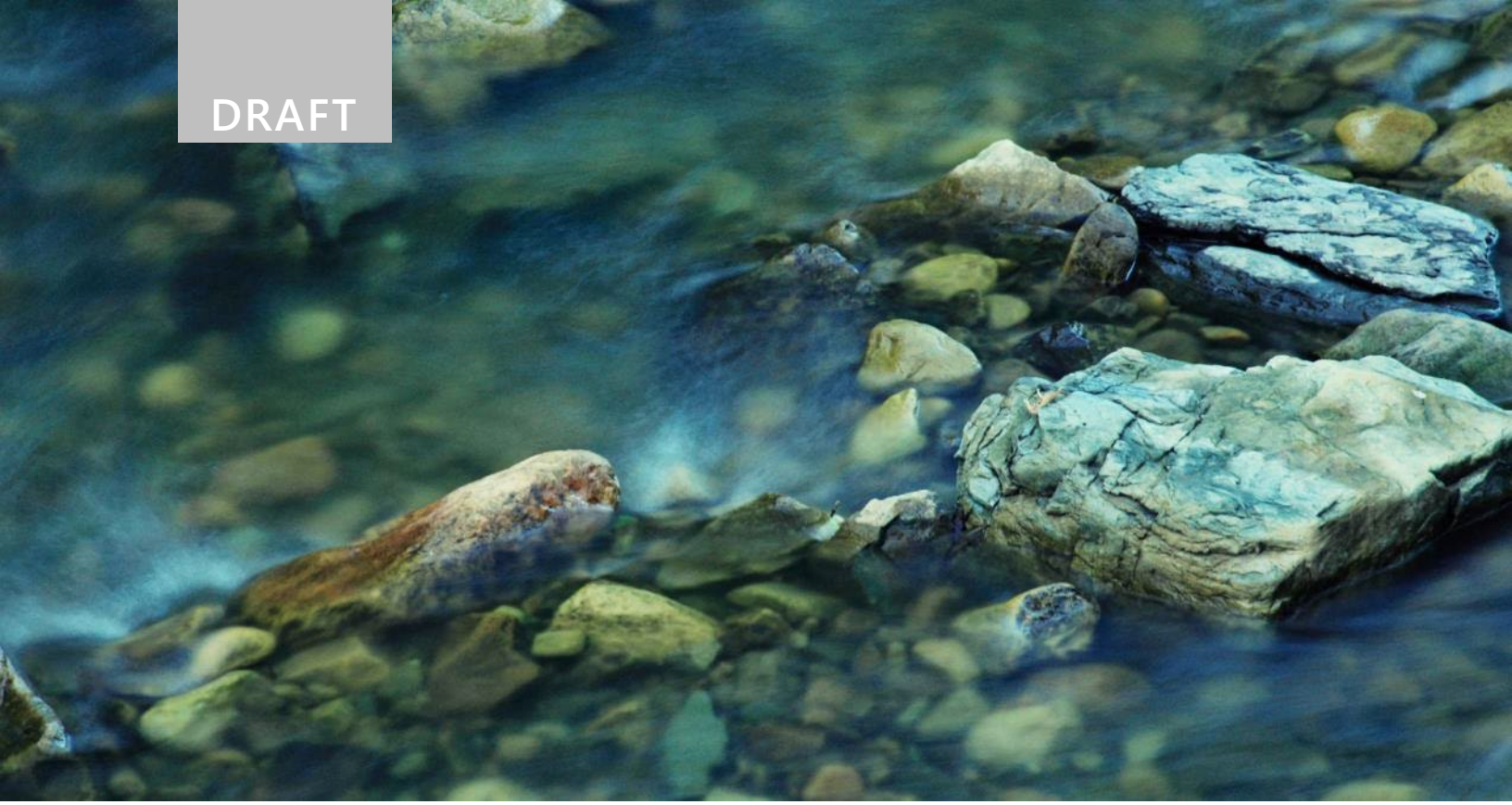

January 2024
Jeld Wen Site, Everett

ANCHOR QEA

Health and Safety Plan

Prepared for JELD-WEN, Inc., and Washington State Department of Ecology

PLAYING IT SAFE

Stop Play Record Rewind

DRAFT

January 2024
Jeld Wen Site, Everett

Health and Safety Plan

Prepared for
JELD-WEN, Inc.
500 JELD-WEN Road
Craigsville, West Virginia 26205
Washington State Department of Ecology
P.O. Box 47600
Olympia, Washington 98504-7600

Prepared by
Anchor QEA, LLC
949 Market Street, Suite 700
Tacoma, Washington 98402

DRAFT

Certification Page

Jason Cornetta

Project Manager

Anchor QEA, LLC

Date: May 22, 2023

Lexus Sullivan

Field Lead

Anchor QEA, LLC

Date: Insert Date

The information in this Health and Safety Plan has been designed for the sediment and soil sampling presently contemplated by Anchor QEA, LLC. Therefore, this document may not be appropriate if the work is not performed by or using the methods presently contemplated by Anchor QEA. In addition, as the work is performed, conditions different from those anticipated may be encountered and this document may have to be modified. Therefore, Anchor QEA only intends this plan to address currently anticipated activities and conditions and makes no representations or warranties as to the adequacy of the Health and Safety Plan for all conditions encountered.

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Health and Safety Plan Acknowledgement Form

Project Number: 220909-01.01

Project Name: Jeld Wen Site

My signature below certifies that I have read and understand the policies and procedures specified in this Health and Safety Plan (HASP). For non-Anchor QEA employees, this HASP may include company-specific appendices to this plan developed by entities other than Anchor QEA. Non-affiliated personnel may be required to sign the Liability Waiver following this Acknowledgement Form.

Date	Name (print)	Signature	Company

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Date	Name (print)	Signature	Company

Site Emergency Procedures

Site Map

Figure A
General Site Location Overview

Emergency Contact Information

Table A
Site Emergency Form and Emergency Phone Numbers*

Category	Information
Possible Chemicals of Concern	Dioxin/furans (D/F), polychlorinated biphenyls (PCBs), carcinogenic polynuclear aromatic hydrocarbons (cPAHs), total volatile solids (TVS)
Minimum Level of Protection	Modified Level D
Site(s) Location Address	300 West Marine View Drive, Everett, WA 98201
Emergency Phone Numbers	
Ambulance	911
Fire	911

Category	Information	
Police	911	
Poison Control	(800) 222-1222	
Client Contact	Eric Rapp	Office: (304_742-5180 x16 Cell: (304) 644-7222
Project Manager (PM)	Jason Cornetta	Office: (206) 971-2680 Cell: (253) 241-0071
Field Lead (FL)	Lexus Sullivan	Office: (206) 903-3365 Cell: (541) 222-9150
Director of Health and Safety	Tim Shaner	Office: (251) 375-5282 Cell: (251) 281-3386
State Emergency Response System	(800) 258-5990	
EPA Emergency Response Team,[1] Region 10	(201) 321-6600	

Notes:
* In the event of any emergency, contact the PM and FL.
1. For local resources, please visit: http://www2.epa.gov/emergency-response/emergency-response-my-community. The National Response Center hotline is (800) 424-8802.

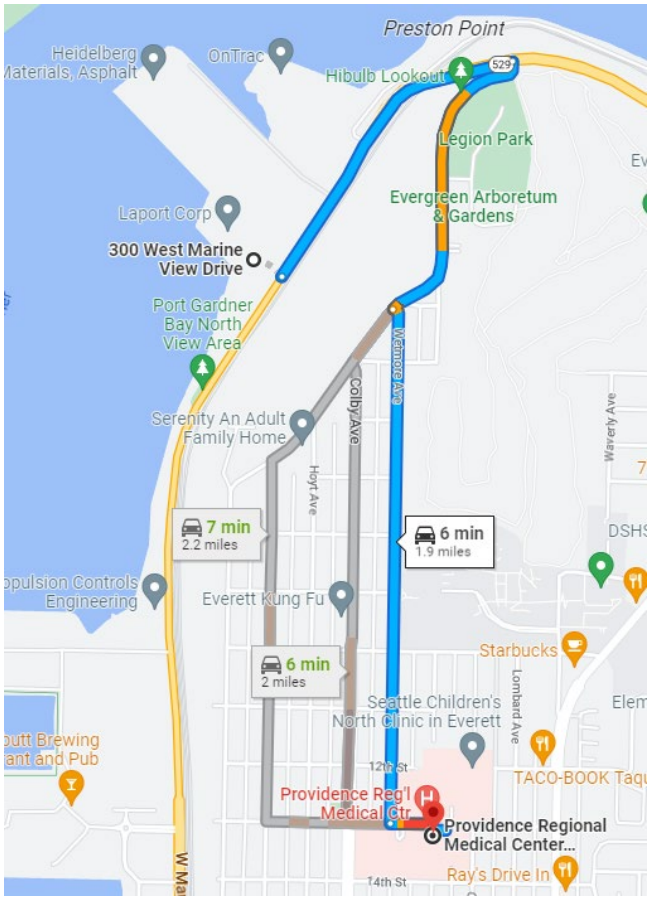
Table B
Hospital Information

Category	Information
Hospital Name	Providence Regional Medical Center Emergency Room
Address	1700 13th St
City, State	Everett, WA 98201
Phone	(425) 261-2000
Emergency Phone	911

Hospital Route Map and Driving Directions

1. Head northeast on W Marine View Dr, 0.5 miles
2. Turn right onto Alverson Blvd, 0.5 miles
3. Turn left onto Wetmore Ave, 0.8 miles
4. Turn left onto 13th St, 344 feet
5. Destination will be on the right, 154 feet. There is garage parking just past the ER entrance.

Figure B
Hospital Route Map



Care Management—WorkCare Incident Intervention

Anchor QEA has an additional Incident Intervention resource from WorkCare to help answer questions, alleviate uncertainty and stress in a potential injury situation, and maintain the health and safety of our employees. Incident Intervention is an injury and illness management tool that provides employees with 24 hours a day/7 days a week (24/7) immediate telephone access to a member of WorkCare's clinical staff of nurses and physicians who intervene at the time of a workplace injury or illness. Contact information is provided below:

- **Access WorkCare 24/7 from anywhere using the toll-free number: 1-888-449-7787**

At the time of a workplace injury or illness, the employee, manager, or another employee at the scene notifies WorkCare using the toll-free number listed above. The caller provides information on

the type of incident, possible cause, and the scope of the situation. With the details of the incident recorded, an experienced nurse or physician provides the following:

- Responsive evaluation of the incident
- Direction on the appropriate course of action
- Consultation with the employee's treating physician to design a quality care treatment plan that meets the needs of the employee and Anchor QEA

All employees are encouraged to use this service should a workplace injury or illness occur.

Key Safety Personnel

The following people share responsibility for health and safety at the site. See Section 4 of this Health and Safety Plan (HASP) for a description of the role and responsibility of each.

Client Contact: Eric Rapp	Office: (304) 742-5180 Cell: (304) 644-7222
Project Manager (PM): Jason Cornetta	Office: (206) 971-2680 Cell: (253) 241-0071
Field Lead (FL): Lexus Sullivan	Office: (206) 903-3365 Cell: (541) 222-9150
Director of Health and Safety: Tim Shaner	Office: (251) 375-5282 Cell: (251)-281-3386

Personal Incident Response Procedures

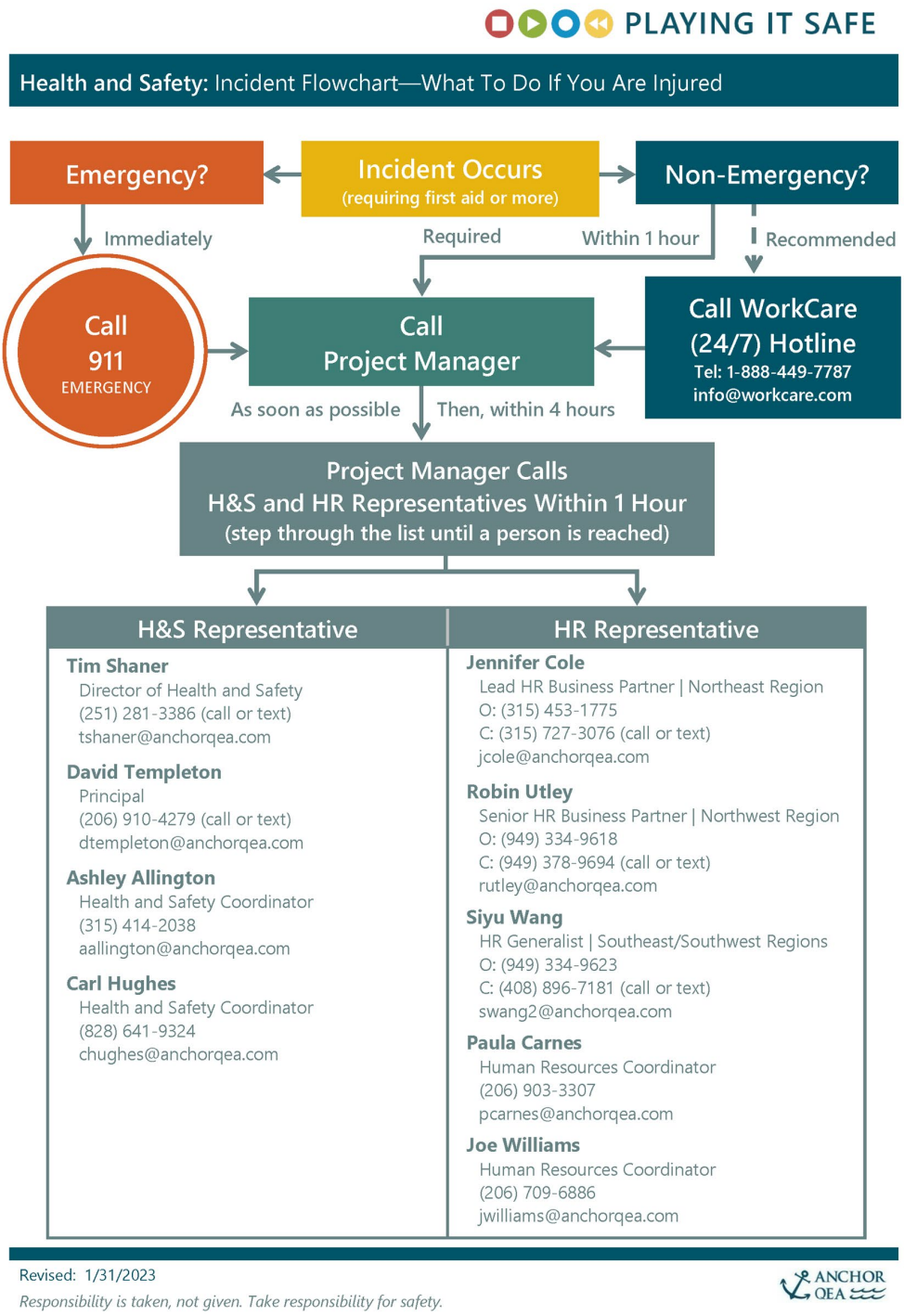
In the event of an emergency, immediate action must be taken by the first person to recognize the event. Use the following steps as a guideline and refer to Figure C:

1. Survey the situation to verify that it is safe for you and the victim. Do not endanger your own life. Do not enter an area to rescue someone who has been overcome unless properly equipped and trained. Verify that all protocols are followed. If applicable, review Safety Data Sheets (SDS) to evaluate response actions for chemical exposures.
2. Call the appropriate emergency number (911, if available) or direct someone else to do this immediately (see Table A). Explain the physical injury, chemical exposure, fire, or release and location of the incident.
3. Have someone retrieve the nearest first aid kit (containing appropriate items for the particular work scope) and Automated External Defibrillator (AED), if available. Note: Only use an AED if you have been properly trained and are currently certified to do so.
4. Decontaminate the victim without delaying life-saving procedures (see Section 8).

5. Administer first aid and cardiopulmonary resuscitation (CPR), if properly trained, until emergency responders arrive.[1]
6. In the event that evacuation is required, the FL must perform a head count to verify that all Anchor QEA personnel are accounted for.
7. Notify the Field Lead (FL) and Project Manager (PM); the PM will notify the client contact. The PM will also contact the Director of Health and Safety (DOHS). The DOHS will facilitate the incident investigation. All client requirements pertinent to personal incident reporting will also be adhered to.
8. Complete the appropriate incident investigation reports.

[1] Personnel qualified and currently certified in basic first aid or CPR are protected under Good Samaritan policies as long as they only perform the basic tasks that they were taught. Do not perform first aid or CPR tasks if you have not been trained in first aid or CPR.

Figure C
Incident Flowchart



Non-Personal Incident Response Procedures

All incidents including, but not limited to, fire, explosion, property damage, or environmental release will be responded to in accordance with the site-specific HASP. In general, this includes securing the site appropriate to the incident, turning control over to the emergency responders, or securing the site and summoning appropriate remedial personnel or equipment. Anchor QEA will immediately notify the client of any major incident, fire, equipment or property damage, or environmental incident with a preliminary report. A full report will be provided within 72 hours.

Spills and Releases of Hazardous Materials

When required, notify the National Response Center and local state agencies. The following information should be provided to the National Response Center:

- Name and telephone number
- Name and address of incident location
- Time and type of incident
- Name and quantity of materials involved, if known
- Extent of injuries
- Possible hazards to human health or the environment outside the facility

The emergency telephone number for the National Response Center is (800) 424-8802. If hazardous waste is released or produced through control of the incident, verify the following:

- Waste is collected and contained
- Containers of waste are removed or isolated from the immediate site of the emergency
- Treatment or storage of the recovered waste, contaminated soil or surface water, or any other material that results from the incident or its control is provided
- No waste that is incompatible with released material is treated or stored in the facility until cleanup procedures are completed

Verify that all emergency equipment used is decontaminated, recharged, and fit for its intended use before operations are resumed.

Near-Miss Reporting

All near-miss incidents (i.e., those that could have reasonably led to an injury, environmental release, or other incident) must be reported to the FL and PM immediately, so action can be taken to verify that such conditions that led to the near-miss incident are readily corrected to prevent future occurrences.

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TABLE OF CONTENTS

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TABLES

FIGURES

APPENDICES

ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
AED	Automated External Defibrillator
ALARA	as low as reasonably achievable
ANSI	American National Standards Institute
APR	Air-Purifying Respirator
ASTM	ASTM International
CDC	Centers for Disease Control and Prevention
CFR	Code of Federal Regulations
COC	chemical of concern
CPR	cardiopulmonary resuscitation
CRZ	Contamination Reduction Zone
dB	decibel
dBA	A-weighted decibel
DOHS	Director of Health and Safety
DOT	U.S. Department of Transportation
DPT	direct push technology
EPA	U.S. Environmental Protection Agency
eV	electron volts
EZ	Exclusion Zone/Hot Zone
FID	flame ionization detector
FL	Field Lead
GFCI	ground-fault circuit interrupter
H:V	horizontal to vertical
HASP	Health and Safety Plan
HAZMAT	Hazardous Materials
HAZWOPER	Hazardous Waste Operations and Emergency Response
HEPA	high-efficiency particulate air
HMIS	Hazardous Material Information System
IDLH	immediately dangerous to life or health
JSA	Job Safety Analysis
kPa	kilopascal
kV	kilovolt
LEL	lower-explosive limit
LO/TO	lockout/tagout
mg/m^3	milligram per cubic meter
MHR	maximum heart rate
MUTCD	Manual of Uniform Traffic Control Devices

NEC	National Electrical Code
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
NPL	National Priority List
NRR	Noise Reduction Rating
O_2	oxygen
OSHA	Occupational Safety and Health Act or Administration
OV	organic vapor
OVM	organic vapor monitor
PAH	polycyclic aromatic hydrocarbon
PE	Professional Engineer
PEL	Permissible Exposure Limit
PFD	personal flotation device
PID	photoionization detector
PM	Project Manager
PPE	personal protective equipment
ppm	parts per million
PRCS	Permit-Required Confined Spaces
QLFT	qualitative fit test
RCRA	Resource Conservation and Recovery Act
REL	Recommended Exposure Limit
RPP	Respiratory Protection Program
SDS	Safety Data Sheets
SZ	Support Zone/Clean Zone
TLV	Threshold Limit Value
TSD	treatment, storage, and disposal
tsf	ton per square foot
TWA	time-weighted average
TWIC	Transportation Worker Identification Credential
USCG	U.S. Coast Guard
UV	ultraviolet
VOC	volatile organic compound
WBGT	wet bulb globe temperature
XRF	x-ray fluorescence

1 Introduction

This Health and Safety Plan (HASP) was prepared on behalf of JELD-WEN and presents health and safety requirements and procedures that will be followed by Anchor QEA, LLC, personnel and at a minimum by Anchor QEA subcontractors during work activities at the Jeld Wen Site (the site). This HASP was developed in accordance with Title 29 of the Code of Federal Regulations (CFR), Part 1910.120(b), and will be used in conjunction with Anchor QEA's Corporate Health and Safety Program. See Section 1.1 for HASP modification procedures.

The provisions of this HASP are mandatory for all Anchor QEA personnel assigned to the project. A copy of this HASP must be maintained on site and available for employee review at all times. Anchor QEA subcontractors are also expected to follow the provisions of this HASP unless they have their own HASP that covers their specific activities related to this project. Any subcontractor HASPs must include the requirements set forth in this HASP, at a minimum. All visitors to the work site must also abide by the requirements of this HASP and will attend a pre-work briefing where the contents of this HASP will be presented and discussed.

Personnel assigned to work at the project site will be required to read this plan and must sign the Health and Safety Plan Acknowledgement Form to confirm that they understand and agree to abide by the provisions of this HASP.

Subcontractors are ultimately responsible for the health and safety of their employees. Subcontractors may mandate health and safety protection measures for their employees beyond the minimum requirements specified in this HASP.

The objectives of this HASP are to identify potential physical, chemical, and biological hazards associated with field activities; establish safe working conditions and protective measures to control those hazards; define emergency procedures; and describe the responsibilities, training requirements, and medical monitoring requirements for site personnel.

This HASP prescribes the procedures that must be followed during specific site activities. Significant operational changes that could affect the health and safety of personnel, the community, or the environment will not be made without the prior approval of the Project Manager (PM) and the Director of Health and Safety (DOHS).

Issuance of this approved HASP documents that the workplace has been evaluated for hazards. A hazard assessment was performed, and the adequacy of the personal protective equipment (PPE) selected was evaluated as required by 29 CFR 1910.132(d)—Personal Protective Equipment, General Requirements (General Industry); 29 CFR 1910.134—Respiratory Protection; 29 CFR 1926.28—Personal Protective Equipment (Construction Industry); and 29 CFR 1926.55—Gases, Vapors, Fumes,

Dusts and Mist, and is duly noted by the signature(s) and date appearing on the certification page of this document.

1.1 Health and Safety Plan Modifications

This HASP will be modified by amendment, if necessary, to address changing field conditions or additional work tasks not already described in this document. Modifications will be proposed by the Field Lead (FL) using the Modification to Health and Safety Plan form included in Appendix A. Modifications will be reviewed by the DOHS or authorized representative and approved by the PM.

2 Site Description and Background Information

2.1 Site Description

The Site is in Snohomish County, Washington, and is bound by vacant land and tidal mudflats owned by the Port of Everett (Port) to the east/northeast, tidal mudflats owned by Wick Family Properties LLC, the Port, and Foss Maritime Company LLC to the west, West Marine View Drive to the southeast, and Port Gardner Bay to the north/northwest. The pre-design investigation of this Site covered by this health and safety plan involves the subtidal and intertidal portions of the site, as well as the northern slope of the property uplands.

2.2 Site Background Information

Prior to JELD-WEN's ownership in 1986, historical activities at the site included pole treating, fish net storage, and the manufacturing of caskets and wood doors and sashes. Operations during JELD-WEN's ownership included drying, planning, and cutting rough green lumber and the assembly of finished wooden products such as doors, posts, spindles, and rails. Wood manufacturing ceased at the site in 2005, and in 2013 JELD-WEN sold the property to an investment firm. The northwest portion of the Site uplands has been leased and operated by several asphalt operations since the 1990s.

3 Scope of Work

3.1 Project Scope of Work

This plan addresses health and safety issues associated with the following field tasks:

3.1.1 Step 1

Phase 1 scoping includes the hand sampling and processing of surface sediments from intertidal site mudflats.

Step 2 scoping includes subtidal subsurface sampling and processing of sediments, additional intertidal surface sediment sampling and processing as needed, and geotechnical soil borings in the site upland.

4 Authority and Responsibilities of Key Personnel

This section describes the authority and responsibilities of key Anchor QEA project personnel. The names and contact information for the following key safety personnel are listed in the Site Emergency Procedures section at the beginning of this HASP. Should key site personnel change during the course of the project, a new list will be established and posted immediately at the site. The emergency phone number for the site is **911** and should be used for all medical, fire, and police emergencies.

4.1 Project Manager

The PM provides overall direction for the project. The PM is responsible for ensuring that the project meets the client's objectives in a safe and timely manner. The PM is responsible for providing qualified staff for the project and adequate resources and budget for the health and safety staff to carry out their responsibilities during the field work. The PM will be in regular contact with the FL and CHSM to verify that appropriate health and safety procedures are implemented into each project task.

The PM has authority to direct response operations; the PM assumes total control over project activities but may assign responsibility for aspects of the project to others. In addition, the PM performs the following tasks:

- Overseeing the preparation and organization of background review of the project, the Scope of Work, and the field team
- Verifying that the team obtains permission for site access and coordinates activities with appropriate officials
- Briefing the FL and field personnel on specific assignments
- Together with the FL, seeing that health and safety requirements are met
- Consulting with the DOHS regarding unsafe conditions, incidents, or changes in site conditions or the Scope of Work

4.2 Field Lead

The FL reports to the PM, has authority to direct response operations, and assumes control over on-site activities. The FL will direct field activities, will coordinate the technical and health and safety components of the field program, and is responsible in general for enforcing this site-specific HASP and Corporate Health and Safety Program requirements. The FL will be the primary point of contact for all field personnel and visitors and has direct responsibility for implementation and administration of this HASP. The FL and any other member of the field team have **STOP WORK AUTHORITY**—the authority to stop or suspend work in the event of an emergency, if conditions arise that pose an unacceptable health and safety risk to the field team or environment, or if

conditions arise that warrant modifications to this HASP. It is critical that both the FL and PM communicate regularly to proactively identify and address any safety-related concerns that may arise. The functions of the FL related to this HASP include, but are not necessarily limited to, the following:

- Conducting and documenting daily safety meetings or designate an alternate FL in his or her absence
- Executing the Scope of Work and schedule
- Conducting periodic field health and safety inspections to verify compliance with this HASP
- Overseeing implementation of safety procedures
- Implementing site personnel protection levels
- Enforcing site control measures to help verify that only authorized personnel are allowed on site
- Notifying, when necessary, local public emergency officials (all personnel on site may conduct this task as needed)
- Following up on incident reports to the PM
- Periodically inspecting protective clothing and equipment for adequacy and safety compliance
- Verifying that protective clothing and equipment are properly stored and maintained
- Performing or overseeing air monitoring (if required) in accordance with this HASP
- Maintaining and overseeing operation of monitoring equipment and interpretation of data from the monitoring equipment
- Monitoring site personnel for signs of stress, including heat stress, overexertion, cold exposure, and fatigue
- Requiring participants to use the "buddy" system in performing tasks
- Providing (via implementation of this HASP) emergency procedures, evacuation routes, and telephone numbers for the local hospital, poison control center, fire department, and police department
- Communicating incidents promptly to the PM
- Maintaining communication with the DOHS regarding on-site activities
- If applicable, verifying that decontamination and disposal procedures are followed
- Maintaining the availability of required safety equipment
- Advising appropriate health services and medical personnel of potential exposures
- Notifying emergency response personnel in the event of an emergency and coordinate emergency medical care

The FL will record health-and-safety-related details of the project in the field logbook. At a minimum, each day's entries must include the following information:

- Project name or location

- Names of all on-site personnel
- Level of PPE worn and any other specifics regarding PPE
- Weather conditions
- Type of field work being performed

The FL will have completed the required Occupational Safety and Health Administration (OSHA) 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training and annual updates, the 8-hour Supervisor training, medical monitoring clearance, and current first aid and cardiopulmonary resuscitation (CPR) training. Other certifications or training may be stipulated based on client or site requirements.

4.3 Director of Health and Safety

The DOHS (or designee) will be responsible for managing on-site health and safety activities and will provide support to the PM and FL on health and safety-related issues. The following are specific duties of the DOHS:

- Providing technical input into the design and implementation of this HASP
- Advising on the potential for occupational exposure to project hazards, along with appropriate methods and/or controls to eliminate site hazards
- Verifying that a hazard assessment has been performed and that the adequacy of the PPE selected was evaluated as required by 29 CFR 1910.132(d), 29 CFR 1910.134, 29 CFR 1926.25, and 29 CFR 1926.55, and is duly noted by the signatures and date appearing on the Certification Page of this document
- Consulting with the FL on matters relating to suspending site activities in the event of an emergency
- Verifying that all on-site Anchor QEA personnel and subcontractors have read and signed the HASP Acknowledgement Form
- Verifying that corrective actions resulting from deficiencies identified by audit and observations are implemented and effective

The DOHS or designee will have completed the required OSHA 40-hour HAZWOPER training and annual updates as well as the 8-hour Supervisor training (or a minimum of 5 years of supervisory experience).

4.4 Project Field Team

All project field team members will attend a project-specific meeting conducted by the FL concerning safety issues and project work task review before beginning work on site. All field team members, including subcontractors, must be familiar with and comply with this HASP. The field team has the responsibility to immediately report any potentially unsafe or hazardous conditions to the FL,

and all members of the field team have **STOP WORK AUTHORITY**—the authority to stop or suspend work if conditions arise that pose an unacceptable health and safety risk to the field team or environment, or if conditions arise that warrant modifications to this HASP. It is critical that all field team members proactively communicate with the FL to identify potential unsafe conditions. The field team reports to the FL for on-site activities and is responsible for the following:

- Reviewing and maintaining a working knowledge of this HASP
- Safely completing on-site tasks required to fulfill the Scope of Work
- Complying with the HASP
- Attending and participating in daily safety meetings
- Notifying the FL of existing or potential safety conditions at the site
- Reporting all incidents to the FL
- Demonstrating safety and health-conscious conduct

Per OSHA 1910.120(e)(3)(i),[2] newly assigned HAZWOPER 40-hour trained field team members must have at least 3 days of field work supervised by an experienced FL (preferably an individual with HAZWOPER Supervisor training). It is the responsibility of the PM to identify such "short service" personnel and verify that their supervised field experience occurs (or has occurred) and is documented in the project field notes and on the Daily Safety Briefing form (Appendix A).

[2] "General site workers (such as equipment operators, general laborers and supervisory personnel) engaged in hazardous substance removal or other activities which expose or potentially expose workers to hazardous substances and health hazards shall receive a minimum of 40 hours of instruction off the site, and a minimum of three days actual field experience under the direct supervision of a trained experienced supervisor."

5 Project-Specific Requirements

This section provides activity-specific levels of protection and air monitoring requirements to be used on this site based on the Scope of Work and the chemicals of concern (COCs).

5.1 Activity-Specific Level of Protection Requirements

Refer to Section 10 for general requirements for PPE. Level D is the minimum acceptable level for most sites. An upgrade to Modified Level D occurs when there is a possibility that contaminated media can come in contact with the skin or work uniform. An upgrade to Level C occurs when there is a potential for exposure to airborne COCs (i.e., if the results of air monitoring reveal that action levels have been exceeded). Hearing protection must be worn when there are high noise levels. Site personnel must maintain proficiency in the use and care of PPE that is to be worn.

Table 5-1 describes the specific means of protection needed for each identified work activity.

5.2 Project Air Monitoring Requirements

Refer to Section 11 of this plan for general requirements for air monitoring at the project site, including information on air monitoring equipment. Upgrade from Level D and/or Modified Level D to Level C when the results of air monitoring reveals that action levels have been exceeded. Use of Level C by Anchor QEA staff requires participation in Anchor QEA's Respiratory Protection Program (RPP).

Surface and subsurface sediment efforts are not anticipated to require dust monitoring due to the saturation of the sample material. Dust monitoring is expected for upland geotechnical soil drilling during phase 2.

Table 5-2 describes the specific air monitoring required for each identified work activity.

Table 5-1
Project Job Tasks and Required Personal Protective Equipment

Job Tasks		PPE Requirements
• Loading and unloading sample coolers, boat equipment, general non-sampling activities onboard a marine vessel • Operation of sampling vessel and equipment from inside boat house • Operation of sampling equipment but with no anticipated direct contact with sediments or decontamination chemicals	☒	Standard work uniform/coveralls
	☒	Work boots with safety toe conforming to ASTM International (ASTM) F2412-05/ASTM F2413-05
	☒	High-visibility traffic safety vest
	☐	Chemical-resistant clothing <u>check appropriate garments</u>: ☐ One-piece coverall ☐ Hooded one- or two-piece chemical splash suit ☐ Disposable chemical coveralls ☐ Chemical-resistant hood and apron ☐ Bib-style overalls and jacket with hood **Fabric Type**: Tyvek NOTE: Thick rain pants and coveralls may be substituted for coated Tyvek if sediments are not obviously contaminated with polycyclic aromatic hydrocarbons (PAHs) or related petroleum products. Rain slickers cannot be effectively decontaminated of tar/petroleum contamination.
	☐	Disposable inner gloves (latex or equivalent "surgical")
	☐	Disposable chemical-resistant outer gloves **Material Type**: Nitrile
	☐	Chemical-resistant boots with safety toe conforming to ASTM F2412-05/ASTM F2413-05 or disposable boot covers for safety toe/work boots **Material Type**: Rubber or leather
	☐	Puncture-resistant shanks in safety shoes conforming to ASTM F2412-05/ASTM F2413-05
	☐	Metatarsal guards conforming to ASTM F2412-05/ASTM F2413-05
	☐	Sleeves to be duct-taped over gloves and pants to be duct-taped over boots
	☐	Splash-proof safety goggles
	☒	Safety glasses
	☒	Hard hat
	☐	Hard hat with face shield
	☒	Hearing protectors (**REQUIRED** if site noise levels are greater than 85 decibels [dB] based on an 8-hour time-weighted average [TWA]). **Type**: Foam
	☐	Two-way radio communication (intrinsically safe, if explosive atmosphere is a potential)

Job Tasks		PPE Requirements
	☐	Long cotton underwear
	☒	High-visibility, U.S. Coast Guard (USCG)-approved personal flotation device (PFD) (if working on any water vessel or without fall protection within 10 feet of water)
	☐	USCG-approved float coat and bib-overalls (e.g., full two-piece "Mustang" survival suit or similar) or one-piece survival suit if combined air and water temperature is below 90°F
	☐	Half-face Air-Purifying Respirator (APR) (OSHA/NIOSH-approved)
	☐	Full-face APR (OSHA/NIOSH-approved)
	☐	**Type of Cartridges to be Used**: ☐ **OV or** ☐ **OV/HEPA (if samples are dry)**
• Vibracore and rotary auger sampling • Sampling and characterizing sediments and soils • Decontamination •	☒	Standard work uniform/coveralls
	☒	Work boots with safety toe conforming to ASTM F2412-05/ASTM F2413-05
	☒	High-visibility traffic safety vest
	☐	Chemical-resistant clothing <u>check appropriate garments</u>: ☐ One-piece coverall ☐ Hooded one- or two-piece chemical splash suit ☐ Disposable chemical coveralls ☐ Chemical-resistant hood and apron ☐ Bib-style overalls and jacket with hood **Fabric Type**: Tyvek NOTE: Thick rain pants and coveralls may be substituted for coated Tyvek if sediments are not obviously contaminated with PAHs or related petroleum products. Rain slickers cannot be effectively decontaminated of tar/petroleum contamination.
	☐	Disposable inner gloves (latex or equivalent "surgical")
	☒	Disposable chemical-resistant outer gloves **Material Type**: Nitrile
	☐	Chemical-resistant boots with safety toe and steel shank conforming to ASTM F2412-05/ASTM F2413-05 or disposable boot covers for safety toe/work boots **Material Type**: Rubber or leather
	☐	Puncture-resistant shanks in safety shoes conforming to ASTM F2412-05/ASTM F2413-05
	☐	Metatarsal guards conforming to ASTM F2412-05/ASTM F2413-05
	☐	Sleeves to be duct-taped over gloves and pants to be duct-taped over boots

Job Tasks		PPE Requirements
	☐	Splash-proof safety goggles
	☒	Safety glasses
	☒	Hard hat
	☐	Hard hat with face shield
	☒	Hearing protectors (**REQUIRED** if site noise levels are greater than 85 dB based on an 8-hour TWA). **Type:** Foam
	☐	Two-way radio communication (intrinsically safe, if explosive atmosphere is a potential)
	☐	Long cotton underwear
	☒	High-visibility, USCG-approved PFD (if working on any water vessel or without fall protection within 10 feet of water)
	☐	USCG-approved float coat and bib-overalls (e.g., full two-piece "Mustang" survival suit or similar) or one-piece survival suit if combined air and water temperature is below 90°F
	☐	Half-face APR (OSHA/NIOSH-approved)
	☐	Full-face APR (OSHA/NIOSH-approved)
	☐	**Type of Cartridges to be Used:** ☐ **OV or** ☐ **OV/HEPA (if samples are dry)**

Table 5-2
Project Air Monitoring Requirements

Instrument*	Job Tasks/Functions	Measurement	Monitoring Schedule[3]	Actions[1]
Dust Monitor (respirable fraction)	Conduct monitoring when dusty conditions are encountered in areas that contain potentially contaminated soils. Monitor in employee breathing zones and general areas. Determine if potentially contaminated materials are migrating off-site. Dust concentration action levels are based on downwind minus upwind measurements.	< 0.5 mg/m^3	Initially and every 15 minutes while conditions persist	Continue work.
		0.5 to 5 mg/m^3 above background	Continuously	Upgrade to Level C protection (HEPA filters);[4] initiate dust suppression activities.
		> 5 mg/m^3 above background		Stop dust-producing activity if levels cannot be maintained < 5 mg/m^3. Move support zone to upwind location.

Notes:
*Note: Instruments must be calibrated according to manufacturer's recommendations.

1. For VOCs, a sustained reading for greater than 2 minutes in excess of the action level will trigger a protective measure.
2. Contact with the DOHS and PM must be made prior to continuance of work. A hazard review must be conducted before proceeding with work. Corrective actions may include temporary work stoppage to allow vapors to dissipate, and then returning to work if air monitoring data permits.
3. Monitoring frequency is from the beginning of each task and at specified intervals thereafter, or when detectable soil contamination is encountered (as indicated by strong, sustained odor, visual evidence of product, or petroleum-discolored soils).
4. Work must be conducted in accordance with Anchor QEA's RPP. Contact the CHSM for respiratory protection fit testing and air purifying cartridge change-out requirements.

6 Risk Analysis and Control

The following sections discuss the potential health and safety hazards associated with the field tasks described in the Scope of Work. Controls of these hazards are addressed through the mechanical and physical control measures, use of PPE, monitoring, training, decontamination, emergency response, and safety procedures.

Significant changes in the Scope of Work covered by this HASP must be communicated to the PM and CHSM, and a modification to this HASP must be created as needed (see Section 1.1). Any task conducted beyond those identified in the Scope of Work and this HASP must be evaluated using the Job Safety Analysis (JSA) process prior to conducting the work.

6.1 Job Safety Analysis

Anchor QEA work tasks have been evaluated for their hazards and JSA documents have been developed that detail the chemical, physical, and biological hazards associated with these tasks along with the control measures (e.g., engineering controls, administrative controls, and/or PPE) that will be used to conduct them in a safe manner.

The PM and FL are responsible for identifying work tasks and project site conditions that are beyond the previously developed JSA documents and for communicating such information to the CHSM. The CHSM will provide support, as needed, to the PM and the FL, who will have primary responsibility to develop project-specific JSAs.

The contents of the JSA documents shall be communicated to project personnel during the site orientation meeting and during daily safety meetings when conducting work where the specific JSAs are applicable.

JSA documents applicable to this project are located in Appendix B and include the following field tasks:

- JSA001 – General Field Activities
- JSA002 - Soil and Sediment Sampling
- JSA003 - General Boating Activities
- JSA004 - Decontamination Activities
- JSA005 - Motor Vehicle Operations
- JSA006 - Sample and Laboratory Glassware Handling
- JSA007 – Investigation Derived Waste
- JSA008 - Subsurface Drilling

6.1.1 Augmented Job Safety Analysis Process

If significant work tasks are identified during the course of the project that were not previously addressed in the JSA documentation supplied in Appendix B, then a task-specific JSA document must be developed prior to conducting the work. The PM and FL shall develop this document(s) with input from the CHSM, as needed, and this HASP will be modified to include the JSA document (see Section 1.1 for HASP modification procedures). Project personnel shall be trained on the contents of the developed task-specific JSA prior to its implementation. Appendix B of this HASP includes a blank JSA form that can be used to create a new task-specific JSA.

6.2 Exposure Routes

Possible routes of exposure to the chemicals potentially encountered on this project include inhalation, dermal contact, and ingestion of dust, mist, gas, vapor, or liquid. Exposure will be minimized by using safe work practices and by wearing the appropriate PPE. A further discussion of PPE requirements is presented in Section 10.

6.2.1 Inhalation

Inhalation of particulates, dust, mist, gas, or vapor during field activities is possible. Whenever possible, work activities will be oriented so that personnel are upwind of the sampling location. An organic vapor monitor (OVM) may be used to monitor ambient air and the breathing zone within the work area for organic compounds. Section 5.2 describes potential OVM action levels and response procedures.

6.2.2 Dermal Contact

Dermal contact with potentially contaminated soil, sediment, or groundwater during field activities is possible. Direct contact will be minimized by using appropriate PPE and decontamination procedures.

6.2.3 Ingestion

Direct ingestion of contaminants can occur by inhaling airborne dust, mist, or vapors, or by swallowing contaminants trapped in the upper respiratory tract. Indirect ingestion can occur by introducing the contaminants into the mouth by way of food, tobacco, fingers, or other carriers. Although ingestion of contaminants can occur, proper hygiene, decontamination, and contamination reduction procedures should reduce the probability of this route of exposure.

6.3 Chemicals of Concern Profile

Table 6-1 provides a summary profile for the COCs for this project. As available, this profile is based on recent site history and site characterization information. For more detailed and specific

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information, always refer to the Safety Data Sheet (SDS) or equivalent information for the chemical (see Appendix C).

Table 6-1
Chemicals of Concern Profile

Chemical	Exposure Routes	Symptoms	Target Organs	Occupational Exposure Limits	Odor Threshold (ppm)	LEL (%)	Ionization Potential (eV)
cPAHs (as coal tar pitch volatiles) CAS# 65996-93-2	Inhalation, skin and/or eye contact	Dermatitis, bronchitis, [potential occupational carcinogen]	Respiratory system, skin, bladder, kidneys	NIOSH REL TWA 0.1 mg/m^3	Varies	Varies	Varies
Dioxins (as 2,3,7,8-Tetrachloro-dibenzo-p-dioxin)* CAS# 1746-01-6	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes; allergic dermatitis, chloracne; porphyria; gastrointestinal disturbance; possible reproductive, teratogenic effects; In Animals: liver, kidney damage; hemorrhage; [potential occupational carcinogen]	Eyes, skin, liver, kidneys, reproductive system	NA	NA	Unknown	Unknown
Furans (as Tetrahydrofuran) CAS# 109-99-9	Inhalation, skin and/or eye contact, ingestion	Irritation eyes, upper respiratory system; nausea, dizziness, headache, central nervous system depression	Eyes, respiratory system, central nervous system	ACGIH TLV TWA 50 ppm (147 mg/m^3) STEL 100 ppm (295 mg/m^3)	30	2	9.45
Chlorodiphenyl (PCBs) 42% chlorine - CAS# 53469-21-9	Inhalation, skin absorption, ingestion, and skin and/or eye contact	Irritation eyes; chloracne; liver damage; reproductive effects; [potential occupational carcinogen]	Liver, reproductive system, skin, and eyes	NIOSH REL TWA 0.001 mg/m^3	N/A	N/A	Not known
Chlorodiphenyl (PCBs) 54% chlorine – CAS# 11097-69-1	Inhalation, skin absorption, ingestion, and skin and/or eye contact	Irritation eyes; chloracne; liver damage; reproductive effects; [potential occupational carcinogen]	Liver, reproductive system, skin, and eyes	NIOSH REL TWA 0.001 mg/m^3	N/A	N/A	Not known

Notes:
Sources: https://www.cdc.gov/niosh/npg/default.html; 1910.1000 TABLE Z-1 - TABLE Z-1 Limits for Air Contaminants | Occupational Safety and Health Administration (osha.gov)

7 Site Control and Communications

The primary purposes for site controls are to establish the hazardous area perimeter, reduce migration of contaminants into clean areas, and prevent unauthorized access or exposure to hazardous materials by site personnel and the public. Site control is especially important in emergency situations.

7.1 General Site Control Safety Procedures

The following standard safe work practices apply to all Anchor QEA site personnel and subcontractors and shall be discussed in the safety briefing prior to initiating work on the site:

- Eating, drinking, chewing gum or tobacco, and smoking are prohibited on site except in designated areas.
- Hands and faces must be washed upon leaving the work area and before eating, drinking, chewing gum or tobacco, and smoking.
- A buddy system will be used. Radio, cell phone, or hand signals will be established to maintain communication.
- During site operations, each worker will consider himself/herself as a safety backup to his/her partner.
- Visual contact will be maintained between buddies on site when performing potentially hazardous duties.
- No personnel will be admitted to the site without the proper safety equipment, training, and (if required) medical monitoring certification.
- All personnel must comply with established safety procedures. Any staff member who does not comply with safety policy as established in this HASP may be subject to corrective action, potentially including but not limited to, being reprimanded or immediately dismissed.
- Proper decontamination procedures must be followed before leaving a contaminated work area.

7.2 Work Area Access Control

If work is performed in public areas, the following precautions shall be taken to protect both the site personnel and the public. Access control to the work area will be accomplished using a combination of the following devices and/or methods:

- Fences and/or barricades
- Traffic control devices and/or use of flaggers
- Caution tape
- Other methods to keep the site secure and provide a visual barrier to help keep unauthorized personnel from entering the site and active work areas

7.3 Hazardous Waste Site Work Control Procedures

To prevent contamination from migrating from personnel and equipment, work areas will be clearly specified as an Exclusion Zone/Hot Zone (EZ), Contamination Reduction Zone (CRZ), or Support Zone/Clean Zone (SZ) prior to beginning operations. Each work area will be clearly identified using signs or physical barriers. At the end of each workday, the site should be secured and/or guarded to prevent unauthorized entry.

The site work zones will be defined as follows:

- **Exclusion Zone/Hot Zone (EZ).** The EZ will be the "hot zone" or contaminated area inside the site perimeter (or sample collection area of boat). The EZ is the defined area where potential respiratory and/or health hazards exist. All personnel entering the EZ must use the required PPE, as set forth in this HASP, and meet the appropriate training and medical clearance. Entry to and exit from this zone will be made through a designated point. Appropriate warning signs to identify the EZ should be posted (e.g., DANGER, AUTHORIZED PERSONNEL ONLY, PROTECTIVE EQUIPMENT REQUIRED BEYOND THIS POINT). Personnel and equipment decontamination must be performed upon exiting the EZ.
- **Contamination Reduction Zone (CRZ).** The CRZ, also known as the "warm zone," is a transitional zone between the EZ and the SZ (also known as the "cold zone" or "clean zone"). The CRZ provides a location for removal and decontamination of PPE and tools leaving the EZ. A separate decontamination area will be established for heavy equipment. All personnel and equipment must exit via the CRZ. If the CRZ is compromised at any time, a new CRZ will be established.
- **Support Zone/Clean Zone (SZ).** This uncontaminated zone will be the area outside the EZ and CRZ and within the geographic perimeters of the site (including boat and processing areas). The SZ is used for support personnel; staging materials; parking vehicles; office, laboratory, and sanitation facilities; and receiving deliveries. Personnel entering this zone may include delivery personnel, visitors, security guards, and others who will not necessarily be permitted in the EZ or CRZ.

A log of all personnel visiting, entering, or working on the site shall be maintained by the FL. No visitor will be allowed in the EZ without showing proof of training and medical certification, per 29 CFR 1910.120(e),(f) (and 29 CFR 1926.1101(k)(9),(m) if appropriate). Visitors will attend a site orientation given by the FL and sign the HASP.

7.4 Site-Specific Work Zone Requirements

This section contains guidelines for maintaining safe conditions when working from a boat, in a roadway, or at an excavation site.

7.4.1 Sediment Sampling Work Zones

This subsection contains guidelines concerning health and safety aboard marine sampling vessels. The vessel captain, onshore coring operator, and the FL will delineate the boundaries of the work zones aboard the vessel and will inform the field team of the arrangement. The purpose of the zones is to limit the migration of sample material out of the zones and to restrict access to active work areas.

Two work zones will be observed aboard the vessel. One will encompass the "moonhole" of the vessel where the samplers will be deployed and recovered. Only the coring team may enter this zone unless assistance is required by other personnel. The second work zone will be a sample processing area on the vessel. The contractor team will deliver sediment core tubes to this zone and open them. Anchor QEA personnel will log and process the sediment cores either on the boat or on shore.

Both the collection and processing areas on the vessel and onshore will have a SZ outside the CRZ to stage clean equipment, don PPE, take rest breaks, or perform any other site activities that do not involve potentially contaminated materials.

7.4.1.1 Vessel Decontamination Area

A station will be set up for decontaminating sample processing equipment and personnel gear such as boots or PPE. The station will have the buckets, brushes, soapy water, rinse water, or wipes necessary to perform decontamination operations. Plastic bags will be provided for expendable and disposable materials. Decontamination fluids will be stored in sealable containers and will be properly disposed of.

7.4.1.2 Access Control

Security and control of access to the sampling vessel and onshore area will be the responsibility of the captain and FL. Additional security measures may be placed into effect by the client, or as required by national security threat levels determined by the federal government. Access to the vessel and onshore areas will only be granted to necessary project personnel and authorized visitors. Any security or access control problems will be reported to the client or appropriate authorities.

7.4.1.3 Safety Equipment

In addition to PPE that will be worn by shipboard personnel, basic emergency and first aid equipment will also be provided. Equipment will include:

- U.S. Coast Guard (USCG)-approved personal flotation devices (PFDs)
- First aid kit adequate for the number of personnel
- Emergency eyewash

Anchor QEA and/or subconsultants will provide this equipment, which must be at the location(s) where field activities are being performed. Equipment will be checked daily to verify its readiness for use.

7.4.2 Working at Excavation or Trenching Sites

Observe the following site control practices and procedures when working around excavation and trenching sites:

- A "competent person" is required per Occupational Safety and Health Act (OSHA), 29 CFR 1926.P.
- Safeguard open excavations by restricting unauthorized access.
- Highlight the work area using prominent warning signs (e.g., cones, sawhorses, or other barricades, and signage) placed a minimum of 10 feet back from the excavation opening.
- Maintain zone definition along the perimeter with a continuous string of high-visibility caution tape.

7.4.2.1 Excavations Left Unattended or Overnight

Use one of the following methods for excavations left unattended or overnight:

- Surround the entire perimeter with plastic or cloth construction net fencing. Anchor the fencing to the ground using steel posts driven into the ground. Space out posts no greater than 8 feet apart. The fence should be a minimum of 4 feet high. Fence material must be of a quality capable of withstanding a pressure of 200 pounds. Place the fencing a minimum of 10 feet back from the excavation opening.
- Place 8-foot-long barricades affixed with flashing lights end to end with 4-foot-high construction net fence attached to barricades.
- Use temporary curbing or concrete "jersey" barriers affixed with flashing signal lights or other effective warning signs.

7.5 Field Communications

Communications between all Anchor QEA employees and subcontractors at the work site can be verbal and/or non-verbal. Verbal communication can be affected by the on-site background noise and various PPE. See Table 7-1 for a list of the types of communication methods and equipment to use, depending on site conditions. Communication equipment must be checked daily to verify proper operation. All project personnel must be initially briefed on the communication methods prior to starting work; communication methods should be reviewed in daily safety meetings.

Table 7-1
Field Communication Methods

Type of Communication	Communication Device	Signal
Emergency notification	On-site Telephone or Cellular Telephone	Initiate phone call using applicable emergency numbers
Emergency notification among site personnel	Cellular telephone or via in-person communication	Initiate cell phone call or discussion
Hailing site personnel for non-emergency	Cellular telephone or via in-person communication	Initiate cell phone call or discussion
Hailing site personnel for emergency evacuation	Cellular telephone or via in-person communication	Initiate cell phone call or discussion
Hailing site personnel for distress, need help	Visual	Arms waved in circle over head
Hailing site personnel for emergency evacuation	Visual	Arms waved in criss-cross over head
Contaminated air/strong odor	Visual	Hands clutching throat
Break, lunch, end of day	Visual	Two hands together, break apart

8 Decontamination Procedures and Practices

8.1 Minimization of Contamination

The following measures will be observed to prevent or minimize exposure to potentially contaminated materials:

Personnel

- Do not walk through spilled materials.
- Do not handle, touch, or smell sample media directly.
- Make sure PPE has no cuts or tears prior to use.
- Protect and cover any skin injuries.
- Stay upwind of airborne dusts and vapors.
- Do not eat, drink, chew tobacco, or smoke in the work zones.

Sampling Equipment and Vehicles/Vessels

- Use care to avoid getting sampled media on the outside of sample containers.
- If necessary, bag sample containers before filling with sampled media.
- Place clean equipment on a plastic sheet to avoid direct contact with contaminated media.
- Keep contaminated equipment and tools separate from clean equipment and tools.
- Fill sample containers over a plastic tub to contain spillage.
- Clean up spilled material immediately to avoid tracking around the vehicle/vessel.

8.2 Decontamination Equipment

All vehicles, vessels, and equipment that have entered potentially contaminated areas will be visually inspected and, if necessary, decontaminated prior to leaving the area. If the level of vehicle contamination is low, decontamination may be limited to rinsing tires and wheel wells with an appropriate detergent and water. If the vehicle is significantly contaminated, steam cleaning or pressure washing may be required. Tools will be cleaned in the same manner. Rinsate from all decontamination activities will be collected for proper disposal. Decontamination of equipment and tools will take place within the CRZ.

The following supplies will be available to perform decontamination activities:

- Wash and rinse buckets
- Tap water and phosphate-free detergent
- Scrub brushes
- Distilled/deionized water
- Deck pump with pressurized freshwater hose (aboard the vessel)
- Pressure washer/steam cleaner, if appropriate
- Paper towels and plastic garbage bags

8.3 Personnel Decontamination

The FL will verify that all site personnel are familiar with personnel decontamination procedures as listed below. All personnel wearing PPE in a work area (EZ) must undergo decontamination prior to entering the SZ. Personnel will perform the following decontamination procedures:

- Wash and rinse outer gloves and boots in portable buckets to remove gross contamination.
- If suit is heavily soiled, rinse it off.
- Remove outer gloves; inspect and discard if damaged. Leave inner gloves on. Personnel will remove their outer garment and gloves, dispose of them, and properly label container or drum. Personnel will then decontaminate their hard hats and boots with an aqueous solution of detergent or other appropriate cleaning solution. These items then will be hand-carried to the next station. Remove inner gloves.
- Thoroughly wash hands and face before leaving CRZ.
- Sanitize respirators and place in a clean plastic bag.

8.4 Sampling and Processing Equipment Decontamination

To prevent sample cross-contamination, sampling and processing equipment in contact with soil, sediment, or water samples will undergo the following decontamination procedures when work is completed in the CRZ and prior to additional use:

1. Rinse with potable water and wash with scrub brush.
2. Wash with phosphate-free detergent (Alconox).
3. Visually inspect the sampler and repeat the scrub and rinse step, if necessary. If scrubbing and rinsing with Alconox is insufficient to remove visually observable tar-related contamination on equipment, the equipment will be scrubbed and rinsed using hexane (or similar type solution) until all visual signs of contamination are absent.
4. Rinse external sampling equipment with potable water three times prior to use. Rinse homogenizing equipment once with potable water and three times with distilled water prior to and between sample processing.

8.5 Handling of Investigation-Derived Waste

All remaining soil or sediment, fluids used for decontamination of sampling equipment, and sample collection disposable wastes (e.g., gloves, paper towels, foil, or others) will be placed into appropriate containers and staged on site for disposal.

8.5.1 Disposable Personal Protective Equipment

Disposable PPE may include Tyvek suits, inner latex gloves, and respirator cartridges. Dispose of PPE according to the requirements of the client and state and federal agencies.

8.5.2 Non-Disposable Personal Protective Equipment

Non-disposable PPE may include respirators and boots and gloves. When decontaminating respirators, observe the following practices and procedures:

- Wipe out the respirator with a disinfecting pad prior to donning.
- Decontaminate the respirator on site at the close of each day with an approved sanitizing solution.

When decontaminating boots and gloves, observe the following practices and procedures:

- Decontaminate the boots or gloves outside with a solution of detergent and water; rinse with water prior to leaving the site.
- Protect the boots or gloves from exposure by covering with disposable covers such as plastic to minimize required decontamination activities.

8.6 Sanitizing Personal Protective Equipment

Respirators, reusable protective clothing, and other personal articles must be not only decontaminated before being reused, but also sanitized. The insides of masks and clothing become soiled due to exhalation, body oils, and perspiration. Manufacturer's instructions should be used to sanitize respirator masks. If practical, reusable protective clothing should be machine-washed after a thorough decontamination; otherwise, it must be cleaned by hand.

8.7 Emergency Personnel Decontamination

Personnel with medical problems or injuries may also require decontamination. There is the possibility that the decontamination may aggravate or cause more serious health effects. If prompt lifesaving, first aid, and medical treatment are required, decontamination procedures will be omitted. In either case, a member of the site management team will accompany contaminated personnel to the medical facility to advise on matters involving decontamination.

8.8 Containment of Decontamination Fluids

As necessary, spill control measures will be used to contain contaminated runoff that may enter into clean areas. Use plastic sheeting, hay bales, or install a spill control system to prevent spills and contain contaminated water.

8.9 Pressure Washing

The following procedure is required when using high-pressure washing equipment for decontamination purposes:

- Wear modified Level D protection, including a face shield and safety goggles.
- Verify that other personnel are out of the area prior to decontamination.

- Secure the area around the decontamination pad with cones, caution tape, or barricades.
- Verify that safe work practices and precautions are taken to minimize the potential for physical injury from high-pressure water spray. Follow the manufacturer's operating instructions.
- The pressure washer wand must be equipped with a safety release handle.
- Verify that the area is clean after equipment is decontaminated. Barricades, cones, or caution tape must be left in place and secured at all times.

9 Health and Safety Training and Informational Programs

This section describes the health and safety training and informational programs with which Anchor QEA project site personnel must comply. All certifications required in this section are provided in Appendix D and will be kept on internal file.

9.1 Initial Project Site Orientation

Work on all Anchor QEA project sites requires participation in an initial health and safety orientation presented by the PM or FL that will consist of, at a minimum, the following topics:

- A review of the contents of this HASP, including the Scope of Work and associated site hazards and control methods and procedures.
- Provisions of this plan are mandatory for all Anchor QEA personnel assigned to the project.
- Anchor QEA subcontractors are also expected to follow the provisions of this plan unless they have their own HASP that covers their specific activities related to this project and includes the minimum requirements of this HASP.
- All visitors to the work site will also be required to abide by the requirements of this plan.
- Personnel assigned to perform work at the project site, working under the provisions of this HASP, will be required to read the plan and must sign the Health and Safety Plan Acknowledgement Form to confirm that they understand and agree to abide by the provisions of this plan. Personnel not directly affiliated with the project (i.e., visitors) may also be required to sign the Liability Waiver.

9.2 Daily Safety Meetings

Daily safety meetings ("tailgate meetings") make accident prevention a top priority for everyone and reinforce awareness of important accident-prevention techniques. The following daily safety meeting procedures and practices are required:

- Daily safety meetings will be held each morning prior to conducting site activities.
- The Daily Safety Briefing form in Appendix A will be used to document each meeting.
- Copies of the completed Daily Safety Briefing forms will be maintained on site during the course of the project.

9.3 End-of-Day Wellness Checks

Similar to the daily safety meetings, field staff will gather at the end of the day to verify group health and wellness and discuss any near misses that occurred that day. The wellness checks will be recorded on that day's Daily Safety Briefing form.

9.4 Hazardous Waste Operations Training

Personnel working on project sites that present a potential exposure to hazardous wastes or other hazardous substances shall be trained in accordance with the requirements of the 29 CFR 1910.120 (HAZWOPER) regulation. Training requirements will consist of the following:

- Field personnel must complete a minimum of 40 hours of hazardous waste activity instruction.
- Field personnel must complete a minimum of 3 days of supervised field instruction.
- Field personnel assigned to the site will also have received 8 hours of refresher training if the time lapse since their previous training has exceeded 1 year.
- On-site managers and supervisors directly responsible for employees engaged in hazardous waste operations will receive an additional 8 hours of supervisory training.
- Field personnel shall be current in first aid/CPR training offered by the American Red Cross or equivalent.
- Other training may be required depending on the task to be performed (e.g., confined space, excavation/trenching, underground storage tank removal, fall protection, respiratory protection, and hazard communication).

9.5 Hazard Communication Program

The purpose of hazard communication (Employee Right-to-Know) is to verify that the hazards of all chemicals located at the field project site are communicated to all Anchor QEA personnel and subcontractors according to 29 CFR 1926.59. Refer to the Anchor QEA Hazard Communication Program document for additional information.

Every container of hazardous materials must be labeled by the manufacturer, who must also provide a SDS upon initial order of the product and upon request thereafter. The actual format may differ from company to company (e.g., National Fire Protection Association [NFPA], Hazardous Material Information System [HMIS], or other), but the labels must contain similar types of information. Maintain manufacturer labels if possible. The label may use words or symbols to communicate the following:

- Introduction
- Hazard(s) identification
- Composition/information on ingredients
- First-aid measures
- Fire-fighting measures
- Accidental release response measures
- Handling and storage
- Exposure controls/personal protection
- Physical and chemical properties

- Stability and reactivity properties
- Toxicological properties
- Ecological properties
- Disposal considerations
- Transport considerations
- Regulatory information
- Other information, including at a minimum, label preparation or last revision date

SDS for all chemicals brought onto the site or anticipated to be used on site shall be provided in Appendix C of this HASP. These SDS shall be readily available for reference by site personnel and emergency response personnel.

Hazardous materials received without proper labels shall be set aside and not distributed for use until properly labeled.

If a hazardous chemical is transferred into a portable container (approved safety can), even if for immediate use only, the contents (e.g., acetone or gasoline) of the portable container must be identified.

10 General PPE Requirements

The minimum level of PPE should be selected according to the hazards that may be encountered during site activities in accordance with established U.S. Environmental Protection Agency (EPA) levels of protection (D and C). Only PPE that meets American National Standards Institute (ANSI) standards shall be worn. Site personnel must maintain proficiency in the use and care of PPE. Damaged or defective PPE must be replaced and may not be used. Anchor QEA will provide all necessary PPE for its employees as described in this HASP.

Refer to Section 5 for site-specific job task and level-of-protection requirements.

10.1 Minimum Requirements: Level D Protection

The minimum level of protection on project sites will be Level D protection, which consists of the following equipment:

- Standard work uniform/coveralls
- Work boots with safety toe conforming to ASTM International (ASTM) F2412-05/ASTM F2413-05
- Approved safety glasses or goggles (meets ANSI Z87.1—2010 requirements for eye protection)
- Hard hat (meets ANSI Z89.1—1986 requirements for head protection)
- High-visibility traffic safety vest
- Hearing protection when there are high noise levels

Level D protection will be used only when:

- The atmosphere contains no known hazards
- Work functions preclude splashes, immersions, or the potential for unexpected inhalation of, or contact with, hazardous concentrations of chemicals
- Atmospheric concentrations of contaminants are less than the Permissible Exposure Limit (PEL) and/or Threshold Limit Value (TLV)

10.1.1 Modified Level D Protection Requirements

Depending on the Scope of Work and the potential hazards to be encountered, Level D protection shall be modified to include additional protective equipment such as USCG-approved PFDs, face shields/goggles, chemical-resistant clothing, and disposable gloves of varying materials depending on the chemical substances involved. An upgrade to Modified Level D occurs when there is a possibility that contaminated media can contact the skin or work uniform, or if unique, site-specific hazards exist.

10.2 Respiratory Protection Requirements

Respiratory protection devices may potentially be used for protection against particulates and organic vapors during the course of an Anchor QEA field project. The need for respiratory protection will be determined by air monitoring results and site conditions, and in accordance with Anchor QEA's RPP (contact David Templeton with questions). However, engineering and administrative controls must first be evaluated for use as the primary controls for protection against site respiratory hazards. In the event that engineering and administrative controls are deemed not feasible, respiratory protection will be required.

Respiratory protection is not anticipated for either phase of this project. Should air monitoring demonstrate a need for respiratory protection work will be stopped and the PM and DOHS will be consulted before modifying or proceeding with work.

11 General Air Monitoring Requirements

11.1 General Requirements

In general, air monitoring shall be conducted when the possibility of hazardous atmospheres, chemical volatilization, or contaminated airborne dust exists (e.g., from intrusive activities involving contaminated soils or groundwater, developing new monitoring wells, working with wells containing known COCs, confined space entry, or others).

Air movers or other engineering controls shall be used to exhaust or dilute solvent vapors emanating from monitoring wells or hazardous atmospheres in confined spaces prior to the use of respiratory protection devices.

Site-specific air monitoring action levels are provided in Section 5.2.

11.2 Real-Time Air Monitoring Equipment

As applicable, organic vapor concentrations shall be monitored in the field with either a photoionization detector (PID) or flame ionization detector (FID). Flammable vapors and/or gasses are monitored with an oxygen/lower-explosive limit (O_2/LEL) real-time instrument. Organic vapor measurements are usually taken in the breathing zone of the worker while O_2/LEL measurements are taken at the point of operation (e.g., monitoring well head or auger point).

As applicable, airborne dust/particulate concentrations shall be measured using a real-time aerosol monitor (using a scattered light photometric sensing cell) when there are visible signs of potentially contaminated airborne dust. Both area and personal air monitoring readings are to be taken to characterize site activities.

As applicable, colorimetric detector tubes shall be used to monitor specific COCs such as benzene or vinyl chloride if there is a possibility that they may be present in elevated concentrations based upon the background of the project site, the Scope of Work, and conditions discovered at the site.

As applicable, other real-time air monitoring equipment, such as hydrogen cyanide meters, may be utilized depending upon the Scope of Work and COCs.

Air monitoring results shall be documented on the Daily Air Monitoring Record form (see Appendix A) or in the field logbook.

11.3 Time-Integrated Air Monitoring Equipment

Some Anchor QEA projects may require the use of time-integrated air monitoring equipment to determine employee exposures to COCs. Time-integrated air monitoring would be required if there is the possibility that employees would be exposed to concentrations of a COC that approach or

exceed an established exposure limit. Typical time-integrated sampling methods will usually involve the use of personal sampling pumps and associated filter and/or charcoal sampling media, or the use of diffusion-based sampling media. Exposed sampling media are normally sent to an accredited laboratory for analysis. Contact the DOHS for consultation and assistance with the performance of time-integrated air monitoring activities.

11.4 Equipment Calibration and Maintenance

Calibration and maintenance of air monitoring equipment shall follow manufacturer specifications and must be documented. Recalibration and adjustment of air monitoring equipment shall be completed as site conditions and equipment operation warrant. Record all air monitoring equipment calibration and adjustment information on the Daily Air Monitoring Record form (see Appendix A) and in the field logbook.

11.5 Air Monitoring Action Levels

Air monitoring action levels have been developed that stipulate the chemical concentrations in the breathing zone that require an upgrade in level of PPE.

Air monitoring action levels are typically set at one-half of the OSHA PEL, NIOSH Recommended Exposure Limit (REL), or the American Conference of Governmental Industrial Hygienists (ACGIH) TLVs. The rationale for establishing action levels is based on the available data that characterize COCs in site media.

Air monitoring measurements shall generally be taken in the breathing zone of the worker most likely to have the highest exposure. Transient peaks will not automatically trigger action. Action will be taken when levels are consistently exceeded in a 2-minute period. Similarly, if chemical odors are detected that are a nuisance, bothersome, or irritating, an upgrade in respiratory protection can provide an extra level of comfort or protection when conducting site activities.

11.6 Air Monitoring Frequency Guidelines

In general, conduct periodic air monitoring when:

- It is possible that an immediately dangerous to life or health (IDLH) condition or a flammable atmosphere has developed (e.g., confined space entry or intrusive activities).
- There is an indication that exposures may have risen over established action levels, PELs, or published exposure levels since the last monitoring. Look for a possible rise in exposures associated with the following situations:
  - Change in site area (e.g., work begins on a different section of the site).
  - Change in on-site activity (e.g., one operation ends and another begins).
  - Change in contaminants (e.g., handling contaminants other than those first identified).

- Visible signs of particulate exposure from intrusive activities such as drilling, boring, or excavation.
- Perceptible chemical odors or symptoms of exposure.
- Handling leaking drums or containers.
- Working with obvious liquid contamination (e.g., a spill or lagoon).
- When the possibility of volatilization exists (such as with a new monitoring well or a well containing known COCs).

12 Health and Safety Procedures and Practices

In addition to the task-specific JSAs listed in Section 6.1 and presented in Appendix B, this section lists the health and safety procedures and practices applicable to this project. For additional information, consult with the PM.

12.1 Physical Hazards and Controls

12.1.1 General Site Activities

Observe the following general procedures and practices to prevent physical hazards:

- Legible and understandable precautionary labels shall be affixed prominently to containers of potentially contaminated soil, sediment, water, and clothing.
- No food or beverages shall be present or consumed in areas that have the potential to contain COCs and/or contaminated materials or equipment.
- No tobacco products or cosmetics shall be present or used in areas that have the potential to contain COCs and/or contaminated materials or equipment.
- An emergency eyewash unit shall be located immediately adjacent to employees who handle hazardous or corrosive materials, including decontamination fluids. All operations involving the potential for eye injury or splash must have approved eyewash units locally available capable of delivering at least 0.4 gallons per minute for at least 15 minutes.
- Personnel working within 10 feet of bodies of water shall wear USCG-approved PFDs.
- Certain project sites may have newly finished work (e.g., concrete, paving, framing, habitat reconstruction, or sediment caps) that may be damaged by unnecessary contact, or that could cause dangerous conditions for personnel (e.g., slipping, sinking, or tripping). Personnel working in or around these areas shall communicate with the PM, FL, and client contact as needed to prevent damaging new work or entering dangerous conditions.
- Generally, all on-site activities will be conducted during daylight hours. If work after dusk is planned or becomes necessary due to an emergency, adequate lighting must be provided.
- Hazardous work, such as handling hazardous materials and heavy loads and operating equipment, should not be conducted during severe storms.
- All temporary electrical power must have a ground-fault circuit interrupter (GFCI) as part of its circuit if the circuit is not part of permanent wiring. All equipment must be suitable and approved for the class of hazard present.

12.1.2 Slips, Trips, and Falls

Observe the following procedures and practices to prevent slips, trips, and falls:

- Inspect each work area for slip, trip, and fall potential prior to each work task.

- Slip, trip, and fall hazards identified must be communicated to all personnel. Hazards identified shall be corrected or labeled with warning signs to be avoided.
- All personnel must be aware of their surroundings and maintain constant communication with each other at all times.

12.1.3 Ergonomic Considerations

Certain field tasks may involve workers in fixed positions (e.g., observing subcontractor work) or performing repetitive motions over a period of time (e.g., sediment sample processing). It is important that workers self-monitor for ergonomic fatigue (e.g., soreness, tightness, stiffness, or pain in muscles) and make adjustments to work tasks, body positions, or work areas so that ergonomic stressors are minimized. Suggestions for decreasing the likelihood of ergonomic stress include the following:

- Limit fixed positions. Periodically vary standing and sitting positions, take frequent short walks, and modify observation locations when possible.
- Minimize extreme postures. Conduct work tasks using comfortable postures (particularly if the tasks are repetitive), and use tools or structures to minimize the need to hold or work with materials or access the work area.
- Limit contact stress. Be aware of soft tissue resting on hard surfaces, and limit these occurrences (e.g., use comfortable footwear, and use tools to hold materials).
- Contact the Field Mobilization Team in advance for prolonged field efforts that involve a field trailer. This group can set up field staff with a monitor, mouse, and keyboard so they are not working solely on laptops.
- Take breaks from work tasks, particularly repetitive ones.
- Consider performing stretching exercises before and during work activities, if those tasks are anticipated to be long in duration and/or strenuous.

12.1.4 Corrosive Material Handling Procedures

Corrosive materials include acids and bases. They are extremely corrosive materials with a variety of uses. Acids include hydrochloric, nitric, and sulfuric acids. Bases include sodium hydroxide. Observe the following procedures when working with corrosive materials:

- Wear gloves and eye-splash protection while using acid dispensed from a small dropper bottle during water sampling.
- Wear a full-face APR equipped with combination cartridges (organic vapor/acid gas) as well as Tyvek coveralls and nitrile gloves for large volume applications.
- Have an eyewash bottle and/or portable eyewash station on site.
- Do not add anything into a virgin chemical drum, including unused product.

- Avoid mixing strong acids and bases. Consult the CHSM for task-specific evaluation. If mixing is absolutely necessary, do it slowly. Avoid vapors or fumes that are generated.
- When diluting acids and bases, add the acid or base to water in small quantities and mix cautiously.

12.1.5 Sediment Core Sampling

Sediment samples will be collected using a "Mud Mole" or vibracore sampling equipment operated from a boat. Please see Sections 12.1.18 and 12.1.19 for additional safety information regarding working on or near the water.

All operations involving the use of powered sediment coring rigs will follow generally accepted drilling/coring practices. One person will be assigned the responsibility of Lead Driller/Corer. Additional personnel will assist with equipment as needed. The Lead Driller/Corer will be responsible for operating the drilling/coring rig and ensuring safety.

General rules associated with drilling/coring rig operations will be as follows:

- While drilling, all non-essential personnel shall remain at a distance that is past the radius of any moving parts.
- All operators and team members will be familiar with the rig operations and will have received practical training.
- All personnel will be instructed in the use of the emergency kill switch/shutdown on the drill rig.
- No loose-fitting clothing, jewelry, or free long hair is permitted near the drilling rig or moving machinery parts.
- A first aid kit and fire extinguisher will be available at all times.
- No drilling will occur during impending electrical storms or tornadoes, or when rain, ice, snow, or wind conditions create undue potential hazards.
- Never allow "horsing around" within the vicinity of the drill rig and tool and supply storage areas, even when the drill rig is shut down.

12.1.6 Underground or Overhead Utility Line Contact Prevention

Observe the following underground/overhead utility line contact prevention procedures and practices:

- Prior to conducting work, the PM or FL shall verify that all existing underground or overhead utilities in the work area are located per the state or local mark-out methods and subcontract. Documentation of utility mark-out shall be completed using the Utility Contact Prevention Checklist form (see Appendix A). No excavation work is to be performed until all utility mark-outs are verified.

- The PM or FL shall conduct a site survey to search for signs of other buried or overhead utilities. The results of such surveys shall be documented on the Utility Mark-out documentation form.
- The property owner or facility operator shall be consulted on the issue of underground utilities. As-built drawings shall be reviewed, when available, to verify that underground utility locations are consistent with the utility location mark-outs. All knowledge of past and present utilities must be evaluated prior to conducting work.
- If on-site subsurface utility locations are in question, a private locating service shall be contacted to verify locations. If the investigation calls for boreholes in an area not covered by the municipal One-Call system, then a private utility locate firm shall be contacted to determine the location of other underground utilities.
- The PM shall have documented verbal contact and an agreement with the fiber optic company for all work within 50 feet of any fiber optic cables.
- **Only non-destructive excavation, such as hand digging or hydro excavation, is permitted within 3 feet of underground high voltage, product, or gas lines.** Once the line is exposed, heavy equipment can be used, but must remain at least 3 feet from the exposed line.
- Elevated superstructures (e.g., drill rig, backhoe, scaffolding, ladders, and cranes) shall remain a distance of 10 feet away from utility lines and 20 feet away from power lines. Distance from utility lines may be adjusted by the FL depending on actual voltage of the lines.
- Overhead utility locations shall be marked with warning tape or flags where equipment has the potential for contacting overhead utilities.

Table 12-1 shows the minimum clearances required for energized overhead electrical lines.

Table 12-1
Overhead Utility Clearance Requirements

Minimum Clearance from Energized Overhead Electric Lines	
Nominal System Voltage	**Minimum Required Clearance**
0 to 50 kV	10 feet
51 to 100 kV	12 feet
101 to 200 kV	15 feet
201 to 300 kV	20 feet
301 to 500 kV	25 feet
501 to 750 kV	35 feet
751 to 1,000 kV	45 feet

Notes:
Whenever equipment operations must be performed closer than 20 feet from overhead power lines, the FL must be notified. When clearance to proceed is received from the FL, the electric utility company must be contacted to turn the power off or physically insulate (protect) the lines if the operation must be performed closer to the power line than is allowed in this table. For voltages not listed on this table, add 0.4 inches per kilovolt (kV) to obtain the safe distance between equipment and power lines.

12.1.7 Electric Safety

Observe the following procedures and practices to prevent electric shock:

- General
  - Use only appropriately trained and certified electricians to perform tasks related to electrical equipment. A good rule of thumb is to defer any task that would not normally and reasonably be completed by the average public consumer.
  - Each circuit encountered will be considered live until proven otherwise.
  - Only proper tools will be used to test circuits.
  - No wire will be touched until the circuit is determined to be de-energized.
- Extension Cords
  - All extension cords used on any project will be three-pronged.
  - All extension cords will be in good working order.
  - Each extension cord ground will be tested for continuity on at least a quarterly basis and marked to indicate when the inspection occurred.
  - Each extension cord will be visually inspected before each use.
  - If any extension cord is found in disrepair or fails the continuity test, it will be taken out of service.
  - Any extension cord that does not have the grounding pin will be taken out of service and not used.
  - Extension cords will not be used in place of fixed wiring.
  - Extension cords will not be run through holes in walls, ceilings, or floors.
  - Extension cords will not be attached to the surface of any building.
  - No extension cord will be of the "flat wire" type. Every extension cord will have each individual wire insulated and further protected by an outside cover.
  - Be sure to locate extension cords out of traffic areas or, if this is unavoidable, flag cords and protect workers from tripping over them (i.e., use barricades and tape the cord down).
  - Do not stage extension cords or powered equipment in wet areas, to the degree possible. Elevate cords, connections, and equipment out of puddles.
- Power Tools/Plug and Cord Sets
  - Any cord that is cut in a way that exposes insulation will be removed from service.
  - All tools and plug and cord sets will be tested for continuity.
  - If grounding pins are missing, the plug and cord will be removed from service.
  - Any tool or plug and cord set failing the continuity test will be removed from service.
  - All power tools will have three-pronged plugs unless double insulated.

- Ground-fault Circuit Interrupters
  - Each 120-volt electrical wall receptacle providing power to the job site will be protected by a portable GFCI.
  - Each GFCI will be tested quarterly and marked to indicate when the inspection occurred.
  - Each 120-volt, single-phase, 15- and 20-ampere receptacle outlet, including those on generators, will have an approved GFCI.
  - GFCIs will be located in line as close to the piece of equipment as possible.
- Specific
  - If unsure if a task requires specific electrical training, err on the side of caution and contact the PM and FL prior to proceeding.
  - If subsurface work is to be performed, follow the guidelines in Section 12.1.6 and conduct utility locating prior to work and in accordance with local ordinances.
  - If lock out/tag out (LO/TO) procedures are required (i.e., de-energizing machinery or equipment so work may be performed), the equipment owner must provide LO/TO procedures and training. By default, the equipment owner should perform any LO/TO. If it becomes necessary for Anchor QEA personnel to perform LO/TO tasks, contact the PM and FL prior to doing so.
  - Maintain appropriate distance from overhead utilities (see Table 12-1).
  - If unexpected electrical equipment is encountered (i.e., buried wire) assume it is live, stop work, and contact the PM and FL immediately.
  - If working in enclosed or restricted areas where electrical hazards may be present, contact a licensed electrician or other suitably trained party to provide barriers, shields, or insulating materials to prevent electric shock.
  - If working in areas where electrical hazards are present, verify that conductive clothing and jewelry is replaced with non-conductive clothing, or removed.

12.1.8 General Falls and Ladder Usage

Observe the following general falls and ladder usage procedures and practices:

- Assess work areas for fall hazards. A fall protection system that meets OSHA and ANSI Z3591 standards must be used if work is conducted 6 feet or more above the surface.
- Use ANSI Type 1A rated ladders.
- Verify that ladders are placed so their rungs, cleats, and steps are parallel, level, and uniformly spaced prior to use.
- Make sure ladder rungs are sturdy and free of cracks.
- Use ladders with secure safety feet.
- Pitch ladders at a 1 horizontal to 4 vertical (1H:4V) ratio.
- Secure ladders at the top or have another person at the bottom to help stabilize it.

- Ladders used to access an upper landing surface shall extend at least 3 feet above the upper landing surface.
- Use non-conductive ladders near electrical wires.
- The top rung of a ladder should not be used as a step.
- Do not carry any object or load that could cause a loss of balance or a fall.
- If a ladder is defective, damaged, or in disrepair (i.e., broken or missing rungs, cleats, or steps; broken or split rails; corroded components; or other faulty or defective components), tag the ladder "Do Not Use" and remove it from service until repaired.

12.1.9 Heavy Equipment Operations

Observe the following heavy equipment operations procedures and practices:

- Wear leather gloves while attaching support members to protect against pinching injuries.
- While working from elevated levels greater than 6 feet, verify that all employees have fall protection that meets OSHA and ANSI Z3591 standards.
- Do not stand under loads that are being raised or lowered with cranes or aerial lifts.
- The subcontractor or Anchor QEA equipment operator must conduct pre-operational inspections of all equipment. In addition, daily inspections will be conducted on the equipment prior to site activities.
- Maintain the appropriate distance from overhead utilities (see Table 12-1):
- Always stay out of the swing radius of all heavy equipment. Always use a spotter during movement of equipment. The spotter and others, as appropriate, shall maintain constant communication with the operator.
- All operators must have adequate training and be qualified to operate the particular heavy equipment unit.
- Conduct a site evaluation to determine proper positioning for the unit. Make sure the surface is level. Cordon off holes, drop-offs, bumps, or weak ground surfaces.
- When using a crane, do not use hands when the load is being lifted or lowered. Use non-conductive tag line to help direct and position the load.
- Never climb a raised platform or stand on the mid-rail or top-rail.
- Tools should always be hung or put into a belt whenever possible

12.1.10 Drilling with a Hollow Stem Auger Drill Rig

All operations involving the use of powered drilling rigs will follow generally accepted drilling practices. One person will be assigned the responsibility of Lead Driller. Additional personnel will assist with equipment as needed. The Lead Driller will be responsible for operating the drilling rig and ensuring safety.

General rules associated with drilling rig operations will be as follows:

- An Exclusion Zone will be established around the drilling rig using barricade tape as a physical barrier.
- While drilling, all non-essential personnel shall remain at a distance that is past the radius of the boom, whenever possible. Workers (e.g., drillers, hydrogeologists, etc.) remaining around the drill rig will be kept to a minimum.
- All vehicles and heavy equipment must be parked at least 50 feet from the drill rig when lowering the mast.
- All operators and team members will be familiar with the rig operations and will have received practical training.
- All personnel will be instructed in the use of the emergency kill switch/shutdown on the drill rig.
- Hard-hats, steel-toed boots conforming to ASTM F2412-05/ASTM F2413-05, goggles or safety glasses with side shields, hearing protection, and gloves for hand protection are required.
- As project conditions dictate (i.e., the presence of puncture or crushing risks to the feet), protective shanks and/or metatarsal guards conforming to ASTM F2412-05/ ASTM F2413-05 must be worn.
- No loose-fitting clothing, jewelry, or free long hair is permitted near the drilling rig or moving machinery parts.
- Before leaving the controls, the Lead Driller will shift the transmission controlling the rotary drive into neutral and place the feed level in neutral. Before leaving the vicinity of the drill, the Lead Driller will shut down the drill engine.
- Drilling must cease immediately if combustible gas concentrations greater than 20% of the LEL are detected in the work area.
- A first aid kit and fire extinguisher will be available at all times.
- If lubrication fittings are not accessible with guards in place, machinery must be stopped for oil and greasing.
- The work area around the borehole shall be kept free of obstructions and undue accumulations of oil, water, ice, or circulating fluids.
- No drilling will occur during impending electrical storms or tornadoes, or when rain, ice, snow, or wind conditions create undue potential hazards.
- During freezing weather, do not touch any metal parts of the drill rig with exposed flesh. Freezing of moist skin to metal can occur almost instantaneously.
- The driller will not attempt to reach a well or borehole location in a manner that compromises the safety of the rig or team.
- All well or borehole locations will be inspected by the drill team to verify that a stable surface exists.

- Before raising the drill mast, the Lead Driller will check for overhead obstructions.
- Before the mast of a drill rig is raised, the drill rig must first be leveled and stabilized with leveling jacks and/or cribbing. Re-level the drill rig if it settles after initial setup. Lower the mast only when the leveling jacks are down, and do not raise the leveling jack pads until the mast is lowered completely.
- The drill rig shall be driven or moved only after the mast has been lowered.
- The leveling jacks shall not be raised until the derrick is lowered.
- Adequately cover or protect all unattended boreholes to prevent drill rig personnel or site visitors from stepping or falling into the borehole.
- Maintain professional behavior at all times in the work area, even when the rig is shut down.

Rotary Drill Rig Operations:

- Drillers must never engage the rotary clutch without watching the rotary table and ensuring that it is clear of personnel and equipment.
- Unless the drawworks is equipped with an automatic feed control, the brake must not be left unattended without first being tied down.
- Drillers will not add or remove pipe from the drill stem without assistance from the driller's helper.
- Drill pipe must not be hoisted until the driller is sure that the pipe is latched and the drilling assistant has signaled that he/she may safely hoist the load.
- During instances of unusual loading of the derrick or mast, such as when making an unusually hard pull, only the driller will be on the rig floor and no one will be on the rig or derrick.
- The brakes on the drawworks of every drilling rig must be tested at the beginning of each shift to determine whether they are in good order.
- A hoisting line with a load imposed will not be permitted to be in direct contact with any derrick member or stationary equipment unless it has been specifically designed for line contact.
- Hoisting control stations must be kept clean and controls shall be labeled as to their functions.
- Under no circumstances will personnel be permitted to ride the traveling block or elevators, nor will the cat line be used as a personnel carrier.

12.1.11 Hand and Power Tools

Observe the following procedures and practices when working with hand and power tools:

- Keep hand tools sharp, clean, oiled, dressed, and not abused.
- Worn tools are dangerous. For example, the "teeth" in a pipe wrench can slip if worn smooth, an adjustable wrench will slip if the jaws are sprung, and hammerheads can fly off loose handles.

- Tools subject to impact (e.g., chisels, star drills, and caulking irons) tend to "mushroom." Keep them dressed to avoid flying spalls, and use tool holders.
- Do not force tools beyond their capacity.
- Flying objects can result from operating almost any power tool, so always warn people in the vicinity and use proper eye protection.
- Each power tool should be examined before use for damaged parts, loose fittings, and frayed or cut electric cords. Tag and return defective tools for repairs. Verify that there is adequate lighting, inspect tools for proper lubrication, and relocate tools or material that could "vibrate into trouble."
- Compressed air must be shut off or the electric cord unplugged before making tool adjustments. Air must be "bled down" before replacement or disconnection.
- Proper guards or shields must be installed on all power tools before issue. Do not use improper tools or tools without guards in place.
- Replace all guards before startup. Remove cranks, keys, or wrenches used in service work.

12.1.12 Motor Vehicle Operation

All drivers are required to have a valid driver's license, and all vehicles must have appropriate state vehicle registration and inspection stickers. **Anchor QEA prohibits the use of hand-held wireless devices while driving any vehicle for business use at any time, for personal use during business hours, and as defined by law**. Additionally, site-specific motor vehicle requirements must be followed, if any.

When driving to, from, and within the job site, be aware of potential hazards including:

- Vehicle accidents
- Distractions
- Fatigue
- Weather and road conditions

To mitigate these hazards, observe the following procedures and practices regarding motor vehicle operation:

- Before leaving, inspect fuel and fluid levels and air pressure in tires, and adjust mirrors and seat positions appropriately.
- Wear a seat belt at all times and make sure that clothing will not interfere with driving.
- Plan your travel route and check maps for directions or discuss with colleagues.
- Clean windows and mirrors as needed throughout the trip.
- Wear sunglasses as needed.
- Fill up when the fuel level is low (not near empty).
- Follow a vehicle maintenance schedule to reduce the possibility of a breakdown while driving.

- Stop driving the vehicle, regardless of the speed (e.g., even 5 miles per hour) or location (e.g., a private road), when the potential of being distracted by conversation exists.
- Using hand-held communication devices (e.g., cell phones) while operating any motor vehicle is prohibited.
- Get adequate rest prior to driving.
- Periodically change your seat position, stretch, open the window, or turn on the radio to stay alert.
- Pull over and rest if you are experiencing drowsiness.
- Check road and weather conditions prior to driving.
- Be prepared to adjust your driving plans if conditions change.
- Travel in daylight hours, if possible.
- Give yourself plenty of time to allow for slowdowns due to construction, accidents, or other unforeseen circumstances.
- Use lights at night and lights and wipers during inclement weather.

12.1.13 Vehicular Traffic

Observe the following procedures and practices regarding vehicular traffic:

- Wear a high-visibility traffic safety vest when vehicle hazards exist.
- Use cones, flags, barricades, and caution tape to define the work area.
- Use a vehicle to block the work area (if conditions allow).
- Engage a police detail for high-traffic situations.
- Always use a spotter in tight or congested areas for material deliveries.
- As necessary, develop traffic control plans and train personnel as flaggers in accordance with the DOT MUTCD and/or local requirements.

See Section 7.4.2 for additional information regarding work in roadways.

12.1.14 Boating Operations

The following precautions shall be followed when conducting boating trailer and launch activities:

- Follow the trailer and boat manufacturers' instructions for securing the boat to the trailer.
- Follow the trailer manufacturer's instructions for securing the trailer to the towing vehicle.
- Prohibit site personnel from moving into trailer/vehicle pinch points without advising the vehicle operator.
- Use experienced operators when backing trailers on boat ramps.
- Wear proper work gloves when the possibility of pinching or other injury may be caused by moving or handling large or heavy objects.
- Maintain all equipment in a safe condition.
- Launch boats one at a time to avoid collisions.

- Use a spotter for vehicles backing boats to the launch area.
- Understand and review hand signals.
- Wear boots with non-slip soles when launching boats.
- Wear USCG-approved PFDs when working within 10 feet of the water.
- Keep ropes and lines coiled and stowed to eliminate trip hazards.
- Maintain three-point contact on dock/pier or boat ladders.
- Verify that drain plugs are in place.

The following precautions shall be followed when conducting boating operations:

- Maintain a current boater's license(s) as required.
- Wear USCG-approved PFDs for work activities within 10 feet of the water.
- Obtain and review information regarding dams that may be present in work areas, particularly with regard to "no boating" zones and safety buoys, cables, and warning signage.
- Maintain boat anchorage devices commensurate with anticipated currents, distance to shore, and water depths.
- Provide a floating ring buoy in the immediate boat launch/landing areas with at least 60 feet (18.3 meters) of line for a vessel less than 65 feet (19.8 meters) in length, or 90 feet (27.4 meters) of line for a vessel 65 feet (19.8 meters) or greater in length (see https://www.law.cornell.edu/cfr/text/46/117.70 for more information).
- Step into the center of the boat.
- Keep your weight low when moving on the boat.
- Move slowly and deliberately.
- Steer directly across other boat wakes at a 90-degree angle to avoid capsizing.
- Steer the boat facing forward.
- Watch for floating objects in the water.
- Right-of-way is yielded to vessels on your boat's right, or starboard, and vessels with limited ability to maneuver such as any wind-propelled vessel.

The following precautions shall be followed when working on a boat:

- Observe proper lifting techniques.
- Obey lifting limits (see Section 12.1.23)
- Use mechanical lifting equipment (i.e., pulleys or winches) to move large or awkward loads.
- Wear USCG-approved PFDs for work activities within 10 feet of the water.

The safety-related items listed in Table 12-2 shall be available when conducting boating operations.

Table 12-2
Safety Equipment Specific to In-Water Work

Additional Safety Equipment for Sampling Vessel per U.S. Coast Guard Requirements:	
• Proper vessel registration, numbering, and documentation (registered with state, certificate of vessel registration number displayed, and carrying a valid certificate of number) • USCG-approved personal flotation devices (PFDs; or life jackets) for every person on the sampling vessel (Type I, II, III, or V are required). High-visibility required by Anchor QEA. • Appropriate, non-expired, visual distress devices for day and night use from the following: – Three hand-held red flares (day and night), or – One hand-held red flare and two parachute flares (day and night), or – One hand-held orange smoke signal, two floating orange smoke signals (day), and one electric distress light (night only) • Alternate means of propulsion (oars or paddles) • Dewatering device (pump or bailer) • Properly maintained and inspected USCG-approved fire extinguishers (no fixed system = (2) B-1 or (1) B-2 type extinguishers; fixed system = (1) B-1 type extinguisher) • Proper ventilation of gasoline-powered vessels • Sound-producing device (whistle, bell, or horn) • VHF 2-way radio • Proper navigational light display • Throwable life ring with attached line (any vessel larger than 16 feet is required to carry one Type IV [throwable] PFD)	
Additional USCG Recommended Equipment Includes:	
• Extra visual distress signals • Primary and spare anchor • Heaving line • Fenders • First aid kit • Flashlight • Mirror • Searchlight • Sunburn lotion • Tool kit • Spare fuel	• Boat hook • Spare propeller • Mooring line • Food and water • Binoculars • Spare batteries • Sunglasses • Marine hardware • Extra clothing • Spare parts • Pertinent navigational chart(s) and compass

12.1.15 Working Over or Near Water

12.1.15.1 Personal Flotation Devices

PFDs are not required where employees are continuously protected from the hazard of drowning by railings, nets, safety belts, or other applicable provisions.

Type I, II, III or V USCG-approved, high-visibility PFD shall be provided and properly worn by all personnel in the following circumstances:

- On or within 10 feet of water
- On floating pipelines, pontoons, rafts, or stages
- On structures extending over or next to the water, except where guard rails or safety nets are provided for employees
- Working alone at night where there are drowning hazards, regardless of other safeguards provided
- In skiffs, small boats, or launches, unless in an enclosed cabin or cockpit
- Whenever there is a drowning hazard

The following precautions shall be followed when using PFDs:

- Prior to and after each use, the buoyant work vests or life preservers shall be inspected for defects that would alter their strength or buoyancy. Defective devices or devices with less than 13 pounds buoyancy shall be removed from service.
- All PFDs shall be equipped with reflective tape as specified in 46 CFR 25.25-15.
- Thirty-inch USCG-approved ring buoys with at least 150 feet of 600-pound capacity line shall be provided and readily available for emergency rescue operations. The distance between ring buoys shall not exceed 200 feet.
- PFD lights conforming to 46 CFR 161.012 shall be required whenever there is a potential need for life rings to be used after dark. Onshore installations, at least one life ring, and every third one thereafter, shall have a PFD light attached. PFD lights on life rings are required only in locations where adequate general lighting (e.g., floodlights or light stanchions) is not provided.

12.1.16 Excavation and Trenching Activities

Observe the following practices and procedures when performing excavation and trenching work.

The purpose of this procedure is to describe the company requirements for excavation and trenching safety. These requirements are based on the federal OSHA excavation standard found in 29 CFR 1926.P. Local regulations should also be consulted for the state in which the work is being performed.

With very few exceptions, protective systems must be designed and installed to protect employees who enter excavations of 4 feet or more in depth. Accepted protective systems include sloping, shoring, and shielding.

The protective system must be designed by a registered Professional Engineer (PE, civil), and plans must be available for inspections on site, under prescribed conditions.

12.1.16.1 Definitions

Angle of Repose: The greatest angle above the horizontal plane at which a material will lie without sliding.

Benching: A method of protecting employees from cave-ins by excavating the sides of an excavation to form one or a series of horizontal levels of steps, usually with vertical or near-vertical surfaces between levels.

Competent Person: An employee who is capable of identifying existing and predictable hazards in the surroundings or working conditions that are unsanitary, hazardous, or dangerous to employees, and who has the authority to take prompt corrective measures to eliminate them.

Excavation: Any man-made cut, cavity, trench, or depression in an earth surface, including its sides, walls, or faces, formed by earth removal.

Registered Professional Engineer: An individual currently registered as a PE (preferably civil) in the state where work is to be performed.

Sheeting: Members of a shoring system that retain the earth in position, and in turn are supported by other members of the shoring system.

Shield: A structure that is able to withstand the forces imposed on it by a cave-in and thereby protects employees within the structure. Shields can be permanent structures or can be designed to be portable and moved along as work progresses. Shields may be pre-manufactured or job-built in accordance with 29 CFR 1926.652(c)(3) or (c)(4). Shields used in trenches are usually referred to as "trench boxes" or "trench shields."

Shoring: Structure such as a metal hydraulic, mechanical, or timber shoring system that supports the sides of an excavation and that is designed to prevent cave-ins.

Sloping: A method of protecting employees from cave-ins by excavating to form sides of a trench that are inclined away from the excavation so as to prevent cave-ins. The angle of incline required to prevent a cave-in varies with differences in such factors as the soil type, environmental conditions of exposure, and application of surcharge loads.

Support System: A structure such as underpinning, bracing, or shoring, that provides support to an adjacent structure, underground installation, or the sides of an excavation.

Trench: A narrow (in relation to its length) excavation made below the surface of the ground. In general, the depth is greater than the width at the bottom, but the width of a trench at the bottom is not greater than 15 feet.

Type A Soil: Cohesive soils with an unconfined compressive strength of 1.5 tons per square foot (tsf) (144 kilopascal [kPa]) or greater. Examples of cohesive soils are: clay, silty clay, sandy clay, clay loam, and, in some cases, silty clay loam and sandy clay loam. Cemented soils such as caliche and hardpan are also considered Type A. However, soil is NOT Type A if:

- The soil is fissured
- The soil is subject to vibration from heavy traffic, pile driving, or similar effects
- The soil has been previously disturbed
- The soil is part of a sloped, layered system where the layers dip into the excavation on a slope of 4H:1V or greater
- The material is subjected to other factors that would require it to be classified as a less stable material

Type B Soil: This classification refers to:

- Cohesive soil with an unconfined compressive strength greater than 0.5 tsf (48 kPa), but less than 1.5 tsf (144 kPa)
- Granular, cohesionless soils including angular gravel (similar to crushed rock), silt, silt loam, sandy loam, and, in some cases, silty clay loam and sandy clay loam
- Previously disturbed soils except those that would otherwise be classified as Type C soil
- Soil that meets the unconfined compressive strength or cementation requirements for Type A, but is fissured or subjected to vibration
- Dry rock that is not stable
- Material that is part of a sloped, layered system where the layers dip into the excavation on a slope less steep than 4H:1V, but only if the material would otherwise be classified as Type B

Type C Soil: This classification refers to:

- Cohesive soil with an unconfined compressive strength of 0.5 tsf (48 kPa) or less
- Granular soils including gravel, sand, and loamy sand
- Submerged soil or soil from which water is freely seeping
- Submerged rock that is not stable
- Material in a sloped, layered system where the layers dip into the excavation or a slope of 4H:1V or steeper

12.1.16.2 Pre-Excavation Requirements

Underground Installations: Prior to opening an excavation, the estimated locations of underground utilities such as sewer, telephone, fuel, electric, water, or any other underground installations that may reasonably be expected to be encountered during the excavation work shall be determined.

The property owner and/or utility location service shall be contacted within the established pre-notification time, advised of the proposed work, and asked to delineate the location of all underground utilities. Employees should be careful to protect and preserve the utility markings until they are no longer required for safe excavation. At least 3 feet of clearance between any underground utility and the cutting edge or point of powered excavation equipment will be maintained until the precise location of the utility is determined. Initial excavation within this 3-foot area will be conducted manually.

Surface Encumbrances: All surface encumbrances (e.g., trees, poles, or boulders) that may create a hazard to employees shall be removed or supported.

Vehicular Traffic: Employees exposed to vehicular traffic shall be provided with, and shall wear, warning vests or other suitable garments marked with or made of reflectorized or high-visibility material. Traffic control devices (e.g., barricades, signs, cones, or flagpersons) shall be specified and used in accordance with regulations applicable to the roadway or area in which excavation activities are occurring.

12.1.16.3 Training

Those who supervise the entry of personnel into an excavation, a "Competent Person," must have completed a training course that included instruction in:

- Types of hazards associated with excavation operations
- Safe work practices and techniques
- A review of applicable federal, state, and local regulations
- A review of this procedure

Employees who enter excavations are required to complete a site-specific training session to enable them to recognize unsafe conditions in and around the excavation. This training can be conducted during a tailgate safety meeting that emphasizes the specific excavation hazards that may be encountered.

Training documentation shall be maintained in the project files. As part of the standard employee supervision process, training shall be complemented with on-the-job instruction and reinforcement of accepted practices to the extent necessary to verify compliance with this procedure and all other applicable regulations.

12.1.16.4 Excavation Work Practices

General: Each employee working within an excavation shall be protected from cave-ins by an adequate protective system designed in accordance with 29 CFR 1926.P, except when the excavation is made entirely in stable rock or when the excavation is less than 4 feet deep and examination of the ground by a competent person provides no indication of a potential cave-in. A competent person

shall verify that protective systems, when required, are installed and maintained per the design specifications. No employees shall be permitted to enter an excavation unless it is absolutely essential to do so and all requirements of this procedure are met.

Supervision: Work in an excavation shall be supervised at all times by a competent person. This individual will remain outside of the excavation at all times, and will be responsible for identifying any unusual developments aboveground that may warn of impending earth movement.

Soil Classification: Based on their training, the competent person will classify each soil or rock deposit as stable rock, Type A, Type B, or Type C. When layers of soil or rock exist, the weakest layer will be classified; however, each layer may be classified individually when a more stable layer lies under a less stable layer. If the properties or conditions of a soil or rock deposit change in any way, re-evaluation will be required.

Access and Egress: Structural ramps that are used solely by employees as a means of access or egress from excavations shall be designed by a competent person. Structural ramps used for access or egress of equipment shall be designed by a competent person qualified in structural design, and shall be constructed in accordance with the design.

A stairway, ladder, ramp or other safe means of egress shall be located in trench excavations that are 4 feet or more in depth so as to require no more than 25 feet of lateral travel for employees.

Protective Systems: Protective systems shall be designed in accordance with 29 CFR 1926.652(b) or (c) and shall have the capacity to resist, without failure, all loads that are intended or could reasonably be expected to be applied or transmitted to the system.

Exposure to Falling Loads: No employees shall be permitted underneath loads handled by lifting or digging equipment. Employees shall be required to stand away from any vehicle being loaded or unloaded to avoid being struck by spillage or falling materials. Operators may remain in the cabs of vehicles being loaded or unloaded provided the vehicles are equipped with a cab shield and/or canopy adequate to protect the operator from shifting or falling materials.

Warning System for Mobile Equipment: When mobile equipment is operated adjacent to an excavation, and the operator does not have a clear and direct view of the edge of the excavation, a warning system shall be utilized such as barricades, hand or mechanical signals, or stop logs.

Hazardous Atmospheres (see related information in Tables 5-1, 5-2, and 7-1): Where an oxygen-deficient (less than 19.5% O_2) or hazardous atmosphere exists, or could reasonably be expected to exist, the excavation shall be tested before employees enter. Testing shall be conducted as often as necessary to verify that the atmosphere remains safe. Some excavations may be considered confined spaces that require compliance with appropriate procedures (see Section 12.1.21). Adequate

precautions shall be taken to prevent employee exposure to oxygen-deficient or hazardous atmospheres. As appropriate, ventilation and/or respiratory protective devices shall be used (see Table 7-1).

Water Accumulation Hazards: Employees shall not work in excavations in which there is accumulated water, or in excavations in which water is accumulating, unless adequate precautions have been taken to protect employees against the hazards posed by water accumulation. If water is controlled or prevented from accumulating by the use of water removal equipment, the process shall be monitored by a competent person to verify proper operation.

If the excavation work interrupts the natural drainage of surface water (e.g., streams or run-off channels), diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation. Excavations subject to run-off from heavy rains shall be regularly inspected by a competent person.

Stability of Adjacent Structures: Structures adjoining an excavation shall be evaluated to assess their stability. Excavation below the level of the base or footing of any foundation or retaining wall that could reasonably be expected to pose a hazard to employees shall only be permitted when:

- A support system (underpinning) is provided to verify the safety of employees and the stability of the structure
- The excavation is in stable rock
- A registered PE has determined that the structure will be unaffected by the excavation
- A registered PE has determined that such excavation will not pose a hazard to employees

Sidewalks, pavements, and other surface structures shall not be undermined unless a support system or another method of protection is provided to protect employees from the possible collapse of such structures.

Protection from Loose Rock or Soil: Employees shall be protected from loose rock or soil that could fall or roll from the excavation face or edge. Such protection could consist of scaling to remove loose materials, or the installation of protective barriers. All spoil shall be placed at least 2 feet from the edge of the excavation. It is strongly recommended that spoil be placed 4 feet or more from the excavation edge so as not to cover surface indicators of subsidence (such as fissures or cracks).

Inspections: A competent person shall make daily inspections of excavations, adjacent areas, and protective systems for evidence of conditions that could result in a cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. The inspection shall be made prior to start of work, and as needed throughout the shift. Inspections shall be made after each rainstorm or other hazard-increasing event, and will be documented. Where the inspection finds

evidence of any hazardous condition, exposed employees shall immediately be removed from the hazardous area until necessary precautions have been taken.

Fall Protection: Where employees or equipment are permitted to cross over excavations, walkways or bridges shall be provided. Standard guard rails shall be provided where walkways are 6 feet or more above lower levels. Adequate barriers or other types of physical protection shall be provided at all remotely located excavations. All wells, pits, or shafts, shall be barricaded or covered, and shall be backfilled as soon as possible.

12.1.17 Noise

Excessive noise is hazardous not only because of its potential to damage hearing, but also because of its potential to disrupt communications and instructions. The following procedures and practices shall be followed to prevent noise-related hazards:

- All employees will have access to ear protection with a Noise Reduction Rating of not less than 30.
- Ear protection must be worn in any environment where site personnel must raise their voices to be heard while standing at a distance of 3 feet or less.
- Ear protection must be worn by any personnel observing or operating concrete cutting or sawing equipment, pile driving, or other loud noise-generating activities.

Hearing protection is required for site personnel operating or working near noisy equipment or operations, where the noise level is greater than 85 A-weighted decibels (dBA) (time-weighted average [TWA]), as well as personnel working around heavy equipment. The FL will determine the need and appropriate testing procedures, (i.e., sound level meter and/or dosimeter) for noise measurement.

When needed, a sound level meter will be used to measure noise levels at selected locations in the work area and on the site perimeter. When used, noise monitoring equipment must be calibrated before and after each shift.

If continuous noise levels are found to exceed 85 dBA at any location within the work area, warning signs will be posted. Site personnel and visitors will be notified that hearing protection is required. Appropriate hearing protection (i.e., ear plugs or ear muffs) will be worn whenever personnel or visitors are working in that location. A supply of ear plugs will be maintained on site.

Action levels in Table 12-3 will trigger the use of appropriate hearing protection (plugs or muffs). Hearing protection must be able to attenuate noise below 90 dBA (8-hour TWA). Each hearing protection or device has a Noise Reduction Rating (NRR) assigned by EPA. The calculation for a hearing protection device's effectiveness is as follows:

Equation 1

Noise reading $dBA - (NNR - 7dB) < 90dBA$

where:

dB	=	decibel
dBA	=	A-weighted decibel
NRR	=	Noise Reduction Rating

Table 12-3
Noise Exposure Action Levels

Instrument	Measurement	Action
Type I or Type II Sound Level Meter or Dosimeter	> 80 dBA to 85 dBA	Hearing protection recommended. Limit work duration to 8-hour shifts.
	> 85 dBA to 90 dBA	Hearing protection required. Limit work duration to 8-hour shifts.
	> 90 dBA to 115 dBA	Hearing protection required. Investigate use of engineering controls. Limit work duration to 8-hour shifts.
	> 115 dBA	Stop work. Consult CHSM.

12.1.18 Lifting and Material Handling

Observe the following procedures and practices for lifting and material handling:

- Use leather gloves when handling metal, wire rope, sharp debris, or transporting materials (e.g., wood, piping, or drums).
- The size, shape, and weight of the object to be lifted must first be considered. No individual employee is permitted to lift any object that weighs more than 60 pounds. Multiple employees or mechanical lifting devices are required for objects heavier than the 60-pound limit.
- Plan a lift before doing it. Bend at the knees and lift with the legs; maintain the natural curves of the back; do not use back muscles.
- Check the planned route for clearance.
- Use the buddy system when lifting heavy or awkward objects.
- Do not twist your body while lifting.
- Know the capacity of any handling device (e.g., crane, forklift, chain fall, or come-along) that you intend to use.
- Use tag lines to control loads.
- Verify that your body, material, tools, and equipment are safe from such unexpected movement as falling, slipping, rolling, tripping, bowing, or any other uncontrolled motion.

- Trucks (i.e., flat beds) hauling equipment or materials must not be moved once rigging has been released.
- Chock all material and equipment (such as pipe, drums, tanks, reels, trailers, and wagons) as necessary to prevent rolling.
- Tie down all light, large-surface-area material that might be moved by the wind.
- When working at heights, secure tools, equipment, and wrenches against falling.
- Do not store materials or tools on ducts, lighting fixtures, beam flanges, hung ceilings, or similar elevated locations.
- Fuel-powered tools used inside buildings or enclosures shall be vented and checked for excessive noise.

12.1.19 Fire Control

Observe the following fire control procedures and practices:

- Smoke only in designated areas.
- Keep flammable liquids in closed containers.
- Keep the work site clean; avoid accumulating combustible debris such as paper.
- Obtain and follow property owner hot work safety procedures when welding or performing other activities requiring an open flame.
- Isolate flammable and combustible materials from ignition sources.
- Verify fire safety integrity of equipment installations according to National Electrical Code (NEC) specifications.

12.1.20 Cleaning Equipment

Observe the following procedures and practices when cleaning equipment:

- Wear appropriate PPE to avoid skin and eye contact with isopropyl alcohol, Alconox, or other cleaning materials.
- Stand upwind to minimize any potential inhalation exposure.
- Dispose of spent cleaning solutions and rinses accordingly.

12.2 Environmental Hazards and Controls

12.2.1 Fatigue Management

Because Anchor QEA personnel may be working during both daytime and nighttime hours several days per week, depending on the activity, it is important that all personnel are aware of the hazards related to fatigue. Fatigue can be defined as an increasing difficulty in performing physical or mental activities. Signs of fatigue may include tiredness, changes in behavior, loss of energy, and reduced ability to concentrate. Fatigued site personnel may have a reduced ability to recognize or avoid risks

on the work site, which may lead to an increase in the number and severity of injuries and other incidents. Fatigue can occur at any time when working and may cause safety concerns due to decreased manual dexterity, reaction time, and alertness.

Fatigue results from insufficient rest and sleep between activities. Contributing factors to fatigue may include the following:

- The time of day that work takes place
- The length of time spent at work and in work-related duties
- The type and duration of a work task and the environment (e.g., weather conditions and ambient noise) in which it is performed
- The quantity and quality of rest obtained prior to, during, and after a work period
- Non-work activities
- Individual factors such as sleeping disorders, medications, or emotional state

Personnel suffering from fatigue may exhibit both physical and mental effects, such as the following:

- Slower movements
- Poor coordination
- Slower response time to interaction
- Bloodshot eyes
- Slumped or weary appearance
- Nodding off
- Distractedness or poor concentration
- Inability to complete tasks
- Fixed gaze
- Appearing depressed, irritable, frustrated, or disinterested

Employees are strongly encouraged to get sufficient pre-work rest, maintain sufficient nutritional intake during work (i.e., eat and drink at regular intervals), and communicate with team members and leaders if their level of fatigue elevates.

Use the following procedures to help detect and address fatigue-related issues:

- Periodically observe and query coworkers for signs or symptoms of fatigue.
- Site personnel that express concern over their level of fatigue, or that are observed to be fatigued such that elevated worker risk is evident, will be relieved or have their work tasks adjusted so that they may rest sufficiently.
- Work schedules will consider fatigue factors and optimize continuous periods available for uninterrupted sleep. The employee is responsible for reporting to work properly rested and fit for duty. In case of an emergency or operational difficulties (e.g., limited access due to water levels or boat repairs), work hours may require adjustment.

- Maintain a routine exercise program and regular sleep schedule as much as possible over the course of the work.
- Avoid heavy meals or caffeine and minimize or eliminate the consumption of alcohol and nicotine before sleeping.

12.2.2 Heat Stress

Observe the following general procedures and practices regarding heat stress:

- Increase the number of rest breaks and/or rotate site personnel in shorter work shifts.
- Watch for signs and symptoms of heat stress and fatigue (see Section 12.2.2.1).
- During hot months, plan work for early morning or evening.
- Use ice vests when necessary.
- Rest in cool, dry areas.
- Verify that employees have access to potable drinking water and shade.
- During conditions exceeding 95°F, verify that the following additional procedures are adhered to:
  - Establish effective communication by voice, observation, or electronic means.
  - Observe employees for alertness and signs or symptoms of heat illness.
  - Designate one or more employees on each work site as authorized to call for emergency medical services.
  - Remind employees to drink water throughout the shift.
  - Conduct pre-shift meetings before beginning work to review the high heat procedures, encourage drinking water, and remind employees of their right to take a cool-down rest when necessary.

12.2.2.1 Signs, Symptoms, and Treatment

The FL will be trained in heat stress prevention, including the following, prior to supervising employees:

- Procedures to prevent heat illness.
- Procedures to follow when an employee exhibits symptoms consistent with possible heat illness, including emergency response procedures.

The information provided below addresses these training requirements.

Adverse climatic conditions are important considerations in planning and conducting site operations. High ambient temperature can result in health effects ranging from transient heat fatigue, physical discomfort, reduced efficiency, personal illness, and increased accident probability to serious illness or death. Heat stress is of particular concern when chemical protective garments are worn because they prevent evaporative body cooling. Wearing PPE places employees at considerable risk of developing heat stress.

Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, and the individual characteristics of the worker. Because heat stress is probably one of the most common (and potentially serious) illnesses, regular monitoring and other preventive precautions are vital.

Heat Rash. Heat rash can be caused by continuous exposure to hot and humid air and skin abrasion from sweat-soaked clothing, rubber boots, or impermeable waders. The condition is characterized by a localized red skin rash and reduced sweating. Heat rash reduces the ability to tolerate heat. To treat, keep skin hygienically clean and allow it to dry thoroughly after using chemical protective clothing. Take measures to prevent heat rash by changing clothes often to maximize use of dry garments, or taking frequent breaks to allow doffing of equipment and drying of skin.

Heat Cramps. Heat cramps are caused by profuse perspiration with inadequate electrolytic fluid replacement. This often robs the larger muscle groups (stomach and quadriceps) of blood, which can cause painful muscle spasms and pain in the extremities and abdomen. To treat, move the employee to a cool place and give sips of water or an electrolytic drink. Watch for signs of heat exhaustion or heat stroke.

Heat Exhaustion. Heat exhaustion is a mild form of shock caused by increased stress on various organs to meet increased demand to cool the body. Onset is gradual and symptoms should subside within 1 hour. Symptoms include a weak pulse; shallow breathing; pale, cool, moist skin; profuse sweating; dizziness; and fatigue. To treat, move the employee to a cool place and remove as much clothing as possible. Give sips of water or electrolytic solution and fan the person continuously to remove heat by convection. Do not allow the affected person to become chilled. Treat for shock if necessary.

Heat Stroke. Heat stroke is the most severe form of heat stress; the body must be cooled immediately to prevent severe injury and/or death. ***This is a medical emergency!*** Symptoms include red, hot, dry skin; a body temperature of 105°F or higher; no perspiration; nausea; dizziness and confusion; and a strong, rapid pulse. Because heat stroke is a true medical emergency, transport the individual to a medical facility immediately. Prior to transport, remove as much clothing as possible and wrap the individual in a sheet soaked with water. Fan the individual vigorously while transporting to help reduce body temperature. If available, apply cold packs under the arms, around the neck, or any other place where they can cool large surface blood vessels. If transportation to a medical facility is delayed, reduce body temperature by immersing the individual in a cool-water bath (however, be careful not to over-chill the individual once body temperature is reduced below 102°F). If this is not possible, keep the individual wrapped in a sheet and continuously douse with water and fan.

12.2.2.2 Prevention

The implementation of preventative measures is the most effective way to limit the effects of heat-related illnesses. During periods of high heat, adequate liquids must be provided to replace lost body fluids. Replacement fluids can be a 0.1% saltwater solution, a commercial mix such as Gatorade, or a combination of these with fresh water. The replacement fluid should be kept cool, 50°F to 60°F, and it should be placed close to the work area. Employees must be encouraged to drink more than the amount required to satisfy thirst. Employees should also be encouraged to salt their foods more heavily during hot times of the year.

Cooling devices such as vortex tubes or cooling vests can be worn beneath impermeable clothing. If cooling devices are worn, only physiological monitoring will be used to determine work activity.

All site personnel are to rest when any symptoms of heat stress are noticed. Rest breaks are to be taken in a cool, shaded rest area. Employees shall remove chemical protective garments during rest periods and will not be assigned other tasks.

All employees shall be informed of the importance of adequate rest and proper diet, including the harmful effects of excessive alcohol and caffeine consumption.

12.2.2.3 Monitoring

Heat stress monitoring should be performed when employees are working in environments exceeding 90°F ambient air temperature. If employees are wearing impermeable clothing, this monitoring should begin at 77°F. There are two general types of monitoring that the health and safety representative can designate to be used: wet bulb globe temperature (WBGT), and physiological. The Heat Stress Monitoring Record form (see Appendix A) will be used to record the results of heat stress monitoring.

Note that some states such as Washington and California have specific regulatory standards for protection of employees from heat stress-related injuries.

Wet Bulb Globe Temperature (WBGT). The WBGT index is the simplest and most suitable technique to measure the environmental factors that most nearly correlate with core body temperature and other physiological responses to heat. When WBGT exceeds 25°C (77°F), the work regimen in Table 12-4 should be followed.

Table 12-4
Permissible Heat Exposure Threshold Limit Values

Work/Rest Regimen	Workload		
	Light	Moderate	Heavy
Continuous work	86°F (30.0°C)	80°F (26.7°C)	77°F (25.0°C)
75% work, 25% rest each hour	87°F (30.6°C)	82°F (28.0°C)	78°F (25.9°C)
50% work, 50% rest, each hour	89°F (31.4°C)	85°F (29.4°C)	82°F (27.9°C)
25% work, 75% rest, each hour	90°F (32.2°C)	88°F (31.1°C)	86°F (30.0°C)
These TLVs assume that nearly all acclimated, fully-clothed site personnel with adequate water and salt intake should be able to function effectively under the given working conditions without exceeding a deep body temperature of 100.4°F (38°C).			

(From OSHA Technical Manual, Section III: Chapter 4 - Heat Stress)

The TLVs denoted in Table 12-4 apply to physically fit and acclimatized individuals wearing light, summer clothing. If heavier clothing that impedes sweat or has a higher insulation value is required, the permissible heat exposure TLVs should be adjusted based on the WBGT Correction Factors in Table 12-5.

Table 12-5
Wet Bulb Globe Temperature Correction Factors

Clothing Type	WBGT Correction
Summer lightweight working clothing	0°F (0°C)
Cotton coveralls	-3.6°F (-2°C)
Winter work clothing	-7.2°F (-4°C)
Water barrier, permeable	-10.8°F (-6°C)
Fully encapsulating	-14.4°F (-10°C)

Physiological. Physiological monitoring can be used in lieu of, or in addition to, WBGT. This monitoring can be self-performed once the health and safety representative demonstrates appropriate techniques to affected employees. Because individuals vary in their susceptibility to heat, this type of monitoring has its advantages. The following two parameters are to be monitored at the beginning of each rest period:

- **Heart Rate:** The maximum heart rate (MHR) is the amount of work (beats) per minute a healthy person's heart can be expected to safely deliver. Each individual will count his/her radial (wrist) pulse for 1 minute as early as possible during each rest period. If the heart rate of any individual exceeds 75% of his/her calculated MHR (MHR = 200 - age) at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain

the same. An individual is not permitted to return to work until his/her sustained heart rate is below 75% of his/her calculated MHR.

- **Temperature:** Each individual will measure his/her temperature with a thermometer for 1 minute as early as possible in the first rest period. If the temperature exceeds 99.6°F at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same. An individual is not permitted to return to work if his/her temperature exceeds 100.4°F.

12.2.2.4 Training

Employees potentially exposed to heat stress conditions will be instructed on the contents of this procedure. This training can be conducted during daily tailgate safety meetings.

12.2.3 Cold Stress

Observe the following procedures and practices regarding cold stress:

- Take breaks in heated shelters when working in extremely cold temperatures.
- Upon entering the shelter, remove the outer layer of clothing and loosen other layers to promote evaporation of perspiration.
- Drink warm liquids to reduce the susceptibility to cold stress.
- Be aware of cold stress symptoms, including shivering, numbness in the extremities, and sluggishness.
- Provide adequate insulating dry clothing to maintain warmth if work is performed in air temperature below 40°F. Wind chill cooling rates and the cooling power of air are critical factors. The higher the wind speed and the lower the temperature in the work area, the greater the insulation value of the protective clothing required.
- If the air temperature is 32°F or less, hands should be protected.
- If only light work is involved and if the clothing on the worker may become wet on the job site, the outer layer of the clothing in use should be impermeable to water. With more severe work under such conditions, the outer layer should be water repellent, and the outer wear should be changed as it becomes wetted. The outer garments should include provisions for easy ventilation in order to prevent wetting of the inner layer by sweat.
- If available clothing does not give adequate protection to prevent cold injury, work should be modified or suspended until adequate clothing is made available, or until weather conditions improve.
- Implement a buddy system in which site personnel are responsible for observing fellow workers for early signs and symptoms of cold stress.

12.2.3.1 Signs, Symptoms, and Treatment

Cold stress can range from frostbite to hypothermia. The signs and symptoms of cold stress are listed below. The appropriate guidelines should be followed if any personnel exhibit these symptoms:

Frostbite. Frostbite is characterized by pain in the extremities and loss of manual dexterity. "Frostnip," or reddening of the tissue, is accompanied by a tingling or loss of sensation in the extremities and continuous shivering.

Hypothermia. Hypothermia is characterized by pain in the extremities and loss of manual dexterity, with severe, uncontrollable shivering, and an inability to maintain the level of activity. Symptoms include excessive fatigue, drowsiness, irritability, or euphoria. Severe hypothermia includes clouded consciousness, low blood pressure, pupil dilation, cessation of shivering, unconsciousness, and possible death.

Move the individual to a warm, dry place. If the individual's clothing is wet, remove it and replace it with dry clothing. Keep the individual warm. Re-warming of the individual should be gradual to avoid stroke symptoms. Dehydration, or the loss of body fluids, may result in a cold injury due to a significant change in blood flow to the extremities. If the individual is conscious and alert, warm sweet liquids should be provided. Coffee and other caffeinated liquids should be avoided because of diuretic and circulatory effects. Extremities affected by frostbite should be gradually warmed up and returned to normal temperature. Moist compresses should be applied; begin with lukewarm compresses and slowly increase the temperature as changes in skin temperature are detected. Keep the individual warm and calm and move them to a medical facility as soon as possible.

12.2.4 Sunlight and Ultraviolet Exposure

Observe the following procedures and practices regarding ultraviolet (UV) exposure:

- Protect against extended exposure to sunlight with shade, long clothing, sunscreen, and high-SPF, broad-spectrum sunscreen applied frequently.
- Plan work to avoid unnecessary UV exposure (see Section 12.2.4.2).
- During peak daylight months, plan work for early morning or evening.
- Many factors affect the hazards associated with UV exposure, including the following:
  - **Time of day:** UV rays are strongest between 10:00 a.m. and 4:00 p.m.
  - **Season of the year:** UV rays are stronger during spring and summer months. This is less of a factor near the equator.
  - **Distance from the equator (latitude):** UV exposure goes down as you get farther from the equator.
  - **Altitude:** More UV rays reach the ground at higher elevations.
  - **Cloud cover**: The effect of clouds can vary. Sometimes cloud cover blocks some UV from the sun and lowers UV exposure, while some types of clouds can reflect UV and

increase UV exposure. What is important to know is that UV rays can get through, even on a cloudy day. Consider monitoring the UV index for your work area: http://www2.epa.gov/sunwise/uv-index.

  - **Reflection off surfaces**: UV rays can bounce off surfaces like water, sand, snow, pavement, or grass, leading to an increase in UV exposure.
- Evaluate site-specific factors affecting UV exposure and address work practices as appropriate.

12.2.4.1 Signs, Symptoms, and Treatment

The best way to treat sunburn is to prevent it using the guidelines listed in the preceding bullets and in Section 12.2.4.2. Signs of sunburn include the following:

- Pinkness or redness
- Skin that feels warm or hot to the touch
- Pain, tenderness, or itching
- Swelling
- Small, fluid-filled blisters, which may break
- Headache, fever, chills, and fatigue if the sunburn is severe

If signs of sunburn are noticed, avoid further exposure and immediately implement treatment. If the sunburn is blistering *and* covers 15% or more of the body, seek medical attention.

12.2.4.2 Prevention

UV exposure hazards and their impacts on each worksite should be evaluated to determine the best practices for risk mitigation. The most effective way to prevent skin damage from UV exposure is to protect bare skin from the exposure. This can be accomplished with shade, clothing (e.g., pants, long sleeves, or hats), sunscreen, and sunglasses. Plan work to either create shade or take advantage of natural shade, and avoid peak UV times during the day when possible.

12.2.5 Inclement Weather

Observe the following procedures and practices regarding inclement weather:

- Evaluate the worksite for hazards that may be amplified during inclement weather, such as traction issues, ingress and egress, slope stability, or wind-driven hazards (e.g., dust, debris, or falling trees).
- Stop outdoor work during electrical storms (lightning strikes), hailstorms, high winds, and other extreme weather conditions such as extreme heat or cold.
- Take cover indoors or in a vehicle that will provide adequate protection. In some cases, this may require exiting the worksite, such as during windstorms in areas with overhead hazards (e.g., trees or power lines).

- Listen to local forecasts for warnings about specific weather hazards such as tornadoes, hurricanes, and flash floods.
- Verify that on-site equipment and resources are adequately protected from inclement weather.
- If working in an unfamiliar geographic location, consult with local resources for unique weather hazards.

12.2.6 Insects and Spiders

Observe the following general procedures and practices regarding insects/spiders:

- Tuck pants into socks.
- Wear long sleeves.
- Use insect repellent.
- Avoid contact by always looking ahead to where you will be walking, standing, sitting, leaning, grabbing, lifting, or reaching.
- Check for signs of insect/spider bites, such as redness, swelling, and flu-like symptoms.

The most dangerous spiders to humans in North America are black widows and brown spiders (also known as brown recluse or fiddleback spiders). A guide to identifying these spiders is presented in Table 12-6.

Table 12-6
North American Hazardous Spider Identification Guide

Hazardous Spider Identification Guide	
Black Widow Spider • Abdomen usually shows hourglass marking • Female is 3 to 4 centimeters in diameter • Have been found in well casings and flush-mount covers • Not aggressive, but more likely to bite if guarding eggs • Light, local swelling and reddening are early signs of a bite, followed by intense muscular pain, rigidity of the abdomen and legs, difficulty breathing, and nausea • If bitten, see a physician as soon as possible	
Brown Spiders (aka Brown Recluse or Fiddleback) • Found in the central and southern United States, although in some other areas, as well • 1/4-to-1/2-inch-long body, and size of a silver dollar • Hide in baseboards, ceiling cracks, and undisturbed piles of material • Bite may either go unnoticed or may be followed by a severe localized reaction, including scabbing, necrosis of the affected tissue, and very slow healing • If bitten, see a physician as soon as possible	

12.2.7 Bees and Wasps

Many encounters with bees and wasps occur when nests built in well casings or excavation areas are disturbed. Before opening a well casing, take a few moments to observe whether or not insects are entering or exiting. If they are flying to and from the casing, avoid it if possible. If you must be in an area where disturbing a nest is likely, be sure to wear long pants and a long-sleeved shirt. Stinging insects fly around the top of their target, so if you get into trouble, pull a portion of your shirt over your head and run away.

If you get stung, look for a stinger and, if one is present, remove it as soon as possible. Several over-the-counter products or a simple cold compress can be used to alleviate the pain of the sting. If the sting is followed by severe symptoms, or if it occurs in the neck or the mouth, seek medical attention immediately because swelling could cause suffocation.

If you need to destroy a nest, consult with the PM and project FL first. Commercially available stinging insect control aerosols are very effective, but could potentially contaminate the well. Once the nest is destroyed, fine mesh may be applied over the exit and entry points of a well casing to prevent re-infestation.

12.2.8 Ticks

Ticks in North America can be carriers of several diseases, including Lyme disease, Rocky Mountain spotted fever, and ehrlichiosis.

Limiting exposure to ticks reduces the likelihood of infection when exposed to tick-infested habitats. Measures to prevent tick exposure include the following:

- Remove leaf litter and brush in areas where you will be working prior to tick season.
- Wear light-colored clothing so that ticks are visible.
- Tuck your pant legs into your socks.
- Apply repellents to discourage tick attachment.
- Promptly inspect your body and remove crawling or attached ticks when you leave a tick-infested area.
- Conduct tick checks on buddies upon exiting any suspect area (may be needed multiple times per work day).
- Be aware of seasonal activity; ticks are often most active in the spring.

Observe the following procedures and practices if you are bitten by a tick:

- Use fine-tipped tweezers or shield your fingers with tissue, paper towel, or rubber gloves.

- Grasp the tick as close to the skin surface as possible and pull upward with steady, even pressure. Do not twist or jerk the tick; this may cause mouthparts to break off and remain in the skin.
- Do not squeeze, crush, or puncture the body of the tick because its fluids may contain infectious organisms.
- Do not handle the tick with bare hands because infectious agents may enter through mucous membranes or breaks in the skin.
- After removing the tick, thoroughly disinfect the bite site and wash your hands with soap and water.
- You may wish to save the tick for identification in case you become ill within 2 to 3 weeks. Place the tick in a sealed plastic bag in the freezer, and mark the bag with the date of the bite.

12.2.9 Mosquitoes

Mosquitoes in the United States have been known to carry West Nile virus, Zika virus, St. Louis encephalitis, and dengue fever. Avoid mosquito bites by doing the following:

- Apply insect repellent containing DEET (N,N-diethyl-meta-toluamide) when outdoors. DEET is very effective, but could potentially contaminate samples.
- Read and follow the product directions whenever you use insect repellent.
- Wear long-sleeved clothes and long pants treated with repellent to further reduce your risk, or stay indoors during peak mosquito feeding hours (dusk until dawn).
- Limit the number of places available for mosquitoes to lay their eggs by eliminating standing water sources from around the work area.
- If you need to destroy a nest, consult with the PM and project FL first.
- Check to see if there is an organized mosquito control program near the project site. If no program exists, work with the local government officials to establish a program.

12.2.10 Bird Droppings

Large populations of roosting birds may present a disease risk. The most serious health risks arise from disease organisms that grow in the accumulations of bird droppings, feathers, and debris under a roost—especially if roosts have been active for years. Among the fungal diseases associated with bird droppings, the two most common are Histoplasmosis and Cryptococcosis.

If you are working in an area where large quantities of droppings are present, follow certain precautions to minimize the risk from disease organisms in the droppings:

- Wear a respirator that can filter particles as small as 0.3 microns, such as a HEPA filter.
- Wear disposable protective gloves, hat, coveralls, and boots if you will be in close contact.
- Wash or shower at the work site after cleanup, if possible.
- If allowable, modify the structure or use methods to prevent birds from re-establishing the roost.

12.2.11 Feral Dogs

Feral (i.e., "wild" or "stray") dogs have been observed at several Anchor QEA job sites. Packs of feral dogs can be dangerous, so if you observe them on the site, call animal control immediately. If a dog approaches you, take the following steps to reduce your chances of being attacked:

- Do not run away or run past the dog.
- Remain calm. If you say anything, speak calmly and firmly. Avoid eye contact. Try to stay still until the dog leaves, or back away slowly until the dog is out of sight. Do not turn and run.
- If you fall to the ground or are knocked down, curl into a ball, placing your hands over your head and neck. Protect your face.

If a dog bites someone, take the following steps:

- Restrain the dog immediately, if it is safe to do so. The dog will have to be quarantined or tested for rabies.
- Check on the victim's condition. Call 911 if paramedic response is required.

12.2.12 Rodent-Borne Diseases

Rodent infestation on a site has the potential to cause serious communicable diseases including hantavirus pulmonary syndrome and bubonic plague. The most common rodent-borne disease is hantavirus, which may infect workers who inhale tiny droplets containing the virus when fresh rodent urine, droppings, or nesting materials are stirred up.

Working conditions that may put workers at risk of hantavirus include:

- Contact with rodent feces or dried urine, which may mobilize particles of these wastes into the air where they may be inhaled
- Entry into rooms or warehouses that have been closed up and infested for extended periods
- Activities that stir up dust that may mobilize hantavirus

If working in areas of obvious rodent infestation, the CDC recommends the following precautions:

- Do not enter rooms or warehouses that have been closed up unless absolutely necessary.
- If work in closed-up areas or areas with rodent infestation is necessary, contact professional exterminators to eliminate the infestation and clean up the location
- If an exterminator is not available or possible, employees should clean up the infested area using the following steps:
  - When going into outbuildings or rooms that have been closed for an extended period, open them up and air them out before cleaning.
  - Don an APR equipped with HEPA P-100 cartridges and nitrile gloves before cleaning.
  - Do not stir up dust by sweeping or vacuuming droppings, urine, or nesting materials.

- Thoroughly wet contaminated areas with detergent or liquid to deactivate the virus. Most general-purpose disinfectants and household detergents are effective. However, a hypochlorite solution prepared by mixing 1 and 1/2 cups of household bleach in 1 gallon of water may be used in place of a commercial disinfectant.
- Once everything is wet, pick up contaminated materials with a damp towel, then mop or sponge the area with disinfectant.
- Spray dead rodents with disinfectant and flea repellent (to avoid bubonic plague), then double-bag and dispose of in an appropriate waste disposal system. Contact the local or state health department for other disposal methods.
- Finally, remove respirator and disinfect gloves before taking them off with disinfectant or soap and water. After taking off the clean gloves, thoroughly wash hands with soap and warm water.

If you experience hantavirus symptoms (fatigue, fever, and muscle aches) within 1 to 5 weeks of exposure to potentially affected rodents and their droppings, contact your supervisor immediately.

12.2.13 Poisonous Plants

Poisonous plants include poison ivy, poison oak, and poison sumac as shown in Table 12-10. Observe the following procedures and practices regarding poisonous plants:

- Avoid entering areas infested with poisonous plants.
- Immediately wash any areas that come into contact with poisonous plants.
- Use PPE when there is a possibility of contact with poisonous plants.

Table 12-10
North American Hazardous Plant Identification Guide

Hazardous Plant Identification Guide		
Poison Ivy • Grows in the West, Midwest, Texas, and the East Coast • Several forms—vine, trailing shrub, or shrub • Three leaflets (can vary from three to nine) • Leaves are green in summer and red in fall • Yellow or green flowers • White berries		
Poison Oak • Grows in the East (New Jersey to Texas) and Pacific Coast • 6-foot tall shrubs or long vines • Oak-like leaves in clusters of three • Yellow berries		
Poison Sumac • Grows in boggy areas, especially in the Southwest and Northern United States • Shrub up to 15 feet tall • Seven to 13 smooth-edged leaflets • Glossy pale yellow or cream-colored berries		

If you have been exposed to poison ivy, oak, or sumac, act quickly because the toxin in the plants penetrates the skin within minutes. If possible, stay outdoors until you complete the first two steps:

1. Cleanse the exposed skin with generous amounts of isopropyl alcohol.
2. Wash the skin with water.
3. Take a regular shower with soap and warm water. Do not use soap until this point because it will pick up the toxin from the surface and move it around.
4. Wash clothes, tools, and anything else that may have been in contact with the toxin with alcohol and water. Be sure to wear hand protection during that process.

Signs and symptoms of exposure include redness and swelling that appears 12 to 48 hours after exposure. Blistering and itching will follow. If you have had a severe reaction in the past, you should see a physician right away. Over-the-counter products that are available to alleviate symptoms include Cortaid, Lanacort, baking soda, Aveeno oatmeal baths, and calamine lotion.

12.2.14 The Public at Large

The community residents around worksites may pose their own specific hazards. These conditions may include the following:

- Unintentional disruption of work
- Benign or malicious trespass
- Criminal intent

Scenarios may include the following:

- Pedestrians, cyclists, or motorists disregarding site boundaries due to distraction or willful disobedience.
- Public use of private site facilities for shelter, relief, and other reasons with no ill-intention.
- Public use of private site facilities for mischievous or criminal activity, such as loitering, vandalism, or theft.
- Encounters with community members who are disgruntled with the project activity.
- Encounters with criminal activities on or near a project site.

If any of the previously mentioned scenarios are anticipated to be likely, take the following precautions as appropriate:

- Verify that the site is adequately marked and barricaded to limit unintentional disruptions of the work by the public.
- Review the site for attractive nuisances (e.g., hazards or conditions that are likely to attract children), and mitigate those.
- Secure all equipment and site facilities to prevent unauthorized access or use.
- Remove valuable items from the site or adequately secure them on site to limit the temptation for potential criminals.
- Have contact information for the client's or owner's public relations office while on site, and direct disgruntled community members to that office. If necessary, vacate the site to relieve the situation and notify the PM or FL.
- Work in pairs when uncertain of the public safety situation at a site. In questionable situations, postpone work as necessary until a plan of action can be developed to verify a safe working environment.

12.2.15 Personal Health and Safety

In addition to hazards associated with chemicals of concern, equipment, operations, or site conditions discussed above, there may be additional personal safety issues to consider at a site, including those related to one or multiple protected classes, such as race, gender, religion, ability,

sexual orientation, or gender identity. These conditions may involve the following, perpetrated by the public or those associated with the work:

- Malicious disruption of work
- Harassment, including unwanted comments, gestures, or actions
- Threats of violence, either implied (using derogatory language) or explicit
- Assault

It is critical that the work environment be discussed within the project team to evaluate risks, ways to avoid those risks, and communication protocols. Anchor QEA requires that work be performed in teams.

Specifically, if any of the above are anticipated, take the following precautions as appropriate:

- Alert the PM, FL, CHSM, and Human Resources Department of potential issue(s).
- Formulate a plan of action to verify and maintain a safe working environment prior to field work, which may include the following:
  - Working in pairs and/or within a certain physical distance of other work groups.
  - Coordinated check-ins (calls to or from the office or visual check-ins with other field members).
- Whenever possible, schedule work only within daylight hours (which fluctuate seasonally) or on weekends when questionable scenarios may be less likely.
  - If night work is required, maintain a minimum of two field personnel at all times, and potentially increase the total number of personnel.
  - If working in high-risk areas, discuss the possibility of hiring security if work needs to be performed at night, in low light, or near potentially dangerous areas (e.g., abandoned buildings, public displays of hostility, discrimination, or gang-related activity).
- Maintain a field phone with active GPS and non-locking 911 capability at all times while out in the field.
- If a need arises for a change in field work (e.g., additional sampling or moving to an area that was not planned) or travel plans (e.g., dead battery or flat tire), immediately alert the FL and PM as to the event.

In addition, practice active awareness of your environment. Discuss personal health and safety concerns at the daily tailgate meeting. If you feel unsafe based on the potential behavior of others, immediately bring it up to field team coworkers. If the issue is not resolved to your satisfaction, alert the PM, FL, CHSM, and Human Resources Department to assist in resolving any potential issue(s).

13 Medical Monitoring Program

This section describes the medical monitoring program that Anchor QEA field personnel must comply with when working on sites where there is a potential for exposure to hazardous wastes or other hazardous substances.

13.1 General Requirements

Anchor QEA employees shall be enrolled in a medical monitoring program in compliance with OSHA standards (29 CFR 1910.120(f)) under the following circumstances:

- If they are involved with any of the following operations:
  - *Cleanup operations* required by a governmental body, whether federal, state, local, or other involving hazardous substances that are conducted at uncontrolled hazardous waste sites (including, but not limited to, the EPA's National Priority List [NPL] sites, state priority list sites, sites recommended for the EPA NPL, and initial investigation of government-identified sites that are conducted before the presence or absence of hazardous substances has been ascertained)
  - *Corrective actions* involving cleanup operations at sites covered by the Resource Conservation and Recovery Act of 1976 (RCRA) as amended (42 United States Code 6901 et seq)
  - *Voluntary cleanup operations* at sites recognized by federal, state, local, or other governmental bodies as uncontrolled hazardous waste sites
  - *Operations involving hazardous wastes* that are conducted at treatment, storage, and disposal (TSD) facilities regulated by 40 CFR 264 and 40 CFR 265 pursuant to RCRA or by agencies under agreement with the EPA to implement RCRA regulations
  - *Emergency response operations* for releases of, or substantial threats of releases of, hazardous substances without regard to the location of the hazard
- And, if they meet the following criteria:
  - Are or may be exposed to hazardous substances or health hazards at or above the established PEL, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more per year
- In addition, employees are required to be enrolled in the medical monitoring program if they meet any of the following conditions:
  - Wear a respirator for 30 days or more per year
  - Are injured, become ill, or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operations
  - Are members of a Hazardous Materials (HAZMAT) team

Anchor QEA employees required to be enrolled in a medical monitoring program under 29 CFR 1910.120(f) shall have medical examinations and consultations made available to them by Anchor QEA on the following schedule:

- Prior to assignment
- At least once every 12 months unless the attending physician believes a longer interval (not greater than biennially) is appropriate
- At termination of employment or reassignment to an area where the employee would not be covered if the employee has not had an examination within the last 6 months
- As soon as possible upon notification that the employee has developed signs or symptoms indicating possible overexposure to hazardous substances or health hazards, or that the employee has been injured or exposed above the PEL or published exposure levels in an emergency situation
- At more frequent times, if the examining physician determines that an increased frequency of examination is medically necessary

The content of medical examinations or consultations made available to employees shall be determined by the attending physician but shall include, at a minimum, a medical and work history with special emphasis on symptoms related to the handling of hazardous substances and health hazards, and to fitness for duty including the ability to wear any required PPE under conditions (i.e., temperature extremes) that may be expected at the work site.

The attending physician shall provide Anchor QEA with a written opinion for each examined employee that contains the following information:

- Whether the employee has any detected medical conditions that would place the employee at an increased risk of impairment of the employee's health from hazardous waste operations work, emergency response, or respirator use
- Any recommended limitations on the employee's assigned work
- A statement that the employee has been informed of the results of the medical examination and any medical conditions that require further examination or treatment

The written opinion obtained by Anchor QEA shall not reveal specific findings or diagnoses unrelated to occupational exposures. Medical monitoring and other employee-related medical records shall be retained for at least the duration of employment plus 30 years.

13.2 Team Self-Monitoring

All personnel will be instructed to look for and inform each other of any deleterious changes in their physical or mental condition during the performance of all field activities. Examples of such changes are as follows:

- Headaches
- Dizziness
- Nausea
- Blurred vision
- Cramps
- Irritation of eyes, skin, or respiratory system
- Skin chafing from damp or wet clothing
- Changes in complexion or skin color
- Changes in apparent motor coordination
- Increased frequency of minor mistakes
- Excessive salivation or changes in papillary response
- Changes in speech ability or speech pattern
- Symptoms of heat stress or heat exhaustion
- Symptoms of hypothermia

If any of these conditions develop, the affected person will be moved from the immediate work location and evaluated. If further assistance is needed, personnel at the local hospital will be notified, and an ambulance will be summoned if the condition is thought to be serious. If the condition is the result of sample collection or processing activities, procedures and/or PPE will be modified to address the problem.

Appendix A
Health and Safety Logs and Forms

Modification to Health and Safety Plan

Date: _____

Project No: _____

Project Name: _____

Modification: _____

_____

_____

_____

_____

Reason for Modification: _____

_____

_____

_____

_____

_____

Site Personnel Briefed

Name:	_____	**Date:**	_____
Name:	_____	**Date:**	_____
Name:	_____	**Date:**	_____
Name:	_____	**Date:**	_____
Name:	_____	**Date:**	_____
Name:	_____	**Date:**	_____
Name:	_____	**Date:**	_____
Name:	_____	**Date:**	_____
Name:	_____	**Date:**	_____
Name:	_____	**Date:**	_____
Name:	_____	**Date:**	_____

Approvals

Field Lead:	_____	_____	_____
	Printed Name	Signature	Date
Project Manager:	_____	_____	_____
	Printed Name	Signature	Date

Field Safety Equipment Checklist

The following is a list of safety-related gear that may be appropriate depending on the type of work being conducted. The purpose of this checklist is twofold: 1) ensure that all field crew members think about appropriate safety gear needs before heading to the worksite; and 2) provide an extensive list of gear to consider in order to serve as a reminder of potential safety gear needs during a field effort.

☐ **Safety Briefing Log or Notebook**

Personal Protective Gear

- ☐ Rain pants and jacket
- ☐ Hard hats
- ☐ Boots (steel-toed, if appropriate)
- ☐ Safety glasses
- ☐ Ear protection
- ☐ Nitrile gloves (inner and outer pair)
- ☐ Tyvek overalls
- ☐ H_2S sensor
- ☐ Flashlight
- ☐ EpiPen (inquire if any field staff use one)
- ☐ Other:

Warm Weather Safety Gear

- ☐ Sunscreen
- ☐ Water
- ☐ Hat
- ☐ Light clothes

Cold Weather Safety Gear

- ☐ Warm clothes (preferably synthetics)
- ☐ Hat
- ☐ Gloves
- ☐ Boot warmers
- ☐ Thermos of warm drink/soup

Communications

- ☐ Notify office staff of day's field plan
- ☐ Walkie Talkies
- ☐ Cell phones
- ☐ Satellite phone (if appropriate)
- ☐ Contact numbers (e.g., for other field crew members, the PM, or others to notify that you are accessing site)

General Gear for Work Near Water

- ☐ Life jacket
- ☐ Boots or waders (hip or chest)
- ☐ Throwline

Boat Safety Gear

U.S. Coast Guard Required Gear:

- ☐ 1. Personal flotation device (PFD), preferably life jacket, for each occupant
- ☐ 2. Fire extinguisher (filled to operable range)
- ☐ 3. Flares (unexpired)
- ☐ 4. Horn
- ☐ 5. Navigation lights

- ☐ First aid kit
- ☐ Bowline and stern line
- ☐ Anchor and anchor line
- ☐ Paddle
- ☐ Spare propeller and linchpin
- ☐ Appropriate personal protective gear (boots or waders) to step onto shore if necessary
- ☐ Drain plug (and spare)
- ☐ Boat fuel and oil
- ☐ Weather radio (if appropriate)
- ☐ Weather, tides, and currents forecasts
- ☐ Warm clothes/blanket in dry bag

Utility Contact Prevention Checklist

NOTE: Utility mark-out requirements vary from state to state; consult state authorities before beginning work.

Purpose: This form is intended to help the Field Lead confirm that underground or overhead utilities are identified to the extent practicable and consistent with applicable regulations **PRIOR** to site work.

INVESTIGATIONS MUST NOT OCCUR UNTIL MULTIPLE LINES OF EVIDENCE INDICATE THAT SUBSURFACE OR OVERHEAD UTILITIES ARE NOT PRESENT IN THE WORK AREA

Project Name/No: _____ **Date:** _____

Field Lead: _____ **Project Address:** _____

Project Manager: _____ **Health & Safety Officer:** _____

Emergency Contact Information for One Call: _____

Duration/Summary of Work to be Performed: _____

_____

_____

Consideration	Check		Explanation	Initial
Has the state One Call been contacted?	☐ Yes	☐ No		
Has the property owner or client been contacted for local knowledge of utilities, as applicable?	☐ Yes	☐ No		
Does the property owner or client have specific utility contact prevention procedures and, if so, have they been completed?	☐ Yes	☐ No		
Are any as-built drawings available? If so, do they show any utilities?	☐ Yes	☐ No		
Has a visual inspection of the work area(s) been completed?	☐ Yes	☐ No		
Has the potential presence of in-water utilities been assessed (shore markers, streets dead-ending at water's edge, etc.)	☐ Yes	☐ No		
Is evidence of electrical utilities present? (electric meters on structures, conduits, overhead lines, light poles, etc.)	☐ Yes	☐ No		
Is evidence of water/sewer utilities present? (water meter, hydrants, restrooms, grates in ground, etc.)	☐ Yes	☐ No		
Is evidence of telecommunications utilities present? (fiber optic warning signs, conduits from utility poles, wall-mounted boxes, etc.)	☐ Yes	☐ No		
Is other evidence of utilities present? (unknown ground markings, manholes or valve covers, "Call Before You Dig" signs, linear asphalt or concrete repair characteristics, liner subsidence of ground surface, pin flags or stakes, etc.)	☐ Yes	☐ No		

Utility Contact Prevention Checklist

NOTE: Utility mark-out requirements vary from state to state; consult state authorities before beginning work.

Consideration	Check		Explanation	Initial
Has a private locating service been contacted?	☐ Yes	☐ No		
Were any utilities identified and marked out through a private locating service? If so, duplicate mark-outs on site drawings.	☐ Yes	☐ No		
Are there any fiber optic cables, fuel lines, or high-pressure lines within 50 feet of work locations?	☐ Yes	☐ No		
If fiber optic cables, fuel lines, or high-pressure lines are within 50 feet, has an agreement with the utility owner been established?	☐ Yes	☐ No		
Can a test borehole be advanced by hand digging, probing, post-hole digging, and/or air knifing to 5 feet below ground surface (bgs)?	☐ Yes	☐ No		
If hand digging, probing, post-hole digging, and/or air knifing to 5 feet bgs is not possible, can a non-invasive geophysical investigation be conducted? If not, why?	☐ Yes	☐ No		
Other considerations:				

NOTE: Please fill in second page and attach additional reports, drawings, or other information, as necessary.

Confirmation Number: _____

Contact Name: _____ **Organization:** _____

Contact Date: _____ **Contact Time:** _____

Response: _____

_____

_____

_____

Completed by:

_____ _____ _____

Printed Name Signature Date

Contractor:

_____ _____ _____

Printed Name Signature Date

Incident Report Form

Please immediately contact your manager when a work-related incident has occurred. It is your responsibility (or your manager's if you are not able) to contact Human Resources (HR) and Health and Safety (H&S) ASAP when an incident happens.

This Incident Report is the first form you must complete when a work-related incident has occurred. Once completed, forward this form to HR and H&S.

Incident Type: ☐ Injury ☐ Illness ☐ Near Miss ☐ Spill ☐ Fire ☐ Other _____

Employees Involved in Incident

_____

_____

Was anyone injured? ◯ Yes ◯ No

(If **Yes**, complete **a** and **b** below)

a. Information Regarding Injured or Ill Employee

Full name: _____

Street: _____

City: _____ **State:** _____ **Zip:** _____

Date of birth: _____ **Sex:** _____

Date hired: _____ **Job title:** _____

b. Information about the Physician or Health Care Professional

Was medical treatment required? ◯ Yes ◯ No

First aid only: ◯ Yes ◯ No

Name of physician/health care professional: _____

If treatment was given away from the worksite, where was it given?

Facility: _____

Street: _____

City: _____ **State:** _____ **Zip:** _____

Was employee treated in emergency room? ◯ Yes ◯ No

Was employee hospitalized overnight as an in-patient? ◯ Yes ◯ No

Did the employee miss a full day of work following the incident? ◯ Yes ◯ No

Date of last day worked: _____

Date of return to work: _____

Number of restricted days of work: _____

Incident Report Form

Information about the Incident:

Date of incident: _____

Time of incident: _____

Location of incident: _____

Were there any witnesses? ○ Yes ○ No

Name and phone number of witness: _____

_____

What was employee doing just before the incident occurred? Describe the activity, as well as the tools, equipment, or material the employee was using. Be specific (e.g., climbing a ladder while carrying roofing materials, spraying chlorine from hand sprayer, daily computer key-entry).

What happened? Tell us how the injury occurred (e.g., when ladder slipped on wet floor, worker fell 20 feet; worker was sprayed with chlorine when gasket broke during replacement; worker developed soreness in wrist over time).

If an injury or illness, what was it? Tell us the part of the body that was affected and how it was affected.

Employer Use Only:

Date Recorded in Incident Log: _____ **By:** _____

Investigation:

Date Investigation Started: _____ **Date Investigation Concluded:** _____

Investigation Team Leader and Title: _____

Investigation Team Member Names and Titles:

Name	Title

Root Cause Determination (attach other sheets as necessary)

Any statements, photographs, sketches, or other documents should be attached to this document.

Incident Report Form

Corrective Actions: *Documentation supporting completion of corrective actions should be attached to this report.

Corrective Action	Person Responsible	Due Date	Completion Date	Completion Notes	Completed By

Daily Air Monitoring Record

Project Name: _____ **Date:** _____

Project Number: _____ **Location:** _____

Temperature: _____

Conditions: _____

COC	Instrument	S/N	Calibration Date	Calibration Gas/Method	Calibration by
Organic vapors					
Particulates					
O_2					
Other:					
Other:					
Other:					

Time	Location/Description	Organic Vapor (ppm)	O2%	CG %LEL	Other	Other

Notes:

Completed by:

Printed Name _____ Signature _____ Date _____

PLAYING IT SAFE

Daily Safety Briefing Form

Date:
Project No: 221749-01.01
Project Name: zis a ba 2 Phase II ESA

Submit a Playing It Safe Event

Person Conducting Meeting: Stephen Strehl
Health & Safety Officer: Timothy Shaner
Project Manager: Julia Fitts

TOPICS COVERED: *Highlighted topics are required*

- ☐ Emergency Procedures and Evacuation Route
- ☐ Directions to Hospital
- ☐ HASP Review and Location
- ☐ Safety Equipment Location
- ☐ Proper Safety Equipment Use
- ☐ Employee Right-to-Know/ SDS Location
- ☐ Fire Extinguisher Location
- ☐ Eye Wash Station Location
- ☐ Buddy System
- ☐ Self and Coworker Monitoring
- ☐ Lines of Authority
- ☐ Communication
- ☐ Site Security
- ☐ Vessel Safety Protocols
- ☐ Work Zones
- ☐ Vehicle Safety and Driving/ Road Conditions
- ☐ Equipment Safety and Operation
- ☐ Proper Use of PPE
- ☐ Decontamination Procedures
- ☐ Near Miss Reporting Procedures
- ☐ Lifting Techniques
- ☐ Slips, Trips, and Falls
- ☐ Hazard Exposure Routes
- ☐ Heat and Cold Stress
- ☐ Overhead and Underfoot Hazards
- ☐ Chemical Hazards
- ☐ Flammable Hazards
- ☐ Biological Hazards
- ☐ Eating/Drinking/Smoking
- ☐ Reviewed Prior Lessons Learned
- ☐ Field Team Medical Conditions for Emergency Purposes (Confidential):
- ☐ Other:

Weather Conditions:

Daily Work Scope:

Site-specific Hazards:

Safety Comments:

Attendees

Printed Name	Signature

End of Day Wellness Check

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Appendix B
Job Safety Analysis (JSA) Documents

Job Safety Analysis

Field Activities

Project Name: JELD-WEN/Former Nord Door PDI	**Project Number:** 220909-01.01	**JSA Number:** 001	**Issue Date:** 5/16/2023
Location: 300 West Marine View Drive, Everett, WA 98201	**Contractor:** Anchor QEA, LLC	**Analysis by:** Lexus Sullivan	**Analysis Date:** 4/23/2023
Work Operation: Field activities	**Superintendent/Competent Person:** Lexus Sullivan	**Revised by:** Lexus Sullivan	**Revised Date:** 4/23/2023
Required Personal Protective Equipment (PPE): • Modified Level D—Long pants, long sleeves, and/or Tyvek coveralls if handling potentially contaminated media, and steel-toed footwear conforming to ASTM International (ASTM) F2412-05/ASTM F2413-05 • Depending on activity, the following PPE may also be required: safety glasses/splash goggles, hard hat, nitrile outer gloves and latex inner gloves, and, if boating, U.S. Coast Guard-approved personal flotation device (PFD; see cold stress section for cold-weather PFD information)		**Reviewed by:** Tim Shaner	**Reviewed Date:** 5/4/2023
		Approved by: Jason Cornetta	**Approved Date:** 5/16/2023

PLAYING IT SAFE

Job Safety Analysis

Field Activities

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
If boating		• Follow the Job Safety Analysis (JSA) for boating activities.	
Outdoor, physical activity	Slips, trips, and falls	• Avoid walking while writing or texting—maintain a heads-up posture. • Be aware of potentially slippery surfaces and tripping hazards. Use handrails where available. Wear footwear that has sufficient traction. • Maintain good housekeeping practices. Clean up all spills immediately. • Be aware of weather effects on the work area, including wet and/or frozen ground. • Jumping, running, and horseplay are prohibited. • Keep all areas clean and free of debris to prevent any trips and falls. • Be aware of and limit loose clothing or untied shoelaces that may contribute to slips, trip, and falls. • Notify the field team members of any unsafe conditions.	• Routinely inspect work area for unsafe conditions.

Job Safety Analysis

Field Activities

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Outdoor, physical activity (continued)	Heat stress	• Adjust work schedules, as necessary, to avoid the hottest part of the day. • Take rest breaks as warranted. • Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods. • Maintain body fluids at normal levels. • Train workers to recognize the symptoms of heat-related illness.	• Review weather forecast prior to field work. • Monitor workers' physical conditions. • Monitor outside temperature versus worker activity.
	Cold stress	• Provide shelter (enclosed, heated environment) to protect personnel during rest periods. • Educate workers to recognize the symptoms of frostbite and hypothermia. • Use appropriate cold-weather gear, up to and including Mustang-type bib coveralls or jacket/bib combinations. • Consider additional precautions if working near water in cold weather. • Have a dry change of clothing available. • Train workers to recognize the symptoms of cold-related illness.	• Review weather forecast prior to field work. • Monitor workers' physical conditions and PPE. • Monitor outside and water temperature versus worker activity and PPE.
	Rain or snow	• Wear appropriate PPE (rain gear). • Be aware of slip hazards, puddles, and electrical hazards when working in wet conditions. • If extremely cold conditions are forecast, consider additional precautions or postponing work activity.	• Review weather forecast prior to field work. • Inspect PPE daily prior to use. • Routinely inspect work area for deteriorating conditions.
	Sunshine	• Have sunscreen available for ultraviolet protection. • Have abundant water available to prevent dehydration. • Consider wearing wide-brimmed headwear and light-colored, lightweight, sun-blocking clothing.	• Ensure that sunscreen and water are available.
	Lightning	• Do not begin or continue work until lightning subsides for at least 30 minutes. Disconnect and do not use or touch electronic equipment. • Immediately head for shore if on the water and lightning is observed. If not able to get to shore, disconnect and do not use or touch the major electronic equipment, including the radio, throughout the duration of the storm.	• Obtain weather forecast and updates as needed.

Job Safety Analysis

Field Activities

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Outdoor, physical activity (continued)	High winds	• Wear goggles or safety glasses if dust or debris are visible.	• Review weather forecast prior to field work. • Ensure that goggles or safety glasses are available.
	Biological hazards (flora [e.g., poison ivy, poison sumac, and poison oak] and fauna [e.g., ticks, bees, spiders, mosquitoes, feral dogs, and snakes])	• Be aware of likely biological hazards in the work area. • Wear appropriate clothing (i.e., hat, long-sleeve shirt, long pants, leather gloves, boots, and Tyvek coveralls, as appropriate), and apply insect repellant. • Wear hand and arm protection when clearing plants or debris from the work area. • Be aware of potential wildlife and defensive behavior (e.g., nesting birds, or animals with young).	• Ensure that insect repellent is available. • Inspect clothing and skin for insects (e.g., ticks) after working in insect-prone areas.
	Noise exposure	• Wear hearing protection in high noise environments or when working around heavy machinery or equipment (action level of 85 decibels averaged over an 8-hour day).	• Ensure that hearing protection is available.

Training Requirements:

- All personnel working on hazardous waste sites must receive appropriate training as required by 29 Code of Federal Regulations (CFR) 1910.120(e), including but not limited to initial 40-hour, 8-hour supervisor, and annual 8-hour refresher trainings.
- Medical clearance must be received on an annual basis as required by 29 CFR 1910.120(f).
- If boating is involved, and a professional captained vessel is not in use, boat operators must take the appropriate state or provincial boater safety courses.
- All assigned employees are required to familiarize themselves with the contents of this JSA before starting a work activity and review it with their supervisor during their daily safety meeting.

Job Safety Analysis

Soil and Sediment Sampling

Project Name: JELD-WEN/Former Nord Door PDI	**Project Number:** 220909-01.01	**JSA Number:** 002	**Issue Date:** 5/16/2023
Location: 300 West Marine View Drive, Everett, WA 98201	**Contractor:** Anchor QEA, LLC	**Analysis by:** Lexus Sullivan	**Analysis Date:** 4/23/2023
Work Operation: Soil and sediment sampling	**Superintendent/Competent Person:**	**Revised by:** Stephen Strehl	**Revised Date:** 4/25/2023
Required Personal Protective Equipment (PPE): • Modified Level D—Long pants, long sleeves, and/or Tyvek coveralls if handling potentially contaminated media, and steel-toed footwear conforming to ASTM International (ASTM) F2412-05/ASTM F2413-05 • Safety glasses/splash goggles, hard hat, nitrile outer gloves and latex inner gloves, and, if boating, U.S. Coast Guard-approved personal flotation device (PFD; see cold stress section for cold-weather PFD information)		**Reviewed by:** Tim Shaner	**Reviewed Date:** 5/4/2023
		Approved by: Jason Cornetta	**Approved Date:** 5/16/2023

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Job Safety Analysis

Soil and Sediment Sampling

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
If boating		• Follow the Job Safety Analysis (JSA) for boating activities.	
If using glassware		• Follow the JSA for handling glassware.	

PLAYING IT SAFE

Job Safety Analysis

Soil and Sediment Sampling

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Sediment sample retrieval and processing	Injury from hand and power tool operation (e.g., spatula or drill)	• Be aware of sharp edges on hand tools (e.g., spatulas, knives, drill bits, and saw blades). • Be aware of electrical connections and water hazards when working with electric- or battery-operated tools. • Ensure that all tools are working properly; repair or replace defective tools. Repair when unplugged and off. • Keep guards on power tools when not in use.	• Inspect tools to ensure that they are in good working order. • Inspect electrical connections (if applicable). • Inspect tools periodically to ensure dry and clean operation.
	Noise exposure	• Wear hearing protection in high noise environments or when working around heavy machinery or equipment (action level of 85 decibels averaged over an 8-hour day).	• Ensure that hearing protection is available.
Sediment sample retrieval and processing (continued)	Slips, trips, and falls	• Avoid walking while writing or texting—maintain a heads-up posture. • Be aware of potentially slippery surfaces, including boat decks, riprap, muddy or algae-covered rocks, shoreline plants/seaweed, thick mud, and tripping hazards. Use handrails where available. Wear footwear that has sufficient traction. • Maintain good housekeeping practices. Clean up all spills immediately. • Be aware of weather effects on the work area, including wet and/or frozen ground. • Jumping, running, and horseplay are prohibited. • Be cautious when entering or exiting the vessel, and load/unload items onto/off of the pier or shore once boarded. • Keep all areas clean and free of debris to prevent any trips and falls. • Notify the field team members of any unsafe conditions.	• Routinely inspect work area for unsafe conditions.

Job Safety Analysis

Soil and Sediment Sampling

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
	Ingestion of contaminants, or skin or eye contact with contaminants	• Wear appropriate PPE to prevent/reduce exposure. • Contact 911, as necessary; perform CPR if breathing stops. • Move exposed person away from source of contamination, and rinse mouth. If exposure to skin occurs, promptly wash contaminated skin using soap or mild detergent and water. Rinse eyes with large amounts of water. • Follow decontamination procedures as outlined in the Health and Safety Plan (HASP).	• Ensure that decontamination procedures are on hand and are reviewed. • Ensure that PPE and rinsing water are available.
	Muscle strain or injuries from improper lifting	• Use proper lifting techniques or ask for assistance with heavy objects. • If boating, avoid carrying objects directly onto or off the boat; rather, load/unload objects while on the boat to/from the pier/shore.	• Evaluate weight and center of gravity of heavier items prior to lifting or moving.
	Pinch points	• If boating, secure any unsecured objects on deck; they may shift on deck quickly in wave, current, or engine acceleration conditions. • Maintain a safe distance from closing mechanisms and moving parts on sampling gear. • Avoid placing hands or self between boat and dock/piles.	

Job Safety Analysis

Soil and Sediment Sampling

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Sediment sample retrieval and processing (continued)	Wading	• Be aware of potentially slippery surfaces and tripping hazards such as fallen brush, logs, rocks, and other debris. Wear footwear that has sufficient traction. • Be aware of water depth and potential drop-offs. • Be aware of existing and projected river flows. • Wear hip or chest waders as appropriate for traction and to protect against cold water. • Keep an extra dry set of clothes on hand, including socks. • Use a wading staff for balance and to check for obstructions in murky water. • Always wear a PFD equipped with a whistle, even if water looks shallow or slow; drop-offs occur and water is often moving faster than it looks. • Waders should fit the person and not be overly baggy • A wading belt should always be worn (some waders come equipped with one) • Felt and/or studded wading boots • When water is deeper than knee deep, walk sideways, at an angle, or shuffle your feet when walking and never cross your feet • Bottom conditions, water conditions and flow can change and must be considered when determining safe allowable wading depth. Higher flow conditions will reduce the safe allowable wading depth. • Water should be entered from the bank and only from a boat that is anchored or on the bank. • If a boat is being used, all applicable boating H&S procedures should be followed (e.g., throwable safety buoy/line (throw bag)) • When entering the water, depth at entry point should be one foot or less and the bottom visible. • Wading should not be conducted if there is overhanging vegetation, logs or other obstructions that would prevent standing upright while wading. • If the current makes it difficult to hold your position, stop and cease wading • Deepest water depth acceptable for wading is to an individual's waist. If water depth increases beyond that point, do not proceed into deeper water. Look for an area with shallower water. If shallower water cannot be found, work must be completed from a boat.	• Inspect work area for tripping hazards visible from streambank. • Inspect waders for leaks. • Check depths and flows before wading. • Inspect PFDs for integrity, particularly the cartridge charge on inflatable PFDs.

Job Safety Analysis

Soil and Sediment Sampling

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Working outdoors	Heat stress	• Adjust work schedules, as necessary, to avoid the hottest part of the day. • Take rest breaks as warranted. • Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods. • Maintain body fluids at normal levels. • Train workers to recognize the symptoms of heat-related illness.	• Review weather forecast prior to field work. • Monitor workers' physical conditions. • Monitor outside temperature versus worker activity.
	Cold stress	• Provide shelter (enclosed, heated environment) to protect personnel during rest periods. • Educate workers to recognize the symptoms of frostbite and hypothermia. • Use appropriate cold-weather gear, up to and including Mustang-type bib coveralls or jacket/bib combinations. • Consider additional precautions if working near water in cold weather. • Have a dry change of clothing available. • Train workers to recognize the symptoms of cold-related illness.	• Review weather forecast prior to field work. • Monitor workers' physical conditions and PPE. • Monitor outside and water temperature versus worker activity and PPE.
	Rain or snow	• Wear appropriate PPE (rain gear). • Be aware of slip hazards, puddles, and electrical hazards when working in wet conditions. • If extremely cold conditions are forecast, consider additional precautions or postponing work activity.	• Review weather forecast prior to field work. • Inspect PPE daily prior to use. • Routinely inspect work area for deteriorating conditions.
Working outdoors (continued)	Sunshine	• Have sunscreen available for ultraviolet protection. • Have abundant water available to prevent dehydration. • Consider wearing wide-brimmed headwear and light-colored, lightweight, sun-blocking clothing.	• Ensure that sunscreen and water are available.
	Lightning	• Do not begin or continue work until lightning subsides for 30 minutes. Disconnect and do not use or touch electronic equipment. • Immediately head for shore if on the water and lightning is observed. If not able to get to shore, disconnect and do not use or touch the major electronic equipment, including the radio, throughout the duration of the storm.	• Obtain weather forecast and updates as needed.

Job Safety Analysis

Soil and Sediment Sampling

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
	High winds	• Wear goggles or safety glasses if dust or debris are visible.	• Review weather forecast prior to field work. • Ensure that goggles or safety glasses are available.
	Biological hazards (flora [e.g., poison ivy, poison sumac,and poison oak] and fauna [e.g., ticks, bees, spiders, mosquitoes, feral dogs, and snakes])	• Be aware of likely biological hazards in the work area. • Wear appropriate clothing (i.e., hat, long-sleeve shirt, long pants, leather gloves, boots, and Tyvek coveralls, as appropriate), and apply insect repellant. • Wear hand and arm protection when clearing plants or debris from the work area.	• Ensure that insect repellent is available. • Inspect clothing and skin for insects (e.g., ticks) after working in insect-prone areas.

Training Requirements:

- All personnel working on hazardous waste sites must receive appropriate training as required by 29 Code of Federal Regulations (CFR) 1910.120(e), including but not limited to initial 40-hour, 8-hour supervisor, and annual 8-hour refresher trainings.
- Medical clearance must be received on an annual basis as required by 29 CFR 1910.120(f).
- If boating is involved, and a professional captained vessel is not in use, boat operators must take the appropriate state or provincial boater safety courses.
- All assigned employees are required to familiarize themselves with the contents of this JSA before starting a work activity and review it with their supervisor during their daily safety meeting.

Job Safety Analysis

General Boating Activities

Project Name: JELD-WEN/Former Nord Door PDI	**Project Number:** 220909-01.01	**JSA Number:** 003	**Issue Date:** 5/16/2023
Location: 300 West Marine View Drive, Everett, WA 98201	**Contractor:** Anchor QEA, LLC	**Analysis by:** Lexus Sullivan	**Analysis Date:** 4/23/2023
Work Operation: General boating activities	**Superintendent/Competent Person:** Lexus Sullivan	**Revised by:** Lexus Sullivan	**Revised Date:** 4/23/2023
Required Personal Protective Equipment (PPE): • U.S. Coast Guard (USCG)-approved personal flotation device (PFD; see cold stress section for cold-weather PFD information)		**Reviewed by:** Tim Shaner	**Reviewed Date:** 5/4/2023
		Approved by: Jason Cornetta	**Approved Date:** 5/16/2023

PLAYING IT SAFE

Job Safety Analysis

General Boating Activities

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Walking on deck	Pinch points	• Secure any unsecured objects on deck; they may shift quickly in wave, current, or engine acceleration conditions. • Maintain a safe distance from closing mechanisms and moving parts, such as on sampling gear. • Avoid placing your hands or yourself between the boat and the dock or piles.	

Job Safety Analysis

General Boating Activities

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
	Slips, trips, and falls	• Avoid walking while writing or texting—maintain a heads-up posture. • Be aware of potentially slippery surfaces, including boat decks, riprap, muddy or algae-covered rocks, shoreline plants or seaweed, thick mud, and tripping hazards. Use handrails where available. Wear footwear that has sufficient traction. • Maintain good housekeeping practices. Clean up all spills immediately. • Be aware of weather effects on the work area, including wet and/or frozen ground. • Jumping, running, and horseplay are prohibited. • Be cautious when entering or exiting the vessel, and load/unload items onto/off of the pier or shore once boarded. • Keep all areas clean and free of debris to prevent any trips and falls. • Notify the field team members of any unsafe conditions. • Keep rope lines neatly coiled and stowed. Avoid stepping on or over lines.	• Routinely inspect work area for unsafe conditions.
	Exceeding boat capacity	• Keep the number of passengers and equipment as posted on boat placards within limits at all times. If conditions warrant, reduce capacity to maintain boat stability.	• Ensure that field team is aware of limits and adheres accordingly.
Walking on deck (continued)	Noise exposure	• Wear hearing protection in high noise environments or when working around heavy machinery or equipment (action level of 85 decibels averaged over an 8-hour day).	• Ensure that hearing protection is available.
Working outdoors	Heat stress	• Adjust work schedules, as necessary, to avoid the hottest part of the day. • Take rest breaks as warranted. • Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods. • Maintain body fluids at normal levels. • Train workers to recognize the symptoms of heat-related illness.	• Review weather forecast prior to field work. • Monitor workers' physical conditions. • Monitor outside temperature versus worker activity.

Job Safety Analysis

General Boating Activities

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
	Cold stress	• Provide shelter (enclosed, heated environment) to protect personnel during rest periods. • Educate workers to recognize the symptoms of frostbite and hypothermia. • If the combined air and water temperature is below 90 degrees Fahrenheit (˚F), wear a USCG-approved float coat, Mustang-type bib coveralls, or one-piece survival suit. • Have a dry change of clothing available. • Train workers to recognize the symptoms of cold-related illness.	• Review weather forecast prior to field work. • Monitor workers' physical conditions and PPE. • Monitor outside and water temperature versus worker activity and PPE.
	Rain or snow	• Wear appropriate PPE (rain gear). • Be aware of slip hazards, puddles, and electrical hazards when working in wet conditions. • If extremely cold conditions are forecast, consider additional precautions or postponing work activity.	• Review weather forecast prior to field work. • Inspect PPE daily prior to use. • Routinely inspect work area for deteriorating conditions.
	Sunshine	• Have sunscreen available for ultraviolet protection. • Have abundant water available to prevent dehydration. • Consider wearing wide-brimmed headwear and light-colored, lightweight, sun-blocking clothing.	• Ensure that sunscreen and water are onboard.
	Fog	• Wait for fog to lift for adequate visibility.	• Review weather forecast prior to field work.
Working outdoors (continued)	Lightning	• Do not begin or continue work until lightning subsides for at least 30 minutes. Disconnect and do not use or touch electronic equipment. • Immediately head for shore if on the water and lightning is observed. • If not able to get to shore, disconnect and do not use or touch the major electronic equipment, including the radio, throughout the duration of the storm.	• Obtain weather forecast and updates as needed.
	High river flows or high waves	• Be aware of waves and forecasts and recent rainfall in your watershed.	• Have forecast available.
	High winds	• Wear goggles or safety glasses if dust or debris are visible. • Stow or secure loads or equipment that could be moved by wind, particularly when underway.	• Review weather forecast prior to field work. • Ensure that goggles or safety glasses are onboard.

Job Safety Analysis

General Boating Activities

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
	Biological hazards (e.g., mosquitoes, deer flies, and horse flies)	• Wear appropriate clothing (i.e., hat, long-sleeve shirt, long pants, leather gloves, boots, and Tyvek coveralls, as appropriate), and apply insect repellent.	• Ensure that insect repellent is onboard.
Vessel emergencies	Person overboard	If you witness someone fall overboard: • Yell, "Person overboard!" • Throw a flotation device immediately. • If the engine is running, take it out of gear and swing the stern clear to keep from hitting the person. • Call 911 or USCG as appropriate. • Assign a spotter to keep the person in sight at all times. • Contact nearby vessels for assistance. • Recover the person from the water. If you fall overboard: • Hold your mouth and nose closed and protect your head. • When you reach the surface, look for movement, listen for sounds, and call for help. Use the whistle attached to the PFD and activate the beacon light. • It is only sensible to swim if there is reason to believe you have a chance of reaching your destination. Too much movement in cold water causes hypothermia.	• Ensure that flotation devices are available. • Ensure that team wears PFDs. • Inspect PFDs for integrity, particularly the cartridge charge on inflatable PFDs.
Vessel emergencies (continued)	Fire, abandon ship	• Be prepared to abandon ship in case of major fire (too large to control with a fire extinguisher), or other emergency. • Only the boat captain can order abandon ship. • Communicate intent to abandon ship to all personnel onboard. • Notify USCG and nearby vessels of intent to abandon ship. • Call 911. • Notify the Project Manager and Field Lead, if time permits. • Be aware of the propeller position before abandoning ship. • Identify a rally point for all personnel. • Know the dangers of hypothermia. • Use the buddy system to support injured personnel.	• Ensure that fire extinguisher is available, current, and in working order. • Review abandon ship procedures with field team prior to work.
Navigation	Boat traffic	• Maintain a safe operating distance from shoreline and other vessels.	• Be aware of on-water surroundings.

Job Safety Analysis

General Boating Activities

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Motor vehicle operation and trailering	Boat not secured properly	• Ensure that latches, straps, antennas, and onboard gear are secure. Ensure that motor is up and lights are plugged in for driving. • Follow Job Safety Analysis (JSA) for motor vehicle operation.	• Inspect around entire boat before driving.

Training Requirements:

- All personnel working on hazardous waste sites must receive appropriate training as required by 29 Code of Federal Regulations (CFR) 1910.120(e), including but not limited to initial 40-hour, 8-hour supervisor, and annual 8-hour refresher trainings.
- Medical clearance must be received on an annual basis as required by 29 CFR 1910.120(f).
- If professional captained vessel is not in use, boat operators must take appropriate state or provincial boater safety courses.
- All assigned employees are required to familiarize themselves with the contents of this JSA before starting a work activity and review it with their supervisor during their daily safety meeting.

Job Safety Analysis

Decontamination Activities

Project Name: JELD-WEN/Former Nord Door PDI	**Project Number:** 220909-01.01	**JSA Number:** 004	**Issue Date:** 5/16/2023
Location: 300 West Marine View Drive, Everett, WA 98201	**Contractor:** Anchor QEA, LLC	**Analysis by:** Lexus Sullivan	**Analysis Date:** 4/23/2023
Work Operation: Decontamination activities	**Superintendent/Competent Person:** Lexus Sullivan	**Revised by:** Lexus Sullivan	**Revised Date:** 4/23/2023
Required Personal Protective Equipment (PPE): • High-visibility safety vest • Hard hat where overhead hazards and/or heavy equipment are present • U.S. Coast Guard-approved personal flotation device (PFD), if boating (see cold stress section for cold-weather PFD information) • Safety glasses, outer nitrile gloves, Level D work clothes		**Reviewed by:** Tim Shaner	**Reviewed Date:** 5/4/2023
		Approved by: Jason Cornetta	**Approved Date:** 5/16/2023

PLAYING IT SAFE

Job Safety Analysis

Decontamination Activities

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
If boating		• Follow the Job Safety Analysis (JSA) for boating activities.	

PLAYING IT SAFE

Job Safety Analysis

Decontamination Activities

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Decontamination area set up	Vehicle, heavy equipment traffic, or boat traffic in work area	• Wear high-visibility safety vest and hard hat PPE. • Be alert when working around heavy equipment and/or other boats, especially if wearing hearing protection.	• Ensure that safety vests are available for staff and visitors.
	Muscle strain or injuries from improper lifting	• Use proper lifting techniques or ask for assistance with heavy objects. • If boating, avoid carrying objects directly onto or off of the boat; rather, load/unload objects while on the boat to/from the pier/shore.	• Evaluate weight and center of gravity of heavier items prior to lifting or moving.

Job Safety Analysis

Decontamination Activities

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
	Biological hazards (flora [e.g., poison ivy, poison sumac, and poison oak] and fauna [e.g., ticks, bees, spiders, mosquitoes, feral dogs, and snakes])	• Be aware of likely biological hazards in the work area. • Wear appropriate clothing (i.e., hat, long-sleeve shirt, long pants, leather gloves, boots, and Tyvek coveralls, as appropriate), and apply insect repellent. • Wear hand and arm protection when clearing plants or debris from the work area.	• Ensure that insect repellent is available. • Inspect clothing and skin for insects (e.g., ticks) after working in insect-prone areas.
Decontamination activities	Injury from hand and power tool operation (e.g., spatula or drill)	• Be aware of sharp edges on hand tools (e.g., spatulas, knives, drill bits, and saw blades). • Be aware of electrical connections and water hazards when working with electric- or battery-operated tools. • Ensure that all tools are working properly; repair or replace defective tools. Repair when unplugged and off. • Keep guards on power tools when not in use.	• Inspect tools to ensure that they are in good working order. • Inspect electrical connections (if applicable). • Inspect tools periodically to ensure dry and clean operation.
	Noise exposure	• Wear hearing protection in high noise environments or when working around heavy machinery or equipment (action level of 85 decibels averaged over an 8-hour day).	• Ensure that hearing protection is available.
	Slips, trips, and falls	• Avoid walking while writing or texting—maintain a heads-up posture. • Be aware of potentially slippery surfaces and tripping hazards. Use handrails where available. Wear footwear that has sufficient traction. • Maintain good housekeeping practices. Clean up all spills immediately. • Be aware of weather effects on the work area, including wet and/or frozen ground. • Jumping, running, and horseplay are prohibited. • Keep all areas clean and free of debris to prevent any trips and falls. • Notify the field team members of any unsafe conditions.	• Routinely inspect work area for unsafe conditions.

Job Safety Analysis

Decontamination Activities

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
	Ingestion of contaminants or decontamination fluids, or skin or eye contact with contaminants or decontamination fluids	• Wear appropriate PPE to prevent/reduce exposure. • Contact 911, as necessary; perform CPR if breathing stops. • Move exposed person away from source of contamination, and rinse mouth. If exposure to skin occurs, promptly wash contaminated skin using soap or mild detergent and water. Rinse eyes with large amounts of water. • Follow decontamination procedures as outlined in the Health and Safety Plan (HASP).	• Ensure that decontamination procedures are on hand and are reviewed. • Ensure that PPE and rinsing water are available.
Working outdoors	Heat stress	• Adjust work schedules, as necessary, to avoid the hottest part of the day. • Take rest breaks as warranted. • Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods. • Maintain body fluids at normal levels. • Train workers to recognize the symptoms of heat-related illness.	• Review weather forecast prior to field work. • Monitor workers' physical conditions. • Monitor outside temperature versus worker activity.
Working outdoors (continued)	Cold stress	• Provide shelter (enclosed, heated environment) to protect personnel during rest periods. • Educate workers to recognize the symptoms of frostbite and hypothermia. • Use appropriate cold-weather gear, up to and including Mustang-type bib coveralls or jacket/bib combinations. • Consider additional precautions if working near water in cold weather. • Have a dry change of clothing available. • Train workers to recognize the symptoms of cold-related illness.	• Review weather forecast prior to field work. • Monitor workers' physical conditions and PPE. • Monitor outside and water temperature versus worker activity and PPE.
	Rain or snow	• Wear appropriate PPE (rain gear). • Be aware of slip hazards, puddles, and electrical hazards when working in wet conditions. • If extremely cold conditions are forecast, consider additional precautions or postponing work activity.	• Review weather forecast prior to field work. • Inspect PPE daily prior to use. • Routinely inspect work area for deteriorating conditions.
	Sunshine	• Have sunscreen available for ultraviolet protection. • Have abundant water available to prevent dehydration. • Consider wearing wide-brimmed headwear and light-colored, lightweight, sun-blocking clothing.	• Ensure that sunscreen and water are available.

Job Safety Analysis

Decontamination Activities

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
	Lightning	• Do not begin or continue work until lightning subsides for at least 30 minutes. Disconnect and do not use or touch electronic equipment.	• Obtain weather forecast and updates as needed.
	High winds	• Wear goggles or safety glasses if dust or debris are visible.	• Review weather forecast prior to field work. • Ensure that goggles or safety glasses are available.

Training Requirements:

- All personnel working on hazardous waste sites must receive appropriate training as required by 29 Code of Federal Regulations (CFR) 1910.120(e), including but not limited to initial 40-hour, 8-hour supervisor, and annual 8-hour refresher trainings.
- Medical clearance must be received on an annual basis as required by 29 CFR 1910.120(f).
- If boating is involved, and a professional captained vessel is not in use, boat operators must take the appropriate state or provincial boater safety courses.
- All assigned employees are required to familiarize themselves with the contents of this JSA before starting a work activity and review it with their supervisor during their daily safety meeting.

Job Safety Analysis

Anchor QEA Motor Vehicle Operation

Project Name: JELD-WEN/Former Nord Door PDI	**Project Number:** 220909-01.01	**JSA Number:** 005	**Issue Date:** 5/16/2023
Location: 300 West Marine View Drive, Everett, WA 98201	**Contractor:** Anchor QEA, LLC	**Analysis by:** Lexus Sullivan	**Analysis Date:** 4/23/2023
Work Operation: Anchor QEA motor vehicle operation	**Superintendent/Competent Person:** Vehicle Driver	**Revised by:** Lexus Sullivan	**Revised Date:** 4/23/2023
Required Personal Protective Equipment (PPE): • Wear seat belt at all times • Make sure that clothing will not interfere with driving		**Reviewed by:** Tim Shaner	**Reviewed Date:** 5/4/2023
		Approved by: Jason Cornetta	**Approved Date:** 5/16/2023

PLAYING IT SAFE

Job Safety Analysis

Anchor QEA Motor Vehicle Operation

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Anchor QEA motor vehicle operation	Unfamiliar with the vehicle	• Allow yourself some time to get familiar with an Anchor QEA vehicle, a rental vehicle, or one not used often. • Test the lights, windshield wipers, hazard lights, horn, parking brake, and other important functions. • Review the dashboard controls, steering radius, and overhead and side clearances. • Allow extra side, front, and back space around the vehicle while driving or parking an unfamiliar vehicle. • Adjust mirrors and the seat while the vehicle is in park. • Drive slowly in confined locations, as in a parking garage, parking lots, or industrial settings. Confirm adequate clearances by sight before turning or backing up in tight or unfamiliar locations. • Use a second person to be a spotter outside the vehicle if needed in tight spaces.	• Inspect fluid levels and air pressure in tires, adjust mirrors and seat positions appropriately, monitor the fuel level, and fill up when the fuel level is low
	Speed and braking	• Fasten and properly adjust the seat belt. • Obey all posted and designated speed limits. • Radar detectors are prohibited in all company-owned, leased, or rented vehicles. • Reduce travel speed during hazardous conditions (e.g., rain, fog, or snow). • Identify whether your vehicle has Anti-Lock Brakes (ABS). If it does, DO NOT pump the brakes to stop when the vehicle has begun to skid. Apply steady pressure to the brakes. If the vehicle does not have ABS, pump the brakes to stop during slippery conditions.	• Seatbelt • Identify designated speed limits • Determine if vehicle has ABS

Job Safety Analysis

Anchor QEA Motor Vehicle Operation

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Anchor QEA motor vehicle operation (continued)	Distance spacing	• Continually check your rear and side view mirrors. • Use the 3-second rule to keep a safe distance between vehicles. • Increase the 3-second rule as necessary during hazardous travel conditions. • Regularly scan the area you will be entering in the next 10 to 12 seconds. • Always leave yourself an "out" during travel. • When stopping, make sure that you leave enough distance between you and the car in front of you. You should be able to see the rear tires of the vehicle in front when stopped. • Obey the speed limit and traffic regulations. • When at a red light and it turns green, use the "delayed start" technique, by counting to three before you take your foot off the brake. • DO NOT TAILGATE. • Keep headlights (and running lights, if available) on for maximum visibility.	• Seatbelt
	Skids	• If the vehicle has begun to skid out of control, turn the steering wheel in the direction of the skid and re-adjust the wheel, as necessary. • Reduce speed during hazardous travel conditions. • Use 4-wheel drive, if available, when driving vehicles off-road, on steep inclines, or in muddy conditions. • Do not take vehicles off-road if they cannot be operated safely in such conditions.	• Seatbelt
	Blind spots	• Become familiar with any blind spots associated with your vehicle. • Adjust mirrors to give the maximum viewing area. • Use your directional devices to signal all turns and when changing lanes; check rear and side view mirror and glance over your shoulder to check that the lane is clear. • Avoid other driver's blind spots; slow down and let the other vehicle pass. • If parked for an extended period and staying in the vehicle, be sure to inspect the area for changed conditions (e.g., a car that moved in behind you) before leaving.	• Seatbelt • Mirrors
	Backing	• Back into parking spaces upon arrival whenever possible. • Perform a 360-degree walk around the vehicle before backing to identify any new conditions or obstructions. • Use a spotter when backing whenever possible. • Understand hand signals. • Sound the horn prior to backing. • Check the rear and side view mirrors prior to backing. • Back slowly in areas of obstructed vision. • Anticipate others who may be backing out into your pathway and adjust accordingly.	• Seatbelt • Mirrors

Job Safety Analysis

Anchor QEA Motor Vehicle Operation

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Anchor QEA motor vehicle operation (continued)	Distractions (e.g., cell phones, reading maps or directions, eating)	• Do not engage in distracted driving—focus on operating the vehicle, and on your surroundings (e.g., road conditions and other drivers). • Obey state or local laws regarding cell phone use, at a minimum. • Certain clients prohibit cell phone use regardless of the state you are operating in—know your client's policy. • Use hands-free devices (not hand-held cellular phones) while driving. • Pull over to the side of the road when making a call or checking directions.	• Seatbelt • Hands-free devices connected and ready for use
	Accidents	• In the event of an accident, use the following procedures: – Stop, call for medical assistance, notify police, and complete an accident report and submit it to your supervisor. – Notify the Project Manager (PM) and Field Lead (FL). – Complete the appropriate incident investigation reports. – Contact Sara Weiskotten, Operations Liaison, at (857) 445-4987. – Contact Diana Reynolds, Insurance Liaison, at (302) 236-8403.	• Seatbelt
	Influenced by drugs or alcohol	• NEVER DRIVE UNDER THE INFLUENCE OF DRUGS OR ALCOHOL. • Keep in mind that the person in another vehicle may be under the influence of controlled substances, and be prepared for erratic or sudden driving changes on their part.	• Seatbelt
	Driver attitude	• Do not operate any vehicle when abnormally tired, temporarily disabled (i.e., injured), or under the influence of drugs or alcohol. • Keep an even temper when driving. Do not let the actions of others affect your attitude. • Do not allow yourself to become frustrated, rushed, distracted, or drowsy.	• Seatbelt
	Fatigue	• Stop and rest if fatigued. Exit the road and enter a safe area. Rest until fully refreshed. • Be aware that certain medications (such as cold or allergy medicines) may make you drowsy when driving a vehicle.	• Seatbelt
	Vehicle loading	• DO NOT OVERLOAD the vehicle. • Secure all equipment and supplies within the body of the vehicle using proper tie-downs. • Do not block side view mirrors with the load. • Do not transport U.S. Department of Transportation (DOT)-manifested hazardous materials. • Dispatch all equipment and personnel with proper forms and identification.	• Seatbelt

Job Safety Analysis

Anchor QEA Motor Vehicle Operation

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Anchor QEA motor vehicle operation (continued)	Equipment failure	• Perform daily inspections of your vehicle. • Maintain vehicle safety equipment (e.g., mirrors, alarms, horns, wipers, lights, and brakes). • Maintain the vehicle (e.g., tire pressure and fluid levels). • Any vehicle with mechanical defects that may endanger the safety of the driver, passengers, or the public shall not be used. • Ensure that appropriate safety equipment is in the vehicle. Safety equipment should include a spare tire, jack, first-aid kit, fire extinguisher, and flashlight. Flares and/or reflective triangles should be available in larger trucks. • Ensure that the proper documentation is in the vehicle. Documentation should include an operations manual for the vehicle, insurance card, vehicle registration, and accident forms.	• Inspect and maintain the vehicle

Training Requirements:

- All drivers are required to have a valid driver's license, and all vehicles must have appropriate state vehicle registration and inspection stickers. The use of hand-held wireless devices is prohibited while driving any vehicle for business use at any time, for personal use during business hours, and as defined by law.
- **If operating a vehicle or vehicle and trailer with a capacity greater than 10,000 pounds, U.S. Department of Transportation regulations may apply. Contact the PM prior to any travel in this configuration.**
- All assigned employees are required to read, familiarize themselves with the contents of this Job Safety Analysis, and sign the signature page before the operation of an Anchor QEA vehicle, and review it with their supervisor during their daily safety meeting.
- All assigned employees are required to complete annual driver training prior to driving an Anchor QEA vehicle.

Job Safety Analysis

Anchor QEA Motor Vehicle Operation

Vehicle Operation Job Safety Analysis Acknowledgement Form

The Anchor QEA Motor Vehicle Operation Job Safety Analysis must be read, understood, and signed before the operation of any Anchor QEA vehicle. My signature below certifies that I have read and understand the procedures presented in the Anchor QEA Motor Vehicle Operation Job Safety Analysis and have completed annual driver training.

Date	Name (print)	Signature

Job Safety Analysis

Anchor QEA Motor Vehicle Operation

Date	Name (print)	Signature

Job Safety Analysis

Sample and Laboratory Glassware Handling

Project Name: JELD-WEN/Former Nord Door PDI	**Project Number:** 220909-01.01	**JSA Number:** 006	**Issue Date:** 5/16/2023
Location: 300 West Marine View Drive, Everett, WA 98201	**Contractor:** Anchor QEA, LLC	**Analysis by:** Lexus Sullivan	**Analysis Date:** 4/23/2023
Work Operation: Sample and laboratory glassware handling	**Superintendent/Competent Person:** Lexus Sullivan	**Revised by:** Lexus Sullivan	**Revised Date:** 4/23/2023
Required Personal Protective Equipment (PPE): • Modified Level D—Long pants, long sleeves, and/or Tyvek coveralls if handling potentially contaminated media, and steel-toed footwear conforming to ASTM International (ASTM) F2412-05/ASTM F2413-05 • Depending on activity, the following PPE may also be required: safety glasses/splash goggles, hard hat, nitrile outer gloves and latex inner gloves, and, if boating, U.S. Coast Guard-approved personal flotation device (PFD)		**Reviewed by:** Tim Shaner	**Reviewed Date:** 5/4/2023
		Approved by: Jason Cornetta	**Approved Date:** 5/16/2023

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Transporting and using glassware	Breakage of containers during field activities	• Use appropriately sized tubs or bottle carriers with dividers to prevent bottle-to-bottle contact during transport. • Consider using coated glassware, if practicable. • Carry oversize bottles in tubs or bottle carriers using both hands during transfer to the sampling vessel and whenever the vessel is underway.	• Ensure dividers are sufficient and will remain in place during transport.
	Faulty glassware	• Replace any glassware that is chipped, nicked, or cracked.	• Inspect glassware before use.
	Impact with equipment and other objects	• Use care when loading and unloading sampling equipment. • Minimize the handling of individual containers to the extent possible.	

PLAYING IT SAFE

Job Safety Analysis

Sample and Laboratory Glassware Handling

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Filling sample containers	Over-tightening of bottle lids causing breakage	• Avoid use of excessive force to tighten bottle caps (i.e., finger tight). • Secure lids with clear tape to prevent opening during transport.	
	Breakage during sample collection	• Place containers in plastic tubs between aliquots to limit contact with hard surfaces. • Place containers on a stable and non-slip surface during collection. • Use the buddy system as needed to hold bottles during filling.	
Filling sample containers (continued)	Contact with sample preservatives (generally HCL or H_2SO_4 to lower pH to less than 2)	• Wear nitrile gloves and protective eyewear to prevent skin and eye contact if a container is damaged. • Do not open preserved bottles until necessary.	
Packing samples for shipment	Breakage during packing and shipment	• Use bottle wraps, foam sleeves, or bubble wrap to prevent bottle contact in the cooler. • Pack coolers snugly, but do not over pack.	• Ensure glass bottles do not touch to minimize potential breakage during transport.

Training Requirements:

- All personnel working on hazardous waste sites must receive appropriate training as required by 29 Code of Federal Regulations (CFR) 1910.120(e), including, but not limited to initial 40-hour, 8-hour supervisor, and annual 8-hour refresher trainings.
- Medical clearance must be received on an annual basis as required by 29 CFR 1910.120(f).
- All assigned employees are required to familiarize themselves with the contents of this JSA before starting a work activity and review it with their supervisor during their daily safety meeting.

Job Safety Analysis

Investigation-derived Waste Management

Project Name: JELD-WEN/Former Nord Door PDI	**Project Number:** 220909-01.01	**JSA Number:** 007	**Issue Date:** 5/16/2023
Location: 300 West Marine View Drive, Everett, WA 98201	**Contractor:** Anchor QEA, LLC	**Analysis by:** Lexus Sullivan	**Analysis Date:** 4/23/2023
Work Operation: Investigation-derived waste management	**Superintendent/Competent Person:** Lexus Sullivan	**Revised by:** Lexus Sullivan	**Revised Date:** 4/23/2023
Required Personal Protective Equipment (PPE): • Modified Level D—Long pants, long sleeves, and/or Tyvek coveralls if handling potentially contaminated media, and steel-toed footwear conforming to ASTM International (ASTM) F2412-05/ASTM F2413-05 • Depending on activity, the following PPE may also be required: safety glasses/splash goggles, hard hat, nitrile outer gloves and latex inner gloves, and, if boating, U.S. Coast Guard-approved personal flotation device (PFD).		**Reviewed by:** Tim Shaner	**Reviewed Date:** 5/4/2023
		Approved by: Jason Cornetta	**Approved Date:** 5/16/2023

PLAYING IT SAFE

Job Safety Analysis

Investigation-derived Waste Management

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Containerizing investigation-derived waste (IDW) at the source	Lifting	• Use care when lifting to redistribute IDW from one container (e.g., drums and buckets) to another at the source. • Seek assistance if loads are too heavy, or if you are experiencing fatigue. • Fill containers only to the degree that will be manageable in the future (e.g., half full) and to limit weight.	• Inspect containers for competency (i.e., no cracks, and handles in good repair).
	Pinch points	• Wear hand protection when closing containers. • Use the buddy system when affixing drum rings.	• Inspect drums for rust or sharp edges prior to opening or closing.

Job Safety Analysis

Investigation-derived Waste Management

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Relocating or staging IDW containers	Lifting	• Use task-specific tools whenever possible to move full containers (i.e., hoists, drum caddies or dollies, and vehicles). • When task-specific tools are not available, use the buddy system to move containers that are reasonable to lift. • Never roll drums or containers holding IDW. • Stage containers in areas protected from heavy traffic and weather, if possible.	• Ensure tools are in good repair. • Assess IDW container weight prior to moving.
Relocating or staging IDW containers (continued)	Pinch points or crushing	• Use tools to achieve the final arrangement when staging containers—do not place hands on the edges of containers while moving them into place. • Stand well clear of containers being moved in case they become dislodged from their handling tool during transport. • Do not stack IDW containers, as this poses a risk for container toppling and damage. • Place containers on a wooden pallet for easy transfer using a pallet jack, if possible.	• Inspect drums for evidence of cracks or rust.
IDW management – general	Splash	• Wear the required PPE at all times. • Use care to minimize splashing or smearing of IDW during handling and containerization.	• Inspect PPE upon donning and periodically during tasks.

Training Requirements:

- All personnel working on hazardous waste sites must receive appropriate training as required by 29 Code of Federal Regulations (CFR) 1910.120(e), including but not limited to initial 40-hour, 8-hour supervisor, and annual 8-hour refresher trainings.
- Medical clearance must be received on an annual basis as required by 29 CFR 1910.120(f).
- All assigned employees are required to familiarize themselves with the contents of this JSA before starting a work activity and review it with their supervisor during their daily safety meeting.

Job Safety Analysis

Subsurface Drilling

Project Name: JELD-WEN/Former Nord Door PDI	**Project Number:** 220909-01.01	**JSA Number:** 008	**Issue Date:** 5/16/2023
Location: 300 West Marine View Drive, Everett, WA 98201	**Contractor:** Holt Services (or similar contractor)	**Analysis by:** Stephen Strehl	**Analysis Date:** 04/07/2023
Work Operation: Subsurface drilling, soil sampling	**Superintendent/Competent Person:** Lexus Sullivan	**Revised by:** Stephen Strehl	**Revised Date:** 04/07/2023
Required Personal Protective Equipment (PPE): • Level D/Modified Level D • Long pants, long sleeves, and/or Tyvek coveralls if handling potentially contaminated media • Work boots with safety toe conforming to ASTM International (ASTM) F2412-05/ASTM F2413-05 • High-visibility traffic safety vest (High-visibility PFD sufficient) • Safety glasses • Hard hat if overhead hazard present • Hearing protection when there are high noise levels • High-visibility U.S. Coast Guard-approved personal flotation device (PFD) (if working within 10 feet of water) (see cold stress section for cold-weather PFD information) • Disposable chemical-resistant nitrile outer gloves and disposable inner gloves (latex or equivalent "surgical")		**Reviewed by:** Tim Shaner	**Reviewed Date:** 5/4/2023
		Approved by: Jason Cornetta	**Approved Date:** 5/16/2023

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Subsurface Drilling	Inhalation of contaminated dust, inhalation of volatile contaminants	• Document change of conditions that would require air monitoring per the HASP • Keep distance from drilling operation and potential dust hazard area • Contact 911 as necessary • If worker exposed to organic vapors, move the exposed person to fresh air, rinse mouth. Have a trained person perform CPR if breathing stops • Keep the affected person warm and at rest.	
Subsurface drilling	Noise exposure	• Wear hearing protection in high noise or sonic vibration environments or when working around heavy machinery or equipment (action level of 85 decibels averaged over an 8-hour day).	• Ensure that hearing protection is available.

PLAYING IT SAFE

Job Safety Analysis

Subsurface Drilling

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
	Slips, trips, and falls	• Avoid walking while writing or texting—maintain a heads-up posture. • Be aware of potentially slippery surfaces, including boat decks, riprap, muddy or algae-covered rocks, shoreline plants/seaweed, thick mud, and tripping hazards. Use handrails where available. Wear footwear that has sufficient traction. • Maintain good housekeeping practices. Clean up all spills immediately. • Be aware of weather effects on the work area, including wet and/or frozen ground. • Jumping, running, and horseplay are prohibited. • Be cautious when entering or exiting the vessel, and load/unload items onto/off of the pier or shore once boarded. • Keep all areas clean and free of debris to prevent any trips and falls. • Notify the field team members of any unsafe conditions.	• Routinely inspect work area for unsafe conditions.
	Ingestion of contaminants, skin/eye contact with contaminants	• Wear appropriate PPE to prevent/reduce exposure. • Do not consume food or beverages in the work area. • Wash hands and face thoroughly prior to eating or drinking. • Contact 911, as necessary; perform CPR if breathing stops. • Move exposed person away from source of contamination, and rinse mouth. If exposure to skin occurs, promptly wash contaminated skin using soap or mild detergent and water. Rinse eyes with large amounts of water. • Follow decontamination procedures as outlined in the Health and Safety Plan (HASP).	• Ensure that decontamination procedures are on hand and are reviewed. • Ensure that PPE and rinsing water are available.
	Muscle strain or injuries from improper lifting	• Use proper lifting techniques or ask for assistance with heavy objects. • If boating, avoid carrying objects directly onto or off the boat; rather, load/unload objects while on the boat to/from the pier/shore.	• Evaluate weight and center of gravity of heavier items prior to lifting or moving.
	Pinch points	• If boating, secure any unsecured objects on deck; they may shift on deck quickly in wave, current, or engine acceleration conditions. • Maintain a safe distance from closing mechanisms and moving parts on sampling gear. • Avoid placing hands or self between boat and dock/piles. • Maintain awareness of procedures underway and be attentive of sampling operators • Maintain safe distance from spud and winch when in operation	
	Overhead Hazards	• Inspect work area for overhead powerlines or cables • Maintain awareness of the drilling rig mast and overhead components. • Maintain awareness of barge spuds	• Inspect field area and winch cable

Job Safety Analysis

Subsurface Drilling

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Working outdoors	Heat stress	• Adjust work schedules, as necessary, to avoid the hottest part of the day. • Take rest breaks as warranted. • Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods. • Maintain body fluids at normal levels. • Train workers to recognize the symptoms of heat-related illness.	• Review weather forecast prior to field work. • Monitor workers' physical conditions. • Monitor outside temperature versus worker activity.
	Cold stress	• Provide shelter (enclosed, heated environment) to protect personnel during rest periods. • Educate workers to recognize the symptoms of frostbite and hypothermia. • Use appropriate cold-weather gear, up to and including Mustang-type bib coveralls or jacket/bib combinations. • Consider additional precautions if working near water in cold weather. • Have a dry change of clothing available. • Train workers to recognize the symptoms of cold-related illness.	• Review weather forecast prior to field work. • Monitor workers' physical conditions and PPE. • Monitor outside and water temperature versus worker activity and PPE.
	Rain/Snow	• Wear appropriate PPE (rain gear). • Be aware of slip hazards, puddles, and electrical hazards when working in wet conditions. • If extremely cold conditions are forecast, consider additional precautions or postponing work activity.	• Review weather forecast prior to field work. • Inspect PPE daily prior to use. • Routinely inspect work area for deteriorating conditions.

Subsurface Drilling

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
	Sunshine	• Have sunscreen available for ultraviolet protection. • Have abundant water available to prevent dehydration. • Consider wearing wide-brimmed headwear and light-colored, lightweight, sun-blocking clothing.	• Ensure that sunscreen and water are available.
	Lightning	• Do not begin or continue work until lightning subsides for 30 minutes. Disconnect and do not use or touch electronic equipment. • Immediately head for shore if on the water and lightning is observed. If not able to get to shore, disconnect and do not use or touch the major electronic equipment, including the radio, throughout the duration of the storm.	• Obtain weather forecast and updates as needed.
Working outdoors (continued)	High winds	• Wear goggles or safety glasses if dust or debris are visible.	• Review weather forecast prior to field work. • Ensure that goggles or safety glasses are available.
	Biological hazards (e.g., bees, wasps, spiders, and mosquitoes)	• Be aware of likely biological hazards in the work area. • Wear appropriate clothing (i.e., hat, long-sleeve shirt, long pants, leather gloves, boots, and Tyvek coveralls, as appropriate), and apply insect repellant. • Wear hand and arm protection when clearing plants or debris from the work area.	• Ensure that insect repellent is available. • Inspect clothing and skin for insects after working in insect-prone areas.

Training Requirements:

- All personnel working on hazardous waste sites must receive appropriate training as required by 29 Code of Federal Regulations (CFR) 1910.120(e), including but not limited to initial 40-hour, 8-hour supervisor, and annual 8-hour refresher trainings.
- Medical clearance must be received on an annual basis as required by 29 CFR 1910.120(f).
- All assigned employees are required to familiarize themselves with the contents of this JSA before starting a work activity and review it with their supervisor during their daily safety meeting.

Appendix C
Safety Data Sheets (SDS)

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

1 Identification of the substance/mixture and of the supplier

1.1 Product identifier

Trade Name: Alconox
Synonyms:
Product number: Alconox

1.2 Application of the substance / the mixture : Cleaning material/Detergent

1.3 Details of the supplier of the Safety Data Sheet

Manufacturer
Alconox, Inc.
30 Glenn Street
White Plains, NY 10603
1-914-948-4040

Supplier
Not Applicable

Emergency telephone number:
ChemTel Inc
North America: 1-800-255-3924
International: 01-813-248-0585

2 Hazards identification

2.1 Classification of the substance or mixture:

In compliance with EC regulation No. 1272/2008, 29CFR1910/1200 and GHS Rev. 3 and amendments.

Hazard-determining components of labeling:
Tetrasodium Pyrophosphate
Sodium tripolyphosphate
Sodium Alkylbenzene Sulfonate

2.2 Label elements:

Skin irritation, category 2.
Eye irritation, category 2A.

Hazard pictograms:

Signal word: Warning

Hazard statements:
H315 Causes skin irritation.
H319 Causes serious eye irritation.

Precautionary statements:
P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P321 Specific treatment (see supplemental first aid instructions on this label).
P332+P313 If skin irritation occurs: Get medical advice/attention.
P362 Take off contaminated clothing and wash before reuse.
P501 Dispose of contents and container as instructed in Section 13.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

Additional information: None.

Hazard description

Hazards Not Otherwise Classified (HNOC): None

Information concerning particular hazards for humans and environment:

The product has to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.

Classification system:

The classification is according to EC regulation No. 1272/2008, 29CFR1910/1200 and GHS Rev. 3 and amendments, and extended by company and literature data. The classification is in accordance with the latest editions of international substances lists, and is supplemented by information from technical literature and by information provided by the company.

3 Composition/information on ingredients

3.1 Chemical characterization : None

3.2 Description : None

3.3 Hazardous components (percentages by weight)

Identification	Chemical Name	Classification	Wt. %
CAS number: 7758-29-4	Sodium tripolyphosphate	Skin Irrit. 2 ; H315 Eye Irrit. 2; H319	12-28
CAS number: 68081-81-2	Sodium Alkylbenzene Sulfonate	Acute Tox. 4; H303 Skin Irrit. 2 ; H315 Eye Irrit. 2; H319	8-22
CAS number: 7722-88-5	Tetrasodium Pyrophosphate	Skin Irrit. 2 ; H315 Eye Irrit. 2; H319	2-16

3.4 Additional Information : None.

4 First aid measures

4.1 Description of first aid measures

General information: None.

After inhalation:

Maintain an unobstructed airway.
Loosen clothing as necessary and position individual in a comfortable position.

After skin contact:

Wash affected area with soap and water.
Seek medical attention if symptoms develop or persist.

After eye contact:

Rinse/flush exposed eye(s) gently using water for 15-20 minutes.
Remove contact lens(es) if able to do so during rinsing.
Seek medical attention if irritation persists or if concerned.

After swallowing:

Rinse mouth thoroughly.
Seek medical attention if irritation, discomfort, or vomiting persists.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

4.2 Most important symptoms and effects, both acute and delayed

None

4.3 Indication of any immediate medical attention and special treatment needed:

No additional information.

5 Firefighting measures

5.1 Extinguishing media

Suitable extinguishing agents:

Use appropriate fire suppression agents for adjacent combustible materials or sources of ignition.

For safety reasons unsuitable extinguishing agents : None

5.2 Special hazards arising from the substance or mixture :

Thermal decomposition can lead to release of irritating gases and vapors.

5.3 Advice for firefighters

Protective equipment:

Wear protective eye wear, gloves and clothing.
Refer to Section 8.

5.4 Additional information :

Avoid inhaling gases, fumes, dust, mist, vapor and aerosols.
Avoid contact with skin, eyes and clothing.

6 Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures :

Ensure adequate ventilation.
Ensure air handling systems are operational.

6.2 Environmental precautions :

Should not be released into the environment.
Prevent from reaching drains, sewer or waterway.

6.3 Methods and material for containment and cleaning up :

Wear protective eye wear, gloves and clothing.

6.4 Reference to other sections : None

7 Handling and storage

7.1 Precautions for safe handling :

Avoid breathing mist or vapor.
Do not eat, drink, smoke or use personal products when handling chemical substances.

7.2 Conditions for safe storage, including any incompatibilities :

Store in a cool, well-ventilated area.

7.3 Specific end use(s):

No additional information.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

8 Exposure controls/personal protection

8.1 Control parameters :

7722-88-5, Tetrasodium Pyrophosphate, OSHA TWA 5 mg/m3.

8.2 Exposure controls

Appropriate engineering controls:

Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use or handling.

Respiratory protection:

Not needed under normal conditions.

Protection of skin:

Select glove material impermeable and resistant to the substance.

Eye protection:

Safety goggles or glasses, or appropriate eye protection.

General hygienic measures:

Wash hands before breaks and at the end of work.
Avoid contact with skin, eyes and clothing.

9 Physical and chemical properties

Appearance (physical state, color):	White and cream colored flakes - powder	**Explosion limit lower**: **Explosion limit upper**:	Not determined or not available. Not determined or not available.
Odor:	Not determined or not available.	**Vapor pressure at 20°C**:	Not determined or not available.
Odor threshold:	Not determined or not available.	**Vapor density**:	Not determined or not available.
pH-value:	9.5 (aqueous solution)	**Relative density**:	Not determined or not available.
Melting/Freezing point:	Not determined or not available.	**Solubilities**:	Not determined or not available.
Boiling point/Boiling range:	Not determined or not available.	**Partition coefficient (n-octanol/water)**:	Not determined or not available.
Flash point (closed cup):	Not determined or not available.	**Auto/Self-ignition temperature**:	Not determined or not available.
Evaporation rate:	Not determined or not available.	**Decomposition temperature**:	Not determined or not available.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

Flammability (solid, gaseous):	Not determined or not available.	**Viscosity**:	a. Kinematic: Not determined or not available. b. Dynamic: Not determined or not available.
Density at 20°C:	Not determined or not available.		

10 Stability and reactivity

10.1 Reactivity : None

10.2 Chemical stability : None

10.3 Possibility hazardous reactions : None

10.4 Conditions to avoid : None

10.5 Incompatible materials : None

10.6 Hazardous decomposition products : None

11 Toxicological information

11.1 Information on toxicological effects :

Acute Toxicity:

Oral:

: LD50 > 5000 mg/kg oral rat - Product .

Chronic Toxicity: No additional information.

Skin corrosion/irritation:

Sodium Alkylbenzene Sulfonate: Causes skin irritation. .

Serious eye damage/irritation:

Sodium Alkylbenzene Sulfonate: Causes serious eye irritation .

Tetrasodium Pyrophosphate: Rabbit - Risk of serious damage to eyes .

Respiratory or skin sensitization: No additional information.

Carcinogenicity: No additional information.

IARC (International Agency for Research on Cancer): None of the ingredients are listed.

NTP (National Toxicology Program): None of the ingredients are listed.

Germ cell mutagenicity: No additional information.

Reproductive toxicity: No additional information.

STOT-single and repeated exposure: No additional information.

Additional toxicological information: No additional information.

12 Ecological information

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

12.1 Toxicity:

Sodium Alkylbenzene Sulfonate: Fish, LC50 1.67 mg/l, 96 hours.
Sodium Alkylbenzene Sulfonate: Aquatic invertebrates, EC50 Daphnia 2.4 mg/l, 48 hours.
Sodium Alkylbenzene Sulfonate: Aquatic Plants, EC50 Algae 29 mg/l, 96 hours.
Tetrasodium Pyrophosphate: Fish, LC50 - other fish - 1,380 mg/l - 96 h.
Tetrasodium Pyrophosphate: Aquatic invertebrates, EC50 - Daphnia magna (Water flea) - 391 mg/l - 48 h.

12.2 Persistence and degradability: No additional information.

12.3 Bioaccumulative potential: No additional information.

12.4 Mobility in soil: No additional information.

General notes: No additional information.

12.5 Results of PBT and vPvB assessment:

PBT: No additional information.

vPvB: No additional information.

12.6 Other adverse effects: No additional information.

13 Disposal considerations

13.1 Waste treatment methods (consult local, regional and national authorities for proper disposal)

Relevant Information:

It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities. (US 40CFR262.11).

14 Transport information

14.1 UN Number: None
ADR, ADN, DOT, IMDG, IATA

14.2 UN Proper shipping name: None
ADR, ADN, DOT, IMDG, IATA

14.3 Transport hazard classes:
ADR, ADN, DOT, IMDG, IATA

Class: None
Label: None
LTD. QTY: None

US DOT
Limited Quantity Exception: None

Bulk:
RQ (if applicable): None
Proper shipping Name: None
Hazard Class: None
Packing Group: None
Marine Pollutant (if applicable): No additional information.

Non Bulk:
RQ (if applicable): None
Proper shipping Name: None
Hazard Class: None
Packing Group: None
Marine Pollutant (if applicable): No additional information.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

	Comments: None	**Comments:** None
14.4	**Packing group:** ADR, ADN, DOT, IMDG, IATA	None
14.5	**Environmental hazards** :	None
14.6	**Special precautions for user:**	None
	Danger code (Kemler):	None
	EMS number:	None
	Segregation groups:	None
14.7	**Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code:**	Not applicable.
14.8	**Transport/Additional information:**	
	Transport category:	None
	Tunnel restriction code:	None
	UN "Model Regulation":	None

15 Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture.

North American

SARA

Section 313 (specific toxic chemical listings): None of the ingredients are listed.
Section 302 (extremely hazardous substances): None of the ingredients are listed.

CERCLA (Comprehensive Environmental Response, Clean up and Liability Act) Reportable

Spill Quantity: None of the ingredients are listed.

TSCA (Toxic Substances Control Act):

Inventory: All ingredients are listed.
Rules and Orders: Not applicable.

Proposition 65 (California):

Chemicals known to cause cancer: None of the ingredients are listed.

Chemicals known to cause reproductive toxicity for females: None of the ingredients are listed.

Chemicals known to cause reproductive toxicity for males: None of the ingredients are listed.

Chemicals known to cause developmental toxicity: None of the ingredients are listed.

Canadian

Canadian Domestic Substances List (DSL):
All ingredients are listed.

EU

REACH Article 57 (SVHC): None of the ingredients are listed.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

Germany MAK: Not classified.

Asia Pacific

Australia

Australian Inventory of Chemical Substances (AICS): All ingredients are listed.

China

Inventory of Existing Chemical Substances in China (IECSC): All ingredients are listed.

Japan

Inventory of Existing and New Chemical Substances (ENCS): All ingredients are listed.

Korea

Existing Chemicals List (ECL): All ingredients are listed.

New Zealand

New Zealand Inventory of Chemicals (NZOIC): All ingredients are listed.

Philippines

Philippine Inventory of Chemicals and Chemical Substances (PICCS): All ingredients are listed.

Taiwan

Taiwan Chemical Substance Inventory (TSCI): All ingredients are listed.

16 Other information

Abbreviations and Acronyms: None

Summary of Phrases

Hazard statements:

H315 Causes skin irritation.
H319 Causes serious eye irritation.

Precautionary statements:

P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P321 Specific treatment (see supplemental first aid instructions on this label).
P332+P313 If skin irritation occurs: Get medical advice/attention.
P362 Take off contaminated clothing and wash before reuse.
P501 Dispose of contents and container as instructed in Section 13.

Manufacturer Statement:

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

NFPA: 1-0-0

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

HMIS: 1-0-0

MATERIAL SAFETY DATA SHEET

POWDER FREE NITRILE EXAM GLOVES

Identification

Product Code:	GLP0065
Product Description:	Non-Sterile, Ambidextrous, Disposable, Powder-Free Nitrile Gloves,Blue Colored.
CASE #:	Not Established
IATA/IACO Hazard Rating:	Not Restricted
D.O.T Rating:	Not Restricted

Physical Data

Composition:

Nitrile
Sulfur
Accelerator, ZDBC
Zinc Oxide
Potassium Hydroxide
Titanium Dioxide
Stabilizer

Fire and Explosion

Stability:	Stable
Flash Point:	N/A
Extinguishing Media:	Foam Carbon Dioxide Water
Incompatible Materials:	None

Normal Precautions

Ventilation:	Not necessary under normal conditions
Equipment:	Not necessary
Spills Clean-up:	N/A

Exposure Data

Eyes:	N/A
Storage:	Keep away from sunlight and heat. Store at room temperature, 10-40°C.

a division of ...

www.tsmfg.com

Total Source Manufacturing

Voice: 888-460-444[illegible] 858-586-9922
Fax: 888-[illegible]58-586-0055
7077 Consol[illegible]ilding G
San Diego, CA 9[illegible]

Total Source Manufacturing

Section 1 - PRODUCT AND COMPANY IDENTIFICATION

Material Name
CARBON PITCH SOLID

Synonyms
CARBON PITCH; CARBON PITCH HARD PENCIL; CARBON PITCH PENCIL; DISTRESSED PITCH; ELECTRODE, AROMATIC, BINDER, TARGET,CORE, COAL TAR PITCH; HARD CARBON PITCH - PENCIL; MISCELLANEOUS PITCH - IMPORT; PITCH FINES; TARGET PITCH PENCIL

Chemical Family
polynuclear aromatic hydrocarbons

Product Use
process chemical. Component in the manufacture of electrodes and anodes for aluminum, metallurgic and electro-steel industries, activated carbon, carbon refractory blast furnace linings, and clay target manufacture.

Restrictions on Use
None known.

Details of the supplier of the safety data sheet

KOPPERS INC.
436 Seventh Avenue
Pittsburgh, PA 15219-1800
Mfg Contact: 412-227-2001 (SDS Requests: 866-852-5239)

CHEMTREC: 800-424-9300 (Outside USA: +1 703-527-3887)
Emergencies: (Medical in USA): 877-737-9047
Emergencies: (Medical Outside of USA): 651-632-9269
E-mail: naorgmsds@koppers.com

Section 2 - HAZARDS IDENTIFICATION

Classification in accordance with paragraph (d) of 29 CFR 1910.1200.
Combustible Dust
Skin Sensitization - Category 1
Germ Cell Mutagenicity - Category 1B
Carcinogenicity - Category 1A
Reproductive Toxicity - Category 1B
Hazardous to the Aquatic Environment - Chronic - Category 4

GHS Label Elements

Symbol(s)

Signal Word
Danger

Hazard Statement(s)
May form combustible dust concentrations in air.
May cause an allergic skin reaction.

May cause genetic defects.
May cause cancer.
May damage fertility or the unborn child.
May cause long lasting harmful effects to aquatic life.

Precautionary Statement(s)

Prevention
Avoid breathing dust.
Contaminated work clothing should not be allowed out of the workplace.
Wear protective gloves/protective clothing/eye protection/face protection.
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Avoid release to the environment.

Response
IF exposed or concerned: Get medical advice/attention.
IF ON SKIN: Wash with plenty of soap and water.
If skin irritation or rash occurs: Get medical advice/attention.
Wash contaminated clothing before reuse.

Storage
Store locked up.

Disposal
Dispose of contents/container in accordance with local/regional/national/international regulations.

Other Hazards
None known.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

CAS	Component Name	Percent
65996-93-2	Coal tar pitches	100
-	The above listed complex substance contains the following constituents	-
50-32-8	Benzo[a]pyrene	1.05-1.67
206-44-0	Fluoranthene	0.37-1.59
189-64-0	Dibenzo(a,h)pyrene	0.12-1.49
53-70-3	Dibenzo(a,h)anthracene	1.06-1.39
192-97-2	Benzo(e)pyrene	0.75-1.36
191-24-2	Benzo(ghi)perylene	0.83-1.34
129-00-0	Pyrene	0.40-1.30
205-99-2	Benzo(b)fluoranthene	0.79-1.30
218-01-9	Chrysene	0.56-1.30

56-55-3	Benz[a]anthracene	0.48-1.11
120-12-7	Anthracene	0.04-0.77
207-08-9	Benzo(k)fluoranthene	0.46-0.75
205-82-3	Benzo(j)fluoranthene	0.39-0.66
238-84-6	Benzo(a)fluorene	0.07-0.49
243-17-4	Benzo[b]fluorene	0.06-0.41
189-55-9	Dibenzo(a,i)pyrene	0.11-0.35
85-01-8	Phenanthrene	0.05-0.31
192-65-4	Dibenzo(a,e)pyrene	0.16-0.28
193-39-5	Indeno(1,2,3-cd)pyrene	0.15-0.26
217-59-4	Triphenylene	0.09-0.20
83-32-9	Acenaphthene	0.00-0.18
132-64-9	Dibenzofuran	0.12-0.14
86-74-8	9H-Carbazole	0.00-0.13
86-73-7	Fluorene	0.00-0.06

Component Related Regulatory Information

This product may be regulated, have exposure limits or other information identified as the following: Aromatic hydrocarbons, polycyclic (130489-29-2).

Section 4 - FIRST AID MEASURES

Inhalation

If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.

Skin

Wash all affected skin areas with warm soapy water. Skin contact causes photosensitization which can last for 36-72 hours after exposure. Keep out of direct sunlight for the next two to three days to avoid sunburn to the photosensitized skin areas. Use a broad spectrum blockout cream to protect against UV alpha ray exposure. Get medical attention, if needed.

Eyes

Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Then get immediate medical attention.

Ingestion

Not a likely route of exposure. Do NOT induce vomiting. If a large amount is swallowed, get medical attention. Do not give anything by mouth to unconscious or convulsive person. If vomiting occurs, keep head lower than hips to help prevent aspiration.

Most Important Symptoms/Effects

Acute
allergic reactions

Delayed
allergic reactions, mutagenic effects, Reproductive Effects, lung cancer, bladder cancer, skin cancer, scrotal cancer

Indication of any immediate medical attention and special treatment needed
Treat symptomatically and supportively.

Section 5 - FIRE FIGHTING MEASURES

Extinguishing Media

Suitable Extinguishing Media
regular dry chemical, carbon dioxide, regular foam, water spray, fog or mist

Unsuitable Extinguishing Media
Do not use high-pressure water streams.

Special Hazards Arising from the Chemical
Dust/air mixtures may ignite or explode. Minimum dust concentration required is 0.35 oz/ft3. Avoid generating dust; fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard. During fire conditions, vapors and decomposition products may be released, forming toxic and/or flammable/explosive mixtures in air.

Hazardous Combustion Products
Oxides of carbon, oxides of nitrogen, oxides of sulfur, polynuclear aromatic hydrocarbons

Fire Fighting Measures
Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas. Use extinguishing agents appropriate for surrounding fire. Flood with fine water spray. Directly spraying water or foam onto hot burning product may cause frothing. For fires in cargo or storage area: Cool containers with water from unmanned hose holder or monitor nozzles until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire. When the solid material is heated (as in a fire) it will melt and begin to flow. The molten material may be chilled and solidified using a water fog or fine water spray.

Special Protective Equipment and Precautions for Firefighters
Wear full protective firefighting gear including self-contained breathing apparatus (SCBA) for protection against possible exposure.

Section 6 - ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures
Wear personal protective clothing and equipment, see Section 8. Avoid release to the environment.

Methods and Materials for Containment and Cleaning Up
Stop leak if possible without personal risk. Shovel solidified material into containers for recycle if clean or disposal if contaminated. The solid or solidified spillage should be cleaned up as quickly as possible. Spilled material in a traffic area will break down with mechanical contact (e.g. vehicle tires) and become a wind borne dust. Solid material spillage may be wet down with a fine water spray to suppress dust during cleanup. If sweeping of a contaminated area is necessary, use a dust suppressant agent. Collect spill using a vacuum cleaner with a HEPA filter or wet and scoop up dry spills. Avoid sweeping spilled dry material. Eliminate ignition sources including sources of electrical, static or frictional sparks. Collect spilled material in appropriate container for disposal. In Canada, report releases to provincial authorities, municipal authorities, or both, as required. Due to the concentration of Benzo(a)pyrene and the CERCLA (40 CFR 302.4) reportable quantity of 1 pound, the release of 60 pounds (5.5

gallons) of this product requires National Response Center notification. See Section 13 for waste disposal information.

Section 7 - HANDLING AND STORAGE

Precautions for Safe Handling

Avoid breathing dust. Avoid contact with eyes, skin and clothing. When using do not eat, drink or smoke. Wear protective gloves/clothing and eye/face protection. Wash exposed areas thoroughly with soap and water, or a waterless hand cleaner, after skin contact and before eating, drinking, using tobacco products, or restrooms. Use protective skin cream on exposed skin before and during work shift. To reduce sun sensitivity a sun-blocking lotion can also be applied prior to application of a protective cream. Contaminated clothing should be removed and laundered before reuse. Contaminated work clothing should not be allowed out of the workplace unless laundered or decontaminated. After working with the product use warm soapy water and a wash cloth to thoroughly wash all areas of skin that have been contacted with product. After washing, apply a broad spectrum UV blockout cream on exposed skin areas before going into sunlight. Keep out of strong sunlight for two to three days after being affected by the product. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Avoid significant deposits of material, especially on horizontal surfaces, which may become airborne and form combustible dust clouds and may contribute to secondary explosions.

Conditions for Safe Storage, Including any Incompatibilities

Store locked up.
Store and handle in accordance with all current regulations and standards. Label all containers. Store in metal containers. Avoid use of plastic containers. Keep in a well-ventilated place. Keep away from heat, sparks and naked flames. Protect from physical damage. Notify State Emergency Response Commission for storage or use at amounts greater than or equal to the TPQ (U.S. EPA SARA Section 302). SARA Section 303 requires facilities storing a material with a TPQ to participate in local emergency response planning (U.S. EPA 40 CFR 355.30).

Incompatible Materials

oxidizing materials

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

Component Exposure Limits

Coal tar pitches	**65996-93-2**
ACGIH:	0.2 mg/m3 TWA as benzene-soluble aerosol
OSHA (US):	0.2 mg/m3 TWA (benzene soluble fraction)

ACGIH - Threshold Limit Values - Biological Exposure Indices (BEI)

Coal tar pitches (65996-93-2)
Medium: urine Time: end of shift at end of workweek Parameter: 1-Hydroxypyrene with hydrolysis (nonquantitative)

Engineering Controls

Provide local exhaust or process enclosure ventilation system. Ventilation equipment should be explosion-resistant if explosive concentrations of material are present. Ensure that dust-handling systems (such as exhaust ducts, dust collectors, vessels, and processing equipment) are designed in a manner to prevent the escape of dust into the work area (i.e., there is no leakage from the equipment). Ensure compliance with applicable exposure limits.

Individual Protection Measures, such as Personal Protective Equipment

Eye/face protection

ANSI Z87.1-1989 approved safety glasses with side shields. Provide an emergency eye wash fountain and quick drench shower in the immediate work area. At elevated temperatures: A face shield is recommended.

Skin Protection
Wear protective clothing to prevent contact. Wear long sleeved shirt or overalls fastened at wrists and neck, with long legged trousers with trouser legs worn outside over boot tops, boots, socks, and safety hat plus gloves. Use protective skin cream on exposed skin before and during work shift. Protective clothing must be changed when it shows signs of contamination. Remove and launder contaminated clothing separately from other laundry before reuse. When material is at an elevated temperature, wear appropriate heat resistant clothing.

Respiratory Protection
If the applicable TLVs and/or PELs are exceeded, use NIOSH-approved multipurpose air-purifying cartridge respirators, for organic vapors and P-100 particulate. Use a positive-pressure, air-supplied respirator if there is any potential for uncontrolled release, exposure levels are not known, or any other circumstance where air-purifying respirators may not provide adequate protection.

Glove Recommendations
Wear appropriate chemical resistant gloves. When material is at an elevated temperature, wear appropriate heat resistant gloves.

Protective Materials
protective skin creams, chemical resistant material, heat resistant material

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

Appearance	black solid	**Physical State**	solid
Odor	none at room temperature	**Color**	black
Odor Threshold	Not available	**pH**	Not available
Melting Point	40 - 180 °C	**Boiling Point**	>240 °C
Boiling Point Range	Not available	**Freezing point**	Not available
Evaporation Rate	Not available	**Flammability (solid, gas)**	Not flammable
Autoignition Temperature	>399 °C	**Flash Point**	>470 °F
Lower Explosive Limit	Not available	**Decomposition temperature**	Not available
Upper Explosive Limit	Not available	**Vapor Pressure**	(Negligible)
Vapor Density (air=1)	>1	**Specific Gravity (water=1)**	>1.297
Water Solubility	(Insoluble, Almost)	**Partition coefficient: n-octanol/water**	Not available
Viscosity	Not available	**Kinematic viscosity**	Not available
Solubility (Other)	Not available	**Density**	Not available

Log KOW	5.98 (approximate)	**Physical Form**	solid at room temperature , changes from solid to liquid as temperature increases
Molecular Weight	Not available	**OSHA Flammability Category**	4

Other Information
None known.

Section 10 - STABILITY AND REACTIVITY

Reactivity
No reactivity hazard is expected.

Chemical Stability
Stable at normal temperatures and pressure.

Possibility of Hazardous Reactions
Will not polymerize.

Conditions to Avoid
Avoid accumulation of airborne dusts. Avoid heat, flames, sparks and other sources of ignition. Avoid contact with incompatible materials. Contact with water at elevated temperatures may cause violent foaming or explosion. Keep out of water supplies and sewers.

Incompatible Materials
oxidizing materials

Hazardous decomposition products
oxides of carbon, oxides of nitrogen, oxides of sulfur, polynuclear aromatic hydrocarbons

Section 11 - TOXICOLOGICAL INFORMATION

Information on Likely Routes of Exposure

Inhalation
lung cancer, bladder cancer

Skin Contact
sensitivity to sunlight, allergic reactions, Reproductive Effects, skin cancer, scrotal cancer

Eye Contact
sensitivity to sunlight

Ingestion
No information on significant adverse effects.

Acute and Chronic Toxicity

Component Analysis - LD50/LC50
The components of this material have been reviewed in various sources and the following selected endpoints are published:
Coal tar pitches (65996-93-2)
Oral LD50 Rat 3300 mg/kg
Dermal LD50 Rat >5000 mg/kg (no deaths occurred)

Product Toxicity Data

Product Analysis LD/LC 50 Toxicity Values

Oral LD50:	Rat >15000 mg/kg LD50
Dermal LD50:	Rat >2000 mg/kg

Acute Toxicity Estimate
No data available.

Immediate Effects
allergic reactions.

Delayed Effects
allergic reactions, mutagenic effects, Reproductive Effects, lung cancer, bladder cancer, skin cancer, scrotal cancer

Irritation/Corrosivity Data
Erythema/eschar score: 0, Oedema score: 0

Respiratory Sensitization
No test data available.

Dermal Sensitization
Component data indicate the substance is sensitizing.

Component Carcinogenicity

Coal tar pitches	**65996-93-2**
ACGIH:	A1 - Confirmed Human Carcinogen
IARC:	Monograph 100F [2012] ; Supplement 7 [1987] ; Monograph 35 [1985] (Group 1 (carcinogenic to humans))
NTP:	Known Human Carcinogen
NIOSH:	potential occupational carcinogen

May cause cancer. NOAEL: 400 mg/kg oral-rat. An animal study may suggest an association between lung cancer and pulmonary deposition of particulate matter originating from coal tar pitches.

Germ Cell Mutagenicity
Available data characterizes this substance as mutagenic. May cause genetic defects.

Tumorigenic Data
No data available

Reproductive Toxicity
Available data characterizes this substance as a reproductive hazard. May cause harm to the unborn child. Possible risk of impaired fertility.

Specific Target Organ Toxicity - Single Exposure
No data available.

Specific Target Organ Toxicity - Repeated Exposure
No data available.

Aspiration hazard
No data available.

Medical Conditions Aggravated by Exposure
respiratory disorders, skin disorders

Additional Data
This product is coal tar pitch. Volume 35 of the IARC monograph states that there is sufficient evidence that coal tar pitches are carcinogenic in humans. IARC's conclusion is based upon studies suggesting an association between skin cancer and chronic occupational dermal exposure to coal tar pitches and upon other historical studies and anecdotal reports showing an association between dermal exposure to coal tar pitch and scrotal cancer in the absence of good hygiene practices. Epidemiological studies of aluminum reduction workers showed an excess risk of developing bladder cancer for workers with chronic inhalation overexposure to coal tar pitch volatiles in excess of the recommended permissible exposure level. Studies also suggest an association between lung cancer and chronic inhalation overexposure to coal tar pitch volatiles in excess of the recommended permissible exposure level. An animal study may suggest an association between lung cancer and pulmonary deposition of particulate matter originating from coal tar pitches.

Section 12 - ECOLOGICAL INFORMATION

Ecotoxicity
May cause long-term adverse effects in the aquatic environment.

Component Analysis - Aquatic Toxicity
No LOLI ecotoxicity data are available for this product's components.

Fish Toxicity
Not considered toxic to fish. Not toxic at limit of water solubility.

Invertebrate Toxicity
HIGH-TEMP. COAL TAR PITCH: >100 mg/l 48 hours EC50 Daphnia magna. EL50 96 hours ~100 mg/l Daphnia. EL50 48 hours >100 mg/l Algae. EL50 72 hours >100 mg/l Daphnia. ~100 mg/l Daphnia - NOELR 21 days. ~10 mg/l Algae - NOELR 72 hours.

Algal Toxicity
HIGH-TEMP. COAL TAR PITCH: >8000 mg/l 72 hours EC50 Scenedesmus subspicatus.

Persistence and Degradability
This substance is not expected to biodegrade. Insoluble in water.

Bioaccumulative Potential
Not bioaccumulating due to solubility and chemical structure. This material is believed not to bioaccumulate. Highly insoluble in water.

Mobility
This substance is expected to be immobile in soil. Insoluble in water.

Other Toxicity
No data available.

Section 13 - DISPOSAL CONSIDERATIONS

Disposal Methods
Dispose in accordance with all applicable regulations.

Component Waste Numbers
The U.S. EPA has not published waste numbers for this product's components.

Section 14 - TRANSPORT INFORMATION

US DOT Information:
Shipping Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. , (Contains:

BENZO(A)PYRENE , BENZO(B)FLUORANTHENE) RQ
Hazard Class: 9
UN/NA #: UN3077
Packing Group: III
Required Label(s): 9
Further information: This material contains reportable quantity (RQ) Hazardous Substances.

IATA Information:
Shipping Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. , (Contains: BENZO(A)PYRENE , BENZO(B)FLUORANTHENE) RQ
Hazard Class: 9
UN#: UN3077
Packing Group: III
Required Label(s): 9
Further information: Passenger & Cargo Aircraft - Ltd. Qty. - (Packing Instruction / Max. Net Qty. per Pkg.): Y956 / 30 kg G,Passenger Aircraft (Packing Instruction / Max. Net Qty. per Pkg.): 956 / 400 kgs,Cargo Aircraft (Packing Instruction / Max. Net Qty. per Pkg.): 956 / 400 kgs, ERG Code: 9L

TDG Information:
Shipping Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. , (Contains: BENZO(A)PYRENE , BENZO(B)FLUORANTHENE) RQ
Hazard Class: 9
UN#: UN3077
Packing Group: III
Required Label(s): 9

International Bulk Chemical Code

This material contains one or more of the following chemicals required by the IBC Code to be identified as dangerous chemicals in bulk.

Coal tar pitches	**65996-93-2**
IBC Code:	Category X (molten)

Further information

STCC Code: 2899868; HAZ STCC Code: 4966997, ERG: 171 US DOT Reportable Quantities BENZO(A)PYRENE (50-32-8) 1 lbs RQ; 0.454 kg RQ BENZO(B)FLUORANTHENE (205-99-2) 1 lbs RQ; 0.454 kg RQ

Section 15 - REGULATORY INFORMATION

U.S. Federal Regulations

This material contains one or more of the following chemicals required to be identified under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65), CERCLA (40 CFR 302.4), TSCA 12(b), and/or require an OSHA process safety plan.

Benzo[a]pyrene	**50-32-8**
SARA 313:	0.1 % Supplier notification limit
CERCLA:	1 lb final RQ ; 0.454 kg final RQ
Fluoranthene	**206-44-0**

SARA 313:	1 % Supplier notification limit
CERCLA:	100 lb final RQ ; 45.4 kg final RQ
Dibenzo(a,h)pyrene	**189-64-0**
SARA 313:	0.1 % Supplier notification limit
Dibenzo(a,h)anthracene	**53-70-3**
SARA 313:	0.1 % Supplier notification limit
CERCLA:	1 lb final RQ ; 0.454 kg final RQ
Benzo(ghi)perylene	**191-24-2**
SARA 313:	1 % Supplier notification limit
CERCLA:	5000 lb final RQ ; 2270 kg final RQ
Pyrene	**129-00-0**
SARA 302:	1000 lb lower TPQ ; 10000 lb upper TPQ
CERCLA:	5000 lb final RQ ; 2270 kg final RQ
SARA 304:	5000 lb EPCRA RQ
Benzo(b)fluoranthene	**205-99-2**
SARA 313:	0.1 % Supplier notification limit
CERCLA:	1 lb final RQ ; 0.454 kg final RQ
Chrysene	**218-01-9**
SARA 313:	1 % Supplier notification limit
CERCLA:	100 lb final RQ ; 45.4 kg final RQ
Benz[a]anthracene	**56-55-3**
SARA 313:	0.1 % Supplier notification limit
CERCLA:	10 lb final RQ ; 4.54 kg final RQ
Anthracene	**120-12-7**
SARA 313:	1 % de minimis concentration
CERCLA:	5000 lb final RQ ; 2270 kg final RQ
Benzo(k)fluoranthene	**207-08-9**

SARA 313:	0.1 % Supplier notification limit
CERCLA:	5000 lb final RQ ; 2270 kg final RQ
Benzo(j)fluoranthene	**205-82-3**
SARA 313:	0.1 % Supplier notification limit
Dibenzo(a,i)pyrene	**189-55-9**
SARA 313:	0.1 % Supplier notification limit
CERCLA:	10 lb final RQ ; 4.54 kg final RQ
Phenanthrene	**85-01-8**
SARA 313:	1 % de minimis concentration
CERCLA:	5000 lb final RQ ; 2270 kg final RQ
Dibenzo(a,e)pyrene	**192-65-4**
SARA 313:	0.1 % Supplier notification limit
Indeno(1,2,3-cd)pyrene	**193-39-5**
SARA 313:	0.1 % Supplier notification limit
CERCLA:	100 lb final RQ ; 45.4 kg final RQ
Acenaphthene	**83-32-9**
CERCLA:	100 lb final RQ ; 45.4 kg final RQ
Dibenzofuran	**132-64-9**
SARA 313:	1 % de minimis concentration
CERCLA:	100 lb final RQ ; 45.4 kg final RQ
Fluorene	**86-73-7**
CERCLA:	5000 lb final RQ ; 2270 kg final RQ

SARA Section 311/312 (40 CFR 370 Subparts B and C) reporting categories

Combustible Dust; Carcinogenicity; Reproductive Toxicity; Respiratory/Skin Sensitization; Germ Cell Mutagenicity

U.S. State Regulations

The following components appear on one or more of the following state hazardous substances lists:

Component	CAS	CA	MA	MN	NJ	PA
Coal tar pitches	**65996-93-2**	Yes	Yes	Yes	Yes	Yes

California Safe Drinking Water and Toxic Enforcement Act (Proposition 65)

WARNING

This product can expose you to chemicals including Benzo[a]pyrene , which is known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov.

Canada Regulations

Canadian WHMIS Ingredient Disclosure List (IDL)

Components of this material have been checked against the Canadian WHMIS Ingredients Disclosure List. The List is composed of chemicals which must be identified on MSDSs if they are included in products which meet WHMIS criteria specified in the Controlled Products Regulations and are present above the threshold limits listed on the IDL

Coal tar pitches	**65996-93-2**
	0.1 %
Benzo[a]pyrene	**50-32-8**
	0.1 %
Fluoranthene	**206-44-0**
	1 %
Dibenzo(a,h)pyrene	**189-64-0**
	0.1 %
Dibenzo(a,h)anthracene	**53-70-3**
	0.1 %
Pyrene	**129-00-0**
	1 %
Benzo(b)fluoranthene	**205-99-2**
	0.1 %
Chrysene	**218-01-9**
	0.1 %
Benz[a]anthracene	**56-55-3**
	0.1 %
Dibenzo(a,i)pyrene	**189-55-9**

	0.1 %
Indeno(1,2,3-cd)pyrene	**193-39-5**
	0.1 %

WHMIS Classification
D2A , D2B

Component Analysis - Inventory
Coal tar pitches (65996-93-2)

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
Yes	DSL	EIN	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes

Benzo[a]pyrene (50-32-8)

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
Yes	DSL	EIN	No	Yes	No	No	Yes	No	No	Yes	Yes	Yes	Yes	Yes

Fluoranthene (206-44-0)

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
Yes	NSL	EIN	Yes	No	Yes	Yes	No	No	No	Yes	Yes	No	Yes	Yes

Dibenzo(a,h)pyrene (189-64-0)

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
No	No	EIN	No	No	No	No	No	No	No	No	No	Yes	Yes	Yes

Dibenzo(a,h)anthracene (53-70-3)

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
Yes	NSL	EIN	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes

Benzo(ghi)perylene (191-24-2)

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
No	No	EIN	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes

Pyrene (129-00-0)

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
Yes	DSL	EIN	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes

Benzo(b)fluoranthene (205-99-2)

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
No	No	EIN	No	No	No	No	No	No	No	No	Yes	No	Yes	Yes

Chrysene (218-01-9)

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
Yes	DSL	EIN	Yes	No	No	No	Yes	No	No	No	Yes	No	Yes	Yes

Benz[a]anthracene (56-55-3)

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
Yes	NSL	EIN	No	No	No	No	No	No	No	Yes	Yes	No	Yes	Yes

Anthracene (120-12-7)

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
Yes	DSL	EIN	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes

Benzo(k)fluoranthene (207-08-9)

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
No	No	EIN	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes

Benzo(j)fluoranthene (205-82-3)

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
No	No	EIN	No	No	No	No	No	No	No	No	No	No	Yes	Yes

Dibenzo(a,i)pyrene (189-55-9)

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
No	No	EIN	No	No	No	No	No	No	No	No	No	Yes	Yes	Yes

Phenanthrene (85-01-8)

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI -	KR KECI -	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)

							Annex 1	Annex 2						
Yes	DSL	EIN	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes

Dibenzo(a,e)pyrene (192-65-4)

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
No	No	EIN	No	No	No	No	No	No	No	No	No	No	Yes	No

Indeno(1,2,3-cd)pyrene (193-39-5)

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
Yes	NSL	EIN	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes

Acenaphthene (83-32-9)

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
Yes	DSL	EIN	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No	Yes	Yes

Dibenzofuran (132-64-9)

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
Yes	DSL	EIN	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	Yes

Fluorene (86-73-7)

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
Yes	DSL	EIN	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	Yes

U.S. Inventory (TSCA)
Listed on inventory.

Section 16 - OTHER INFORMATION

NFPA Ratings
Health: 2 Fire: 1 Reactivity: 0
Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

Summary of Changes
Updated: 07/19/2018; MSDS SUMMARY OF CHANGES: SECTION 15 - CA Proposition 65

Key / Legend
ACGIH - American Conference of Governmental Industrial Hygienists; ADR - European Road Transport; AU - Australia; BOD - Biochemical Oxygen Demand; C - Celsius; CA - Canada; CA/MA/MN/NJ/PA - California/Massachusetts/Minnesota/New Jersey/Pennsylvania*; CAS - Chemical Abstracts Service; CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act; CFR - Code of Federal Regulations (US); CLP - Classification, Labelling, and Packaging; CN - China; CPR - Controlled Products Regulations; DFG - Deutsche Forschungsgemeinschaft; DOT - Department of Transportation; DSD - Dangerous Substance Directive; DSL - Domestic Substances List; EC – European Commission; EEC - European Economic Community; EIN - European Inventory of (Existing Commercial Chemical Substances); EINECS - European Inventory of Existing Commercial Chemical Substances; ENCS - Japan Existing and New Chemical Substance Inventory; EPA - Environmental Protection Agency; EU - European Union; F - Fahrenheit; F - Background (for Venezuela Biological Exposure Indices); IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; ICAO - International Civil Aviation Organization; IDL - Ingredient Disclosure List; IDLH - Immediately Dangerous to Life and Health; IMDG - International Maritime Dangerous Goods; ISHL - Japan Industrial Safety and Health Law; IUCLID - International Uniform Chemical Information Database; JP - Japan; Kow - Octanol/water partition coefficient; KR KECI Annex 1 - Korea Existing Chemicals Inventory (KECI) / Korea Existing Chemicals List (KECL); KR KECI Annex 2 - Korea Existing Chemicals Inventory (KECI) / Korea Existing Chemicals List (KECL) , KR - Korea; LD50/LC50 - Lethal Dose/ Lethal Concentration; LEL - Lower Explosive Limit; LLV - Level Limit Value; LOLI - List Of LIsts™ - ChemADVISOR's Regulatory Database; MAK - Maximum Concentration Value in the Workplace; MEL - Maximum Exposure Limits; MX – Mexico; Ne- Non-specific; NFPA - National Fire Protection Agency; NIOSH - National Institute for Occupational Safety and Health; NJTSR - New Jersey Trade Secret Registry; Nq - Non-quantitative; NSL – Non-Domestic Substance List (Canada); NTP - National Toxicology Program; NZ - New Zealand; OSHA - Occupational Safety and Health Administration; PEL- Permissible Exposure Limit; PH - Philippines; RCRA - Resource Conservation and Recovery Act; REACH- Registration, Evaluation, Authorisation, and restriction of Chemicals; RID - European Rail Transport; SARA - Superfund Amendments and Reauthorization Act; Sc - Semi-quantitative; STEL - Short-term Exposure Limit; TCCA – Korea Toxic Chemicals Control Act; TDG - Transportation of Dangerous Goods; TLV - Threshold Limit Value; TSCA - Toxic Substances Control Act; TW – Taiwan; TWA - Time Weighted Average; UEL - Upper Explosive Limit; UN/NA - United Nations /North American; US - United States; VLE - Exposure Limit Value (Mexico); VN (Draft) - Vietnam (Draft); WHMIS - Workplace Hazardous Materials Information System (Canada).

Other Information

Disclaimer:

The information set forth in this Safety Data Sheet does not purport to be all-inclusive and should be used only as a guide. While the information and recommendations set forth herein are believed to be accurate, the company makes no warranty regarding such information and recommendations and disclaims all liability from reliance thereon.

Safety Data Sheet
acc. to OSHA HCS

Printing date 03/25/2019 Version Number 2 Reviewed on 03/25/2019

*
1 Identification

· **Product identifier**

· **Trade name: Aroclor 1242 (PCB 1242)**

· **Part number:** RPC-1242, RPC-1242-1
· **CAS Number:**
53469-21-9
· **EC number:**
215-648-1
· **Index number:**
602-039-00-4
· **Application of the substance / the mixture** Reagents and Standards for Analytical Chemical Laboratory Use

· **Details of the supplier of the safety data sheet**
· **Manufacturer/Supplier:**
Agilent Technologies, Inc.
5301 Stevens Creek Blvd.
Santa Clara, CA 95051 USA

· **Information department:**
Telephone: 800-227-9770
e-mail: pdl-msds_author@agilent.com
· **Emergency telephone number:** CHEMTREC®: 1-800-424-9300

*
2 Hazard(s) identification

· **Classification of the substance or mixture**


GHS08 Health hazard

Carc. 1B H350 May cause cancer.
STOT RE 1 H372 Causes damage to organs through prolonged or repeated exposure.

· **Label elements**
· **GHS label elements** The substance is classified and labeled according to the Globally Harmonized System (GHS).
· **Hazard pictograms**


GHS08

· **Signal word** Danger

· **Hazard-determining components of labeling:**
Aroclor 1242 (PCB 1242)
· **Hazard statements**
May cause cancer.
Causes damage to organs through prolonged or repeated exposure.
· **Precautionary statements**
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Do not breathe dust/fume/gas/mist/vapors/spray.
Wash thoroughly after handling.
Do not eat, drink or smoke when using this product.

(Contd. on page 2)

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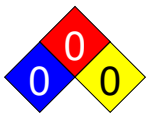
Trade name: Aroclor 1242 (PCB 1242)

(Contd. of page 1)

Wear protective gloves/protective clothing/eye protection/face protection.
IF exposed or concerned: Get medical advice/attention.
Get medical advice/attention if you feel unwell.
Store locked up.
Dispose of contents/container in accordance with local/regional/national/international regulations.

· **Classification system:**
· **NFPA ratings (scale 0 - 4)**



Health = 0
Fire = 0
Reactivity = 0

· **HMIS-ratings (scale 0 - 4)**

Health = *1
Fire = 0
Reactivity = 0

· **Other hazards**
· **Results of PBT and vPvB assessment**
· **PBT:** Not applicable.
· **vPvB:** Not applicable.

3 Composition/information on ingredients

· **Chemical characterization: Substances**
· **CAS No. Description**
53469-21-9 Aroclor 1242 (PCB 1242)
· **Identification number(s)**
· **EC number:** 215-648-1
· **Index number:** 602-039-00-4

*
4 First-aid measures

· **Description of first aid measures**
· **General information:**
Symptoms of poisoning may even occur after several hours; therefore medical observation for at least 48 hours after the accident.
· **After inhalation:** Supply fresh air; consult doctor in case of complaints.
· **After skin contact:** Generally the product does not irritate the skin.
· **After eye contact:** Rinse opened eye for several minutes under running water.
· **After swallowing:** If symptoms persist consult doctor.
· **Information for doctor:**
· **Most important symptoms and effects, both acute and delayed** No further relevant information available.
· **Indication of any immediate medical attention and special treatment needed**
No further relevant information available.

(Contd. on page 3)

Safety Data Sheet
acc. to OSHA HCS

(Contd. of page 2)

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5 Fire-fighting measures

· **Extinguishing media**
· **Suitable extinguishing agents:** Use fire fighting measures that suit the environment.
· **Special hazards arising from the substance or mixture**
During heating or in case of fire poisonous gases are produced.
· **Advice for firefighters**
· **Protective equipment:** Mouth respiratory protective device.

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6 Accidental release measures

· **Personal precautions, protective equipment and emergency procedures** Mount respiratory protective device.
· **Environmental precautions:** Do not allow to enter sewers/ surface or ground water.
· **Methods and material for containment and cleaning up:**
Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust).
Dispose contaminated material as waste according to item 13.
Ensure adequate ventilation.
· **Reference to other sections**
See Section 7 for information on safe handling.
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.
· **Protective Action Criteria for Chemicals**

· **PAC-1:**
3 mg/m³
· **PAC-2:**
140 mg/m³
· **PAC-3:**
840 mg/m³

*
7 Handling and storage

· **Handling:**
· **Precautions for safe handling**
Ensure good ventilation/exhaustion at the workplace.
Open and handle receptacle with care.
Prevent formation of aerosols.
· **Information about protection against explosions and fires:** Keep respiratory protective device available.

· **Conditions for safe storage, including any incompatibilities**
· **Storage:**
· **Requirements to be met by storerooms and receptacles:** No special requirements.
· **Information about storage in one common storage facility:** Not required.
· **Further information about storage conditions:** Keep receptacle tightly sealed.
· **Specific end use(s)** No further relevant information available.

(Contd. on page 4)

Safety Data Sheet
acc. to OSHA HCS

(Contd. of page 3)

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8 Exposure controls/personal protection

· **Additional information about design of technical systems:** No further data; see item 7.

· **Control parameters**

· **Components with limit values that require monitoring at the workplace:**
The following constituent is the only constituent of the product which has a PEL, TLV or other recommended exposure limit.
The following constituents are the only constituents of the product which have a PEL, TLV or other recommended exposure limit.
At this time, the remaining constituent has no known exposure limits.
At this time, the other constituents have no known exposure limits.

53469-21-9 Aroclor 1242 (PCB 1242)	
PEL	Long-term value: 1 mg/m³ Skin
REL	Long-term value: 0.001 mg/m³ See Pocket Guide App. A
TLV	Long-term value: 1 mg/m³ Skin

· **Additional information:** The lists that were valid during the creation were used as basis.

· **Exposure controls**

· **Personal protective equipment:**

· **General protective and hygienic measures:**
Keep away from foodstuffs, beverages and feed.
Wash hands before breaks and at the end of work.
Store protective clothing separately.

· **Breathing equipment:**
When used as intended with Agilent instruments, the use of the product under normal laboratory conditions and with standard practices does not result in significant airborne exposures and therefore respiratory protection is not needed.
Under an emergency condition where a respirator is deemed necessary, use a NIOSH or equivalent approved device/equipment with appropriate organic or acid gas cartridge.

· **Protection of hands:**
Although not recommended for constant contact with the chemicals or for clean-up, nitrile gloves 11-13 mil thickness are recommended for normal use. The breakthrough time is 1 hr. For cleaning a spill where there is direct contact of the chemical, butyl rubber gloves are recommended 12-15 mil thickness with breakthrough times exceeding 4 hrs. Supplier recommendations should be followed.

· **Material of gloves**
For normal use: nitrile rubber, 11-13 mil thickness
For direct contact with the chemical: butyl rubber, 12-15 mil thickness
The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer.

· **Penetration time of glove material**
For normal use: nitrile rubber: 1 hour
For direct contact with the chemical: butyl rubber: >4 hours

(Contd. on page 5)

(Contd. of page 4)

· **Eye protection:**

Tightly sealed goggles

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9 Physical and chemical properties

· **Information on basic physical and chemical properties**	
· **General Information**	
· **Appearance:**	
Form:	Fluid
Color:	Not determined.
· **Odor:**	Characteristic
· **Odor threshold:**	Not determined.
· **pH-value:**	Not determined.
· **Change in condition**	
Melting point/Melting range:	Undetermined.
Boiling point/Boiling range:	Undetermined.
· **Flash point:**	Not applicable.
· **Flammability (solid, gaseous):**	Not applicable.
· **Decomposition temperature:**	Not determined.
· **Auto igniting:**	Not determined.
· **Danger of explosion:**	Product does not present an explosion hazard.
· **Explosion limits:**	
Lower:	Not determined.
Upper:	Not determined.
· **Vapor pressure:**	Not determined.
· **Density:**	Not determined.
· **Relative density**	Not determined.
· **Vapor density**	Not determined.
· **Evaporation rate**	Not determined.
· **Solubility in / Miscibility with**	
Water:	Not miscible or difficult to mix.
· **Partition coefficient (n-octanol/water):**	Not determined.
· **Viscosity:**	
Dynamic:	Not determined.
Kinematic:	Not determined.
VOC content:	0.00 % 0.0 g/l / 0.00 lb/gal
· **Other information**	No further relevant information available.

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Trade name: Aroclor 1242 (PCB 1242)

(Contd. of page 5)

10 Stability and reactivity

· **Reactivity** No further relevant information available.
· **Chemical stability**
· **Thermal decomposition / conditions to be avoided:** No decomposition if used according to specifications.
· **Possibility of hazardous reactions** No dangerous reactions known.
· **Conditions to avoid** No further relevant information available.
· **Incompatible materials:** No further relevant information available.
· **Hazardous decomposition products:** No dangerous decomposition products known.

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11 Toxicological information

· **Information on toxicological effects**
· **Acute toxicity:**

· **LD/LC50 values that are relevant for classification:**		
ATE (Acute Toxicity Estimate)		
Oral	LD50	4,250 mg/kg (rat)

53469-21-9 Aroclor 1242 (PCB 1242)		
Oral	LD50	4,250 mg/kg (rat)

· **Primary irritant effect:**
· **on the skin:** No irritant effect.
· **on the eye:** No irritating effect.
· **Sensitization:** No sensitizing effects known.
· **Additional toxicological information:**

· **Carcinogenic categories**

· **IARC (International Agency for Research on Cancer)**
2A

· **NTP (National Toxicology Program)**
Substance is not listed.

· **OSHA-Ca (Occupational Safety & Health Administration)**
Substance is not listed.

12 Ecological information

· **Toxicity**
· **Aquatic toxicity:** No further relevant information available.
· **Persistence and degradability** No further relevant information available.
· **Behavior in environmental systems:**
· **Bioaccumulative potential** No further relevant information available.
· **Mobility in soil** No further relevant information available.
· **Additional ecological information:**
· **General notes:**
Water hazard class 1 (Self-assessment): slightly hazardous for water
Do not allow undiluted product or large quantities of it to reach ground water, water course or sewage system.
· **Results of PBT and vPvB assessment**
· **PBT:** Not applicable.

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Trade name: Aroclor 1242 (PCB 1242)

(Contd. of page 6)

· **vPvB:** Not applicable.
· **Other adverse effects** No further relevant information available.

13 Disposal considerations

· **Waste treatment methods**
· **Recommendation:**
Must not be disposed of together with household garbage. Do not allow product to reach sewage system.

· **Uncleaned packagings:**
· **Recommendation:** Disposal must be made according to official regulations.

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14 Transport information

· **UN-Number**	
· **DOT, IMDG, IATA**	UN2315
· **UN proper shipping name**	
· **DOT**	Polychlorinated biphenyls, liquid
· **IMDG**	POLYCHLORINATED BIPHENYLS, LIQUID, MARINE POLLUTANT
· **IATA**	POLYCHLORINATED BIPHENYLS, LIQUID
· **Transport hazard class(es)**	
· **DOT, IATA**	
· **Class**	9 Miscellaneous dangerous substances and articles
· **Label**	9
· **IMDG**	
· **Class**	9 Miscellaneous dangerous substances and articles
· **Label**	9
· **Packing group**	
· **DOT, IMDG, IATA**	II
· **Environmental hazards:**	
· **Marine pollutant:**	Symbol (fish and tree)
· **Special precautions for user**	Warning: Miscellaneous dangerous substances and articles
· **Danger code (Kemler):**	90
· **EMS Number:**	6.1-02
· **Stowage Category**	A

(Contd. on page 8)

(Contd. of page 7)

· **Segregation Code**	SG50 Segregation from foodstuffs as in 7.3.4.2.1, 7.6.3.1.2 or 7.7.3.6.
· **Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code**	Not applicable.
· **Transport/Additional information:**	
· **DOT**	
· **Quantity limitations**	On passenger aircraft/rail: 100 L On cargo aircraft only: 220 L
· **Hazardous substance:**	1 lbs, 0.454 kg
· **IMDG**	
· **Limited quantities (LQ)**	1L
· **Excepted quantities (EQ)**	Code: E2 Maximum net quantity per inner packaging: 30 ml Maximum net quantity per outer packaging: 500 ml
· **UN "Model Regulation":**	UN 2315 POLYCHLORINATED BIPHENYLS, LIQUID, 9, II, ENVIRONMENTALLY HAZARDOUS

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15 Regulatory information

· **Safety, health and environmental regulations/legislation specific for the substance or mixture**
· **Sara**

· **Section 355 (extremely hazardous substances):**
Substance is not listed.

· **Section 313 (Specific toxic chemical listings):**
Substance is not listed.

· **TSCA (Toxic Substances Control Act):**
Substance is not listed.

· **TSCA new (21st Century Act): (Substances not listed)**

53469-21-9	Aroclor 1242 (PCB 1242)

· **Proposition 65**

· **Chemicals known to cause cancer:**
Substance is not listed.

· **Chemicals known to cause reproductive toxicity for females:**
Substance is not listed.

· **Chemicals known to cause reproductive toxicity for males:**
Substance is not listed.

· **Chemicals known to cause developmental toxicity:**
Substance is not listed.

· **Carcinogenic categories**

· **EPA (Environmental Protection Agency)**

B2

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Trade name: Aroclor 1242 (PCB 1242)

(Contd. of page 8)

· **TLV (Threshold Limit Value established by ACGIH)**

Substance is not listed.

· **NIOSH-Ca (National Institute for Occupational Safety and Health)**

Substance is listed.

· **National regulations:**

· **Information about limitation of use:**
Workers are not allowed to be exposed to this hazardous material. Exceptions can be made by the authorities in certain cases.

· **Chemical safety assessment:** A Chemical Safety Assessment has not been carried out.

*
16 Other information

The information contained in this document is based on Agilent's state of knowledge at the time of preparation. No warranty as to its accurateness, completeness or suitability for a particular purpose is expressed or implied.

· **Department issuing SDS:** Document Control / Regulatory
· **Contact:** regulatory@ultrasci.com
· **Date of preparation / last revision** 03/25/2019 / 1
· **Abbreviations and acronyms:**
ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
ACGIH: American Conference of Governmental Industrial Hygienists
EINECS: European Inventory of Existing Commercial Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
NFPA: National Fire Protection Association (USA)
HMIS: Hazardous Materials Identification System (USA)
VOC: Volatile Organic Compounds (USA, EU)
LC50: Lethal concentration, 50 percent
LD50: Lethal dose, 50 percent
PBT: Persistent, Bioaccumulative and Toxic
vPvB: very Persistent and very Bioaccumulative
NIOSH: National Institute for Occupational Safety
OSHA: Occupational Safety & Health
TLV: Threshold Limit Value
PEL: Permissible Exposure Limit
REL: Recommended Exposure Limit
Carc. 1B: Carcinogenicity – Category 1B
STOT RE 1: Specific target organ toxicity (repeated exposure) – Category 1
· *** Data compared to the previous version altered.**

2,3,7,8-Tetrachlorodibenzo-p-dioxin solution

sc-256309

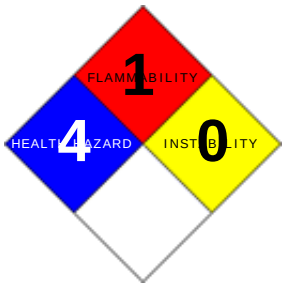
Material Safety Data Sheet

Hazard Alert Code Key:	EXTREME	HIGH	MODERATE	LOW

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME
2,3,7,8-Tetrachlorodibenzo-p-dioxin solution

STATEMENT OF HAZARDOUS NATURE
CONSIDERED A HAZARDOUS SUBSTANCE ACCORDING TO OSHA 29 CFR 1910.1200.

NFPA


SUPPLIER
Company: Santa Cruz Biotechnology, Inc.
Address:
2145 Delaware Ave
Santa Cruz, CA 95060
Telephone: 800.457.3801 or 831.457.3800
Emergency Tel: CHEMWATCH: From within the US and Canada: 877-715-9305
Emergency Tel: From outside the US and Canada: +800 2436 2255 (1-800-CHEMCALL) or call +613 9573 3112

PRODUCT USE
■ Operators should be trained in procedures for safe use of this material. Possession prohibited; other than for Approved Research use. [NHMRC]. Handling of this material must be planned and monitored. Use best control measures, best handling procedures and full body protection to avoid any possible contact.

SYNONYMS
C12-H4-Cl4-O2, Cl2C6H2O2C6H2Cl2, "2, 3, 7, 8-tetrachlorodibenzo-1, 4-dioxin", "2, 3, 7, 8-tetrachlorodibenzo-1, 4-dioxin", "2, 3, 7, 8-tetrachlorodibenzo[b, e](1, 4)dioxan", "2, 3, 7, 8-tetrachlorodibenzo[b, e](1, 4)dioxan", "dioxin herbicide contaminant", dioxine, TCDD, TCDBD, "2, 3, 7, 8-TCDD", "2, 3, 7, 8-TCDD", tetradioxin

Section 2 - HAZARDS IDENTIFICATION

CANADIAN WHMIS SYMBOLS


EMERGENCY OVERVIEW
RISK
May cause CANCER.
Very toxic in contact with skin and if swallowed.
May cause long-term adverse effects in the environment.

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

■ Severely toxic effects may result from the accidental ingestion of the material; animal experiments indicate that ingestion of less than 5 gram may be fatal or may produce serious damage to the health of the individual.
■ Dioxin TCDD has been associated with a range of toxic effects. These include loss of body fat, inflammation of the eyelids, kidney damage, depression, loss of hair and nails, anemia, decreased cholesterol and increased triglycerides, and degeneration of the thymus glands. The substance does have fetal toxic effects; the kidneys of fetuses were affected.

EYE

■ There is some evidence that material may produce eye irritation in some persons and produce eye damage 24 hours or more after instillation. Moderate inflammation may be expected with redness; conjunctivitis may occur with prolonged exposure.
■ Application of dioxins to the eye may produce irritation, inflammation of eyelids and conjunctiva, and irritation of other mucous membranes.

SKIN

■ Skin contact with the material may produce severely toxic effects; systemic effects may result following absorption and these may be fatal.
■ There is some evidence to suggest that this material can cause inflammation of the skin on contact in some persons.
■ Open cuts, abraded or irritated skin should not be exposed to this material.
■ Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects. Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.
■ Skin absorption of TCDD may result in redness and swelling,followed by acne.
■ Exposure to the material may result in a skin inflammation called chloracne. This is characterized by white- and blackheads, keratin cysts, spots, excessive discoloration. These mainly involve the skin under the eyes and behind the ears. The reaction may be delayed. There may also be excess hair growth, degeneration of elastic tissue as a result of sunlight, and scarring of the membrane of the penis.

INHALED

■ Inhalation of dusts, generated by the material during the course of normal handling, may produce severe damage to the health of the individual. Relatively small amounts absorbed from the lungs may prove fatal.
■ There is some evidence to suggest that the material can cause respiratory irritation in some persons. The body's response to such irritation can cause further lung damage.
■ Persons with impaired respiratory function, airway diseases and conditions such as emphysema or chronic bronchitis, may incur further disability if excessive concentrations of particulate are inhaled.
■ The inhalation of dioxins may produce respiratory tract irritation, headache, dizziness, nausea and vomiting, fatigue, sleep difficulties, sexual dysfunction, and intolerance to cold. Muscular pains and weakness may be present as well as behavioral disturbances. Redness and swelling of skin may occur, followed by acne. The central nervous system and liver may also be affected.

CHRONIC HEALTH EFFECTS

■ There is sufficient evidence to suggest that this materialdirectly causes cancer in humans.
Limited evidence suggests that repeated or long-term occupational exposure may produce cumulative health effects involving organs or biochemical systems.
Exposure to the material may cause concerns for human fertility, on the basis that similar materials provide some evidence of impaired fertility in the absence of toxic effects, or evidence of impaired fertility occurring at around the same dose levels as other toxic effects, but which are not a secondary non-specific consequence of other toxic effects.
.
Based on experience with animal studies, there is a possibility that exposure to the material may result in toxic effects to the development of the fetus, at levels which do not cause significant toxic effects to the mother.
Long term exposure to high dust concentrations may cause changes in lung function i.e. pneumoconiosis; caused by particles less than 0.5 micron penetrating and remaining in the lung. Prime symptom is breathlessness; lung shadows show on X-ray.
Exposure to PHAHs, including TCDD, can result in acne, fatigue, decreased libido, sleep trouble, loss of appetite and weight and sensory dysfunction. Skin changes are also possible including pigmentation disorders and excess hair growth. Cardiac function and function of the liver, which can be enlarged, may be impaired. Thyroid function and the efficiency of the immune system is also affected leading to more frequent infections. The substance is associated with fetal toxicity, miscarriage, and reduced fertility in males; it is also associated with cancers of the liver, thyroid and skin.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

HAZARD RATINGS

		Min	Max
Flammability:	1		
Toxicity:	4		
Body Contact:	4		
Reactivity:	1		
Chronic:	4		

Min/Nil=0
Low=1
Moderate=2
High=3
Extreme=4

NAME	CAS RN	%
2,3,7,8-tetrachlorodibenzo-p-dioxin	1746-01-6	>98

Section 4 - FIRST AID MEASURES

SWALLOWED

■

- Give a slurry of activated charcoal in water to drink. NEVER GIVE AN UNCONSCIOUS PATIENT WATER TO DRINK.
- At least 3 tablespoons in a glass of water should be given.
- Although induction of vomiting may be recommended (IN CONSCIOUS PERSONS ONLY), such a first aid measure is dissuaded because to the risk of aspiration of stomach contents. (i) It is better to take the patient to a doctor who can decide on the necessity and method of emptying the stomach. (ii) Special circumstances may however exist; these include

non- availability of charcoal and the ready availability of the doctor.
NOTE: If vomiting is induced, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration. NOTE: Wear protective gloves when inducing vomiting.

- REFER FOR MEDICAL ATTENTION WITHOUT DELAY.
- In the mean time, qualified first-aid personnel should treat the patient following observation and employing supportive measures as indicated by the patient's condition.
- If the services of a medical officer or medical doctor are readily available, the patient should be placed in his/her care and a copy of the MSDS should be provided. Further action will be the responsibility of the medical specialist.
- If medical attention is not available on the worksite or surroundings send the patient to a hospital together with a copy of the MSDS.

(ICSC20305/20307).

EYE

■ If this product comes in contact with the eyes:

- Immediately hold eyelids apart and flush the eye continuously with running water.
- Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.
- Continue flushing until advised to stop by the Poisons Information Center or a doctor, or for at least 15 minutes.
- Transport to hospital or doctor without delay.
- Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

SKIN

■ If skin or hair contact occurs:

- Immediately flush body and clothes with large amounts of water, using safety shower if available.
- Quickly remove all contaminated clothing, including footwear.
- Wash skin and hair with running water. Continue flushing with water until advised to stop by the Poisons Information Center.
- Transport to hospital, or doctor.

INHALED

■

- If fumes or combustion products are inhaled remove from contaminated area.
- Lay patient down. Keep warm and rested.
- Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.
- Apply artificial respiration if not breathing, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary.
- Transport to hospital, or doctor, without delay.

NOTES TO PHYSICIAN

■ compare PCB treatment regime:
Presentation:

- Acute symptoms related to overexposure to the PCBs and dioxins (PCDDs and PCDFs) include irritation of the skin, eyes and mucous membranes and nausea, vomiting and myalgias.
- After a latency period which may be prolonged (up to several weeks or more), chloracne, porphyria cutanea tarda, hirsutism, or hyper- pigmentation may occur. Elevated levels of hepatic transaminases and blood lipids may be found. Polyneuropathies with sensory impairment and lower-extremity motor weakness may also occur.
- Useful laboratory studies might include glucose, electrolytes, BUN, creatinine, liver transaminase, and liver function tests, and uroporphyrins (where porphyria is suspected)

Treatment:

- Emergency and Supportive Measures: Treat skin, eye and respiratory irritation symptomatically
- There is no specific antidote
- Decontamination: 1. Inhalation; remove victims from exposure and give supplemental oxygen if available. 2. Eyes and Skin: remove contaminated clothing and wash affected skin with copious soap and water; irrigate exposed eyes with copious tepid water or saline. 3. Ingestion; (a) Prehospital: Administer activated charcoal if available. Ipecac-induced vomiting may be useful for initial treatment at the scene if it can be given within a few minutes exposure (b) Hospital: Administer activated charcoal. Gastric emptying is not necessary if activated charcoal can be given promptly.
- Enhanced elimination: There is no known role for these procedures.

POISONING and DRUG OVERDOSE, Californian Poison Control System Ed. Kent R Olson; 3rd Edition.
For acute exposure gut decontamination by lavage, charcoal, cathartic, in the first several hours is recommended.
Monitor for metabolic acidosis, hyperthermia, hyperkalemia, myoglobinuria and hepatic / renal dysfunction.

Section 5 - FIRE FIGHTING MEASURES

Vapor Pressure (mmHg):	0 @ 25
Upper Explosive Limit (%):	Not Available
Specific Gravity (water=1):	1.827
Lower Explosive Limit (%):	Not Available

EXTINGUISHING MEDIA

■

- Foam.
- Dry chemical powder.
- BCF (where regulations permit).
- Carbon dioxide.
- Water spray or fog - Large fires only.

FIRE FIGHTING

■

- Alert Emergency Responders and tell them location and nature of hazard.
- Wear full body protective clothing with breathing apparatus.

- Prevent, by any means available, spillage from entering drains or water course.
- Use fire fighting procedures suitable for surrounding area.
- DO NOT approach containers suspected to be hot.
- Cool fire exposed containers with water spray from a protected location.
- If safe to do so, remove containers from path of fire.
- Equipment should be thoroughly decontaminated after use.

GENERAL FIRE HAZARDS/HAZARDOUS COMBUSTIBLE PRODUCTS

■

- Combustible solid which burns but propagates flame with difficulty.
- Avoid generating dust, particularly clouds of dust in a confined or unventilated space as dusts may form an explosive mixture with air, and any source of ignition, i.e. flame or spark, will cause fire or explosion. Dust clouds generated by the fine grinding of the solid are a particular hazard; accumulations of fine dust may burn rapidly and fiercely if ignited.
- Dry dust can be charged electrostatically by turbulence, pneumatic transport, pouring, in exhaust ducts and during transport.
- Build-up of electrostatic charge may be prevented by bonding and grounding.
- Powder handling equipment such as dust collectors, dryers and mills may require additional protection measures such as explosion venting.

Combustion products include: carbon monoxide (CO), carbon dioxide (CO_2), hydrogen chloride, phosgene, other pyrolysis products typical of burning organic material.
May emit poisonous fumes.

FIRE INCOMPATIBILITY

■ Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids,chlorine bleaches, pool chlorine etc. as ignition may result.

PERSONAL PROTECTION

Glasses:
Safety Glasses.
Gloves:
Respirator:
Particulate

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS

■ Environmental hazard - contain spillage.

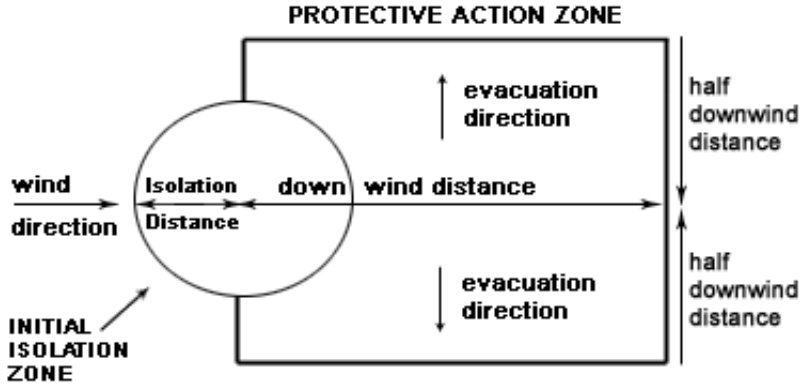
- Clean up waste regularly and abnormal spills immediately.
- Avoid breathing dust and contact with skin and eyes.
- Wear protective clothing, gloves, safety glasses and dust respirator.
- Use dry clean up procedures and avoid generating dust.
- Vacuum up or sweep up. NOTE: Vacuum cleaner must be fitted with an exhaust micro filter (HEPA type) (consider explosion-proof machines designed to be grounded during storage and use).
- Dampen with water to prevent dusting before sweeping.
- Place in suitable containers for disposal.

MAJOR SPILLS

■ Environmental hazard - contain spillage.

- Clear area of personnel and move upwind.
- Alert Emergency Responders and tell them location and nature of hazard.
- Wear full body protective clothing with breathing apparatus.
- Prevent, by all means available, spillage from entering drains or water courses.
- Consider evacuation (or protect in place).
- No smoking, naked lights or ignition sources.
- Increase ventilation.
- Stop leak if safe to do so.
- Water spray or fog may be used to disperse / absorb vapour.
- Contain or absorb spill with sand, earth or vermiculite.
- Collect recoverable product into labelled containers for recycling.
- Collect solid residues and seal in labelled drums for disposal.
- Wash area and prevent runoff into drains.
- After clean up operations, decontaminate and launder all protective clothing and equipment before storing and re-using.
- If contamination of drains or waterways occurs, advise emergency services.
- DO NOT touch the spill material

PROTECTIVE ACTIONS FOR SPILL



From IERG (Canada/Australia)	
Isolation Distance	25 meters
Downwind Protection Distance	250 meters

FOOTNOTES

1 PROTECTIVE ACTION ZONE is defined as the area in which people are at risk of harmful exposure. This zone assumes that random changes in wind direction confines the vapour plume to an area within 30 degrees on either side of the predominant wind direction, resulting in a crosswind protective action distance equal to the downwind protective action distance.
2 PROTECTIVE ACTIONS should be initiated to the extent possible, beginning with those closest to the spill and working away from the site in the downwind direction. Within the protective action zone a level of vapour concentration may exist resulting in nearly all unprotected persons becoming incapacitated and unable to take protective action and/or incurring serious or irreversible health effects.
3 INITIAL ISOLATION ZONE is determined as an area, including upwind of the incident, within which a high probability of localised wind reversal may expose nearly all persons without appropriate protection to life-threatening concentrations of the material.
4 SMALL SPILLS involve a leaking package of 200 litres (55 US gallons) or less, such as a drum (jerrican or box with inner containers). Larger packages leaking less than 200 litres and compressed gas leaking from a small cylinder are also considered "small spills". LARGE SPILLS involve many small leaking packages or a leaking package of greater than 200 litres, such as a cargo tank, portable tank or a "one-tonne" compressed gas cylinder.
5 Guide 154 is taken from the US DOT emergency response guide book.
6 IERG information is derived from CANUTEC - Transport Canada.

ACUTE EXPOSURE GUIDELINE LEVELS (AEGL) (in ppm)

AEGL 1: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.
AEGL 2: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.
AEGL 3: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

■

- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.
- Use in a well-ventilated area.
- Prevent concentration in hollows and sumps.
- DO NOT enter confined spaces until atmosphere has been checked.
- DO NOT allow material to contact humans, exposed food or food utensils.
- Avoid contact with incompatible materials.
- When handling, DO NOT eat, drink or smoke.
- Keep containers securely sealed when not in use.
- Avoid physical damage to containers.
- Always wash hands with soap and water after handling.
- Work clothes should be laundered separately.
- Launder contaminated clothing before re-use.
- Use good occupational work practice.
- Observe manufacturer's storing and handling recommendations.
- Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

Empty containers may contain residual dust which has the potential to accumulate following settling. Such dusts may explode in the presence of an appropriate ignition source.

- Do NOT cut, drill, grind or weld such containers
- In addition ensure such activity is not performed near full, partially empty or empty containers without appropriate workplace safety authorisation or permit.

RECOMMENDED STORAGE METHODS

■ Glass container.

- Lined metal can, Lined metal pail/drum
- Plastic pail
- Polyliner drum
- Packing as recommended by manufacturer.
- Check all containers are clearly labeled and free from leaks.

For low viscosity materials
- Drums and jerricans must be of the non-removable head type.
- Where a can is to be used as an inner package, the can must have a screwed enclosure.

For materials with a viscosity of at least 2680 cSt. (23 deg. C) and solids (between 15 C deg. and 40 deg C.):
- Removable head packaging;
- Cans with friction closures and
- low pressure tubes and cartridges may be used.

- Where combination packages are used, and the inner packages are of glass, there must be sufficient inert cushioning material in contact with inner and outer packages * . - In addition, where inner packagings are glass and contain liquids of packing group I and II there must be sufficient inert absorbent to absorb any spillage *. - * unless the outer packaging is a close fitting molded plastic box and the substances are not incompatible with the plastic. All inner and sole packagings for substances that have been assigned to Packaging Groups I or II on the basis of inhalation toxicity criteria, must be hermetically sealed.

STORAGE REQUIREMENTS

■
- Store in original containers.
- Keep containers securely sealed.
- Store in a cool, dry, well-ventilated area.
- Store away from incompatible materials and foodstuff containers.
- Protect containers against physical damage and check regularly for leaks.
- Observe manufacturer's storing and handling recommendations.

SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS

X X + X X +

X: Must not be stored together
O: May be stored together with specific preventions
+: May be stored together

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

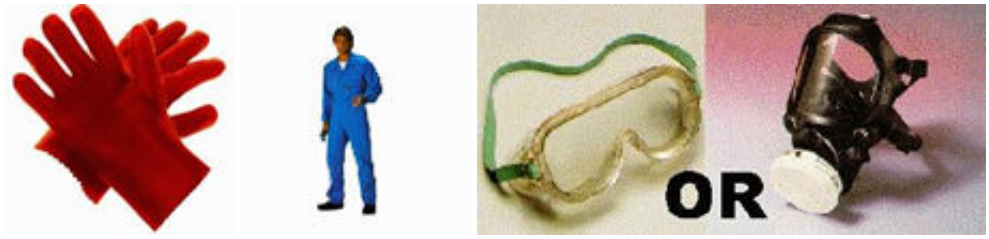
EXPOSURE CONTROLS

Source	Material	TWA ppm	TWA mg/m³	STEL ppm	STEL mg/m³	Peak ppm	Peak mg/m³	TWA F/CC	Notes
Canada - Ontario Occupational Exposure Limits	2,3,7,8-tetrachlorodibenzo-p-dioxin (Polychlorinated biphenyls (PCBs) (1))		0.05						
US - Alaska Limits for Air Contaminants	2,3,7,8-tetrachlorodibenzo-p-dioxin (Chlorodiphenyl (54% Chlorine) PCB)		0.5						
Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances	2,3,7,8-tetrachlorodibenzo-p-dioxin (Polychlorobiphenyls, see Chlorodiphenyls - Skin)	-	-	-	-				
US - Alaska Limits for Air Contaminants	2,3,7,8-tetrachlorodibenzo-p-dioxin (Chlorodiphenyl (42% Chlorine) PCB)		1						

MATERIAL DATA

2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN:
■ Airborne particulate or vapor must be kept to levels as low as is practicably achievable given access to modern engineering controls and monitoring hardware. Biologically active compounds may produce idiosyncratic effects which are entirely unpredictable on the basis of literature searches and prior clinical experience (both recent and past).
No exposure threshold assigned as any exposure is regarded as hazardous.

PERSONAL PROTECTION



Consult your EHS staff for recommendations

EYE

■
- Chemical protective goggles with full seal
- Shielded mask (gas-type)

- Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lens or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lens should be removed at the first signs of eye redness or irritation - lens should be removed in a clean environment only after workers have washed hands thoroughly. [CDC NIOSH Current Intelligence Bulletin 59]

HANDS/FEET

■ Elbow length PVC gloves.

Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include: such as:

- frequency and duration of contact,
- chemical resistance of glove material,
- glove thickness and
- dexterity

Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739).

- When prolonged or frequently repeated contact may occur, a glove with a protection class of 5 or higher (breakthrough time greater than 240 minutes according to EN 374) is recommended.
- When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes according to EN 374) is recommended.
- Contaminated gloves should be replaced.

Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturiser is recommended.

OTHER

■

- Employees working with confirmed human carcinogens should be provided with, and be required to wear, clean, full body protective clothing (smocks, coveralls, or long-sleeved shirt and pants), shoe covers and gloves prior to entering the regulated area.
- Employees engaged in handling operations involving carcinogens should be provided with, and required to wear and use half-face filter-type respirators with filters for dusts, mists and fumes, or air purifying canisters or cartridges. A respirator affording higher levels of protection may be substituted.
- Emergency deluge showers and eyewash fountains, supplied with potable water, should be located near, within sight of, and on the same level with locations where direct exposure is likely.
- Prior to each exit from an area containing confirmed human carcinogens, employees should be required to remove and leave protective clothing and equipment at the point of exit and at the last exit of the day, to place used clothing and equipment in impervious containers at the point of exit for purposes of decontamination or disposal. The contents of such impervious containers must be identified with suitable labels. For maintenance and decontamination activities, authorized employees entering the area should be provided with and required to wear clean, impervious garments, including gloves, boots and continuous-air supplied hood.
- Prior to removing protective garments the employee should undergo decontamination and be required to shower upon removal of the garments and hood.
- For quantities up to 500 grams a laboratory coat may be suitable.
- For quantities up to 1 kilogram a disposable laboratory coat or coverall of low permeability is recommended. Coveralls should be buttoned at collar and cuffs.
- For quantities over 1 kilogram and manufacturing operations, wear disposable coverall of low permeability and disposable shoe covers.
- For manufacturing operations, air-supplied full body suits may be required for the provision of advanced respiratory protection.
- Eye wash unit.
- Ensure there is ready access to an emergency shower.
- For Emergencies: Vinyl suit

■

- Respirators may be necessary when engineering and administrative controls do not adequately prevent exposures.
- The decision to use respiratory protection should be based on professional judgment that takes into account toxicity information, exposure measurement data, and frequency and likelihood of the worker's exposure - ensure users are not subject to high thermal loads which may result in heat stress or distress due to personal protective equipment (powered, positive flow, full face apparatus may be an option).
- Published occupational exposure limits, where they exist, will assist in determining the adequacy of the selected respiratory . These may be government mandated or vendor recommended.
- Certified respirators will be useful for protecting workers from inhalation of particulates when properly selected and fit tested as part of a complete respiratory protection program.
- Use approved positive flow mask if significant quantities of dust becomes airborne.
- Try to avoid creating dust conditions.

RESPIRATOR

■

Protection Factor	Half-Face Respirator	Full-Face Respirator	Powered Air Respirator
10 x PEL	P1	-	PAPR-P1
	Air-line*	-	-
50 x PEL	Air-line**	P2	PAPR-P2
100 x PEL	-	P3	-
		Air-line*	-
100+ x PEL	-	Air-line**	PAPR-P3

* - Negative pressure demand ** - Continuous flow

Explanation of Respirator Codes:

Class 1 low to medium absorption capacity filters.

Class 2 medium absorption capacity filters.

Class 3 high absorption capacity filters.

PAPR Powered Air Purifying Respirator (positive pressure) cartridge.

Type A for use against certain organic gases and vapors.

Type AX for use against low boiling point organic compounds (less than 65ºC).

Type B for use against certain inorganic gases and other acid gases and vapors.

Type E for use against sulfur dioxide and other acid gases and vapors.

Type K for use against ammonia and organic ammonia derivatives
Class P1 intended for use against mechanically generated particulates of sizes most commonly encountered in industry, e.g. asbestos, silica.
Class P2 intended for use against both mechanically and thermally generated particulates, e.g. metal fume.
Class P3 intended for use against all particulates containing highly toxic materials, e.g. beryllium.
The local concentration of material, quantity and conditions of use determine the type of personal protective equipment required.
Use appropriate NIOSH-certified respirator based on informed professional judgement. In conditions where no reasonable estimate of exposure can be made, assume the exposure is in a concentration IDLH and use NIOSH-certified full face pressure demand SCBA with a minimum service life of 30 minutes, or a combination full facepiece pressure demand SAR with auxiliary self-contained air supply. Respirators provided only for escape from IDLH atmospheres shall be NIOSH-certified for escape from the atmosphere in which they will be used.

ENGINEERING CONTROLS

■

- Employees exposed to confirmed human carcinogens should be authorized to do so by the employer, and work in a regulated area.
- Work should be undertaken in an isolated system such as a "glove-box" . Employees should wash their hands and arms upon completion of the assigned task and before engaging in other activities not associated with the isolated system.
- Within regulated areas, the carcinogen should be stored in sealed containers, or enclosed in a closed system, including piping systems, with any sample ports or openings closed while the carcinogens are contained within.
- Open-vessel systems are prohibited.
- Each operation should be provided with continuous local exhaust ventilation so that air movement is always from ordinary work areas to the operation.
- Exhaust air should not be discharged to regulated areas, non-regulated areas or the external environment unless decontaminated. Clean make-up air should be introduced in sufficient volume to maintain correct operation of the local exhaust system.
- For maintenance and decontamination activities, authorized employees entering the area should be provided with and required to wear clean, impervious garments, including gloves, boots and continuous-air supplied hood. Prior to removing protective garments the employee should undergo decontamination and be required to shower upon removal of the garments and hood.
- Except for outdoor systems, regulated areas should be maintained under negative pressure (with respect to non-regulated areas).
- Local exhaust ventilation requires make-up air be supplied in equal volumes to replaced air.
- Laboratory hoods must be designed and maintained so as to draw air inward at an average linear face velocity of 150 feet/ min. with a minimum of 125 feet/ min. Design and construction of the fume hood requires that insertion of any portion of the employees body, other than hands and arms, be disallowed.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL PROPERTIES

Solid.
Does not mix with water.
Sinks in water.

State	Divided solid	Molecular Weight	321.96
Melting Range (°F)	581- 617	Viscosity	Not Applicable
Boiling Range (°F)	789.8- 834.8	Solubility in water (g/L)	Insoluble
Flash Point (°F)	Not Available	pH (1% solution)	Not applicable
Decomposition Temp (°F)	Not Available	pH (as supplied)	Not applicable
Autoignition Temp (°F)	Not Available	Vapor Pressure (mmHg)	0 @ 25
Upper Explosive Limit (%)	Not Available	Specific Gravity (water=1)	1.827
Lower Explosive Limit (%)	Not Available	Relative Vapor Density (air=1)	Not Applicable
Volatile Component (%vol)	Not available	Evaporation Rate	Not Applicable

APPEARANCE

Colourless solid. Practically insoluble in water; solubility = 0.00002% Soluble in benzene, chloroform, chlorobenzene, o-dichlorobenzene. Occurs as contaminant, parts per million, in 2,4,5-T, chlorinated herbicide and Agent Orange, now banned. Also present in PCB electrical fluids. Has become widely spread in biosphere in trace amounts. Material is accidentally produced in quantity in runaway exothermic reaction in the manufacture of chlorinated phenols; e.g. Seveso accident.

Section 10 - CHEMICAL STABILITY

CONDITIONS CONTRIBUTING TO INSTABILITY

■

- Presence of incompatible materials.
- Product is considered stable.
- Hazardous polymerization will not occur.

STORAGE INCOMPATIBILITY

■ Avoid reaction with oxidizing agents.

For incompatible materials - refer to Section 7 - Handling and Storage.

Section 11 - TOXICOLOGICAL INFORMATION

2,3,7,8-tetrachlorodibenzo-p-dioxin

TOXICITY AND IRRITATION

■ unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

TOXICITY	IRRITATION
Oral (rat) LD50: 0.02 mg/kg	Eye (rabbit): 2 mg - Moderate
Dermal (human) TDLo: 0.1 mg/kg	
Dermal (rabbit) LD50: 0.275 mg/kg	

■ Side-reactions during manufacture of the parent compound may result in the production of trace amounts of polyhalogenated aromatic hydrocarbon(s). Halogenated phenols, and especially their alkali salts, can condense above 300 deg. C . to form polyphenoxyphenols or, in a very specific reaction, to form dibenzo-p-dioxins.
Polyhalogenated aromatic hydrocarbons (PHAHs) can cause effects on hormones and mimic thyroid hormone. Acne, discharge in the eye, eyelid swellings and visual disturbances may occur. Babies born to exposed mothers can also exhibit these effects. There is an increased risk of liver cancer among those who have taken PHAHs.
The material may produce moderate eye irritation leading to inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.
WARNING: This substance has been classified by the IARC as Group 1: CARCINOGENIC TO HUMANS.
Use control measures and full personal protective equipment to prevent
all personal contact.

CARCINOGEN

2,3,7,8-Tetrachlorodibenzo-para-dioxin (NB: Overall evaluation upgraded from 2A to 1 with supporting evidence from other relevant data)	International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs	Group	1
Polychlorinated biphenyls	International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs	Group	2A
Polychlorinated dibenzofurans	International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs	Group	3
Polychlorinated biphenyls (PCBs)	US EPA Carcinogens Listing	Carcinogenicity	B2
Polychlorinated biphenyls (PCBs)	US ACGIH Threshold Limit Values (TLV) - Carcinogens	Carcinogen Category	B2
2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN (TCDD)	US Environmental Defense Scorecard Recognized Carcinogens	Reference(s)	P65
DIOXIN AND DIOXIN-LIKE COMPOUNDS	US Environmental Defense Scorecard Recognized Carcinogens	Reference(s)	P65-MC
2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN (TCDD)	US Environmental Defense Scorecard Suspected Carcinogens	Reference(s)	P65
DIOXIN AND DIOXIN-LIKE COMPOUNDS	US Environmental Defense Scorecard Suspected Carcinogens	Reference(s)	P65-MC
2,3,7,8-Tetrachlorodibenzo-p-dioxin	US Air Toxics Hot Spots TSD for Describing Available Cancer Potency Factors	IARC Class	
2,3,7,8-Tetrachlorodibenzo-p-dioxin [TCDD]	US NIOSH Recommended Exposure Limits (RELs) - Carcinogens	Carcinogen	Ca

REPROTOXIN

2,3,7,8-tetrachlorodibenzo-p-dioxin	ILO Chemicals in the electronics industry that have toxic effects on reproduction	Reduced fertility or sterility	A

Section 12 - ECOLOGICAL INFORMATION

Refer to data for ingredients, which follows:
2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN:

■ Hazardous Air Pollutant:	Yes
■ Half- life Soil - High (hours):	14160
■ Half- life Soil - Low (hours):	10032
■ Half- life Air - High (hours):	223
■ Half- life Air - Low (hours):	22.3
■ Half- life Surface water - High (hours):	14160
■ Half- life Surface water - Low (hours):	10032
■ Half- life Ground water - High (hours):	28320
■ Half- life Ground water - Low (hours):	20064
■ Aqueous biodegradation - Aerobic - High (hours):	14160
■ Aqueous biodegradation - Aerobic - Low (hours):	10032
■ Aqueous biodegradation - Anaerobic - High (hours):	56640
■ Aqueous biodegradation - Anaerobic - Low (hours):	40128

■ Aqueous photolysis half- life - High (hours):	81
■ Aqueous photolysis half- life - Low (hours):	27
■ Aqueous photolysis half- life - High (hours):	81
■ Aqueous photolysis half- life - Low (hours):	27
■ Photooxidation half- life air - High (hours):	223
■ Photooxidation half- life air - Low (hours):	22.3

■ On the basis of available evidence concerning either toxicity, persistence, potential to accumulate and or observed environmental fate and behaviour, the material may present a danger, immediate or long-term and /or delayed, to the structure and/ or functioning of natural ecosystems.
■ PCBs and other polyhalogenated polyaromatic hydrocarbons (including the dioxins and brominated species) are resistant to chemical and biological degradation and because of their solubility in fats and oils they tend to be bioconcentrated in living organisms. The highly chlorinated PCBs are retained in animals longer and seem to delay the excretion of the lower chlorinated PCBs. This is presumably true of other halogenated species and halogenated polyaromatic systems. They have become widely dispersed in the world environment and in the food-chain since their introduction. They are now recognized internationally to be a major environmental pollutant, their persistence causing ecological damage via water pollution. Consequently the loss of these materials to the environment is to be avoided at all costs.
PCBs are exceptionally persistent in the food chain, some even more so than the organochlorine insecticides with which they are often confused. In general the higher the degree of chlorination, the more resistant to degradation and more persistent environmentally they become.
Bioconcentration factors of PCBs in aquatic species such as fish, shrimp, and oysters range from 26000 to 60000. The health effects of PCBs are well established. These include interference with reproduction in wildlife and experimental animals and effects in birds and mammals including microsomal enzyme induction, porphyrogenic activity, tumor promotion, estrogen activity and immunosuppression. Because of their high lipophilicity and their stability, the potential to bioaccumulate is great and long-term effects may be significant.
■ DO NOT discharge into sewer or waterways.
log Kow: 6.0151
log Koc: 6.66
Half-life (hr) H2O surface water: 14400
BCF: 4.2-27000
Nitrif. inhib.: not sig
Degradation Biological: resist
processes Abiotic: RxnOH*

Ecotoxicity

Ingredient	Persistence: Water/Soil	Persistence: Air	Bioaccumulation	Mobility
2,3,7,8-tetrachlorodibenzo-p-dioxin	HIGH	HIGH	LOW	

Section 13 - DISPOSAL CONSIDERATIONS

Disposal Instructions

All waste must be handled in accordance with local, state and federal regulations.
¦ Puncture containers to prevent re-use and bury at an authorized landfill.
Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked.
A Hierarchy of Controls seems to be common - the user should investigate:

- Reduction
- Reuse
- Recycling
- Disposal (if all else fails)

This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. Shelf life considerations should also be applied in making decisions of this type. Note that properties of a material may change in use, and recycling or reuse may not always be appropriate.
DO NOT allow wash water from cleaning equipment to enter drains. Collect all wash water for treatment before disposal.
Due to their environmental persistence and potential health hazards, PCBs and dioxins cannot be disposed of in landfills or dumped at sea. The only environmentally acceptable method of disposal of PCBs and dioxins is by high temperature incineration. However this option is costly and uncertain. Currently, most PCB and dioxin wastes must be stored in an approved manner until satisfactory arrangements can be made for their disposal. All wastes and residues containing PCBs and/or dioxins (e.g. wiping clothes, absorbent materials, used disposable protective gloves, contaminated clothing, etc.) should be collected, placed in proper containers, labelled and disposed of in the manner prescribed by government regulations. Regulations may require the compulsory reporting of all spills.

- Recycle wherever possible.
- Consult manufacturer for recycling options or consult Waste Management Authority for disposal if no suitable treatment or disposal facility can be identified.
- Dispose of by: Burial in a licensed land-fill or Incineration in a licensed apparatus (after admixture with suitable combustible material)
- Decontaminate empty containers. Observe all label safeguards until containers are cleaned and destroyed.

Requires incineration temperatures above 800 deg C for 40 seconds.

Section 14 - TRANSPORTATION INFORMATION

DOT:

Symbols:	G	Hazard class or Division:	6.1
Identification Numbers:	UN2811	PG:	I
Label Codes:	6.1	Special provisions:	IB7, T6, TP33
Packaging: Exceptions:	None	Packaging: Non-bulk:	211
Packaging: Exceptions:	None	Quantity limitations: Passenger aircraft/rail:	5 kg
Quantity Limitations: Cargo aircraft only:	50 kg	Vessel stowage: Location:	B
Vessel stowage: Other:	None	S.M.P.:	Severe

Hazardous materials descriptions and proper shipping names:
Toxic solids, organic, n.o.s.

Air Transport IATA:

ICAO/IATA Class:	6.1	ICAO/IATA Subrisk:	None
UN/ID Number:	2811	Packing Group:	I
Special provisions:	A3		

Shipping Name: TOXIC SOLID, ORGANIC, N.O.S. *(CONTAINS 2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN)

Maritime Transport IMDG:

IMDG Class:	6.1	IMDG Subrisk:	None
UN Number:	2811	Packing Group:	I
EMS Number:	F-A,S-A	Special provisions:	274
Limited Quantities:	None		

Shipping Name: TOXIC SOLID, ORGANIC, N.O.S.(contains 2,3,7,8-tetrachlorodibenzo-p-dioxin)

Section 15 - REGULATORY INFORMATION

2,3,7,8-tetrachlorodibenzo-p-dioxin (CAS: 1746-01-6) is found on the following regulatory lists;

"Canada - Saskatchewan Occupational Health and Safety Regulations - Designated Chemical Substances","Canada ARET (Accelerated Reduction / Elimination of Toxics) Substance List","Canada National Pollutant Release Inventory (NPRI)","International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs","OSPAR List of Substances of Possible Concern","US - California Air Toxics ""Hot Spots"" List (Assembly Bill 2588) Substances for which emissions must be quantified","US - California Environmental Health Standards for the Management of Hazardous Waste - List of Organic Persistent and Bioaccumulative Toxic Substances and Their STLC & TTLC Values","US - California Occupational Safety and Health Regulations (CAL/OSHA) - Hazardous Substances List","US - California OEHHA/ARB - Chronic Reference Exposure Levels and Target Organs (CRELs)","US - California Proposition 65 - Carcinogens","US - California Proposition 65 - No Significant Risk Levels (NSRLs) for Carcinogens","US - California Proposition 65 - Priority List for the Development of MADLs for Chemicals Causing Reproductive Toxicity","US - California Proposition 65 - Reproductive Toxicity","US - California Toxic Air Contaminant List Category II","US - Connecticut Hazardous Air Pollutants","US - Maine Chemicals of High Concern List","US - Massachusetts Oil & Hazardous Material List","US - Minnesota Hazardous Substance List","US - New Jersey Right to Know Hazardous Substances","US - Pennsylvania - Hazardous Substance List","US - Rhode Island Hazardous Substance List","US - Texas Drinking Water Standards - Maximum Contaminant Levels (MCLs) for synthetic organic contaminants","US - Vermont Hazardous Constituents","US - Washington Class A toxic air pollutants: Known and Probable Carcinogens","US - Washington Dangerous waste constituents list","US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)","US CERCLA Priority List of Hazardous Substances","US Clean Air Act - Hazardous Air Pollutants","US CWA (Clean Water Act) - Priority Pollutants","US CWA (Clean Water Act) - Toxic Pollutants","US Department of Transportation (DOT) List of Hazardous Substances and Reportable Quantities - Hazardous Substances Other Than Radionuclides","US DOE Temporary Emergency Exposure Limits (TEELs)","US EPA National Priorities List - Superfund Chemical Data Matrix (SCDM) - Hazard Ranking System - Hazardous Substance Benchmarks","US List of Lists - Consolidated List of Chemicals Subject to the Emergency Planning and Community Right-to-Know Act (EPCRA) and Section 112(r) of the Clean Air Act","US National Toxicology Program (NTP) 11th Report Part A Known to be Human Carcinogens","US NIOSH Recommended Exposure Limits (RELs)","US RCRA (Resource Conservation & Recovery Act) - Appendix IX to Part 264 Ground-Water Monitoring List 1","US RCRA (Resource Conservation & Recovery Act) - Hazardous Constituents - Appendix VIII to 40 CFR 261"

Section 16 - OTHER INFORMATION

LIMITED EVIDENCE

- Inhalation may produce severe health damage*.
- Cumulative effects may result following exposure*.
- May produce discomfort of the eyes respiratory tract and skin*.
- May possibly affect fertility*.
- May possibly be harmful to the fetus/ embryo*.
- Possible risk of harm to breastfed babies*.

* (limited evidence).

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■ Classification of the mixture and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.
A list of reference resources used to assist the committee may be found at:
www.chemwatch.net/references.

■ The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

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SAFETY DATA SHEET

Version 6.19
Revision Date 03/29/2023
Print Date 04/08/2023

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Tetrahydrofuran

Product Number : 401757
Brand : Sigma-Aldrich
Index-No. : 603-025-00-0
CAS-No. : 109-99-9

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Flammable liquids (Category 2), H225
Acute toxicity, Oral (Category 4), H302
Eye irritation (Category 2A), H319
Carcinogenicity (Category 2), H351
Specific target organ toxicity - single exposure (Category 3), Respiratory system, Central nervous system, H335, H336

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

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Signal Word	Danger
Hazard statement(s)	
H225	Highly flammable liquid and vapor.
H302	Harmful if swallowed.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
H336	May cause drowsiness or dizziness.
H351	Suspected of causing cancer.
Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P210	Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.
P233	Keep container tightly closed.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P261	Avoid breathing mist or vapors.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P312 + P330	IF SWALLOWED: Call a POISON CENTER/ doctor if you feel unwell. Rinse mouth.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

May form explosive peroxides.
May form explosive peroxides.

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms : THF

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Formula	:	C_4H_8O
Molecular weight	:	72.11 g/mol
CAS-No.	:	109-99-9
EC-No.	:	203-726-8
Index-No.	:	603-025-00-0

Component	Classification	Concentration
Tetrahydrofuran		
	Flam. Liq. 2; Acute Tox. 4; Eye Irrit. 2A; Carc. 2; STOT SE 3; H225, H302, H319, H351, H335, H336 Concentration limits: >= 25 %: Eye Irrit. 2, H319; >= 25 %: STOT SE 3, H335;	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air. Call in physician.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician.

In case of eye contact
After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

If swallowed
After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Carbon dioxide (CO2) Foam Dry powder

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Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture
Carbon oxides
Combustible.
Pay attention to flashback.
Vapors are heavier than air and may spread along floors.
Development of hazardous combustion gases or vapours possible in the event of fire.
Forms explosive mixtures with air at ambient temperatures.

5.3 Advice for firefighters
Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information
Remove container from danger zone and cool with water. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Keep away from heat and sources of ignition.
Evacuate the danger area, observe emergency procedures, consult an expert.
For personal protection see section 8.

6.2 Environmental precautions
Do not let product enter drains. Risk of explosion.

6.3 Methods and materials for containment and cleaning up
Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up carefully with liquid-absorbent material (e.g. Chemizorb®). Dispose of properly. Clean up affected area.

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

Advice on protection against fire and explosion
Keep away from open flames, hot surfaces and sources of ignition.Take precautionary measures against static discharge.

Hygiene measures
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions

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Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition.

Test for peroxide formation periodically and before distillation.

Storage class
Storage class (TRGS 510): 3: Flammable liquids

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Tetrahydrofuran	109-99-9	TWA	50 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption		
		STEL	100 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption		
		ST	250 ppm 735 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	200 ppm 590 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	200 ppm 590 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		PEL	200 ppm 590 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		STEL	250 ppm 735 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Tetrahydrofuran	109-99-9	Tetrahydrofuran	2 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift (As soon as possible after exposure ceases)			

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Derived No Effect Level (DNEL)

Application Area	Routes of exposure	Health effect	Value
Workers	Skin contact	Long-term systemic effects	25mg/kg BW/d
Consumers	Skin contact	Long-term systemic effects	15mg/kg BW/d
Workers	Inhalation	Long-term local effects	150 mg/m3
Workers	Inhalation	Long-term systemic effects	150 mg/m3
Consumers	Inhalation	Long-term systemic effects	62 mg/m3
Consumers	Inhalation	Acute local effects	150 mg/m3
Consumers	Inhalation	Acute systemic effects	150 mg/m3

Predicted No Effect Concentration (PNEC)

Compartment	Value
Soil	2.13 mg/kg
Sea water	0.432 mg/l
Fresh water	4.32 mg/l
Sea sediment	2.33 mg/kg
Fresh water sediment	23.3 mg/kg
Onsite sewage treatment plant	4.6 mg/l

8.2 Exposure controls

Appropriate engineering controls
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

Personal protective equipment

Eye/face protection
Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses

Skin protection
This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Splash contact
Material: butyl-rubber
Minimum layer thickness: 0.7 mm
Break through time: 10 min
Material tested:Butoject® (KCL 898)

Body Protection
Flame retardant antistatic protective clothing.

Respiratory protection
required when vapours/aerosols are generated. Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains. Risk of explosion.

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SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid
b)	Odor	No data available
c)	Odor Threshold	No data available
d)	pH	ca.7 - 8
e)	Melting point/freezing point	Melting point: -108.44 °C (-163.19 °F) - (ECHA)
f)	Initial boiling point and boiling range	65 °C 149 °F at 1,013.25 hPa - (ECHA)
g)	Flash point	-21.2 °C (-6.2 °F) - closed cup - DIN 51755 Part 1
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 12.4 %(V) - (THF) Lower explosion limit: 1.5 %(V)
k)	Vapor pressure	170 hPa at 20 °C (68 °F) - (THF)
l)	Vapor density	No data available
m)	Density	0.89 g/cm3 at 20 °C (68 °F)
	Relative density	No data available
n)	Water solubility	miscible
o)	Partition coefficient: n-octanol/water	log Pow: 0.45 at 25 °C (77 °F) - Bioaccumulation is not expected.
p)	Autoignition temperature	215 °C (419 °F) at 1,013 hPa - DIN 51794
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	none

9.2 Other safety information

No data available

SECTION 10: Stability and reactivity

10.1 Reactivity

Formation of peroxides possible.
Vapors may form explosive mixture with air.

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10.2 Chemical stability

Sensitivity to light
Sensitive to air.
The product is chemically stable under standard ambient conditions (room temperature) .
Stable under recommended storage conditions.
Test for peroxide formation before distillation or evaporation. Test for peroxide formation or discard after 1 year.

10.3 Possibility of hazardous reactions

Vapors may form explosive mixture with air.

10.4 Conditions to avoid

Distillation (Risk of explosion).
Warming.
Moisture.

10.5 Incompatible materials

No data available

10.6 Hazardous decomposition products

Peroxides
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - male and female - 1,650 mg/kg
Remarks: (ECHA)
Symptoms: Irritation of mucous membranes
LC50 Inhalation - Rat - male and female - 6 h - > 14.7 mg/l - vapor

(US-EPA)
LD50 Dermal - Rat - male and female - > 2,000 mg/kg
(OECD Test Guideline 402)

Skin corrosion/irritation
Skin - Rabbit
Result: No skin irritation - 72 h
(Draize Test)
Remarks: Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Causes serious eye irritation.
Remarks: (IUCLID)
Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

Respiratory or skin sensitization
Local lymph node assay (LLNA) - Mouse

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Result: negative
(OECD Test Guideline 429)

Germ cell mutagenicity
Test Type: Ames test
Test system: S. typhimurium
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 471
Result: negative
Test Type: In vitro mammalian cell gene mutation test
Test system: Chinese hamster ovary cells
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 476
Result: negative
Test Type: Chromosome aberration test in vitro
Test system: Chinese hamster ovary cells
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 473
Result: negative

Test Type: Micronucleus test
Species: Mouse
Cell type: Red blood cells (erythrocytes)
Application Route: inhalation (vapor)
Method: OECD Test Guideline 474
Result: negative

Carcinogenicity
Suspected of causing cancer.

IARC:	2B - Group 2B: Possibly carcinogenic to humans (Tetrahydrofuran)
NTP:	No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity
No data available

Specific target organ toxicity - single exposure
Inhalation - May cause respiratory irritation. - Central nervous system
Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)
May cause drowsiness or dizziness.

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

11.2 Additional Information

Repeated dose toxicity - Rat - male and female - Oral - 4 Weeks

RTECS: LU5950000
irritant effects, Cough, Shortness of breath, narcosis, somnolence
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

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In high doses:

somnolence
narcosis

Other dangerous properties can not be excluded.

This substance should be handled with particular care.

Stomach - Irregularities - Based on Human Evidence

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	flow-through test LC50 - Pimephales promelas (fathead minnow) - 2,160 mg/l - 96 h (OECD Test Guideline 203)
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Daphnia magna (Water flea) - 3,485 mg/l - 48 h (OECD Test Guideline 202)
Toxicity to fish(Chronic toxicity)	flow-through test NOEC - Pimephales promelas (fathead minnow) - 216 mg/l - 33 d Remarks: (ECHA)

12.2 Persistence and degradability

Biodegradability	aerobic Biochemical oxygen demand - Exposure time 28 d Result: 39 % - Not readily biodegradable. (OECD Test Guideline 301D)

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Endocrine disrupting properties

No data available

12.7 Other adverse effects

No data available

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SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14: Transport information

DOT (US)
UN number: 2056 Class: 3 Packing group: II
Proper shipping name: Tetrahydrofuran
Reportable Quantity (RQ): 1000 lbs
Poison Inhalation Hazard: No

IMDG
UN number: 2056 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: TETRAHYDROFURAN

IATA
UN number: 2056 Class: 3 Packing group: II
Proper shipping name: Tetrahydrofuran

SECTION 15: Regulatory information

SARA 302 Components
This material does not contain any components with a section 302 EHS TPQ.

SARA 313 Components
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Tetrahydrofuran	109-99-9	1993-02-16

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Tetrahydrofuran	109-99-9	1993-02-16

California Prop. 65 Components

	CAS-No.	Revision Date
, which is/are known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov.Tetrahydrofuran	109-99-9	2021-12-31

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SECTION 16: Other information

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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Version: 6.19 Revision Date: 03/29/2023 Print Date: 04/08/2023

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Appendix D
Certifications

Individual User Report

Training Summary

User: Amber Smith

Report Date: April 21, 2023

Completed

Title	Completed	Expiry
2022 Driving Safety: The Basics [MARCOM_BIZ Library]	08/09/2022	08/09/2023
2022 Using Fire Extinguishers Effectively [BIZ Library]	08/09/2022	08/09/2023
Adult First Aid/CPR/AED [ProTrainings]	17/12/2022	17/12/2024
Bloodborne Pathogens Course [ProTrainings]	29/12/2022	29/12/2023
HAZWOPER 40 Hour Training [Safety Unlimited, Inc.]	12/06/2022	-
HAZWOPER 8 Hour Refresher 2023 In-Person [Anchor QEA, LLC]	19/04/2023	19/04/2024
Medical Surveillance Exam [Occupational Health Monitoring]	20/07/2022	20/07/2023
Washington L&I WAC 296-800-140 Accident Prevention Program [Anchor QEA, LLC]	02/01/2023	-

Individual User Report

Training Summary

User: Lexus Sullivan

Report Date: April 21, 2023

Completed

Title	Completed	Expiry
2022 Driving Safety: The Basics [MARCOM_BIZ Library]	06/07/2022	06/07/2023
2022 Using Fire Extinguishers Effectively [BIZ Library]	06/07/2022	06/07/2023
Adult First Aid/CPR/AED [ProTrainings]	12/12/2022	12/12/2024
Bloodborne Pathogens Course [ProTrainings]	29/11/2022	29/11/2023
HAZWOPER 40 Hour Training [Safety Unlimited, Inc.]	21/06/2022	-
HAZWOPER 8 Hour Refresher 2023 In-Person [Anchor QEA, LLC]	19/04/2023	19/04/2024
HAZWOPER New to HAZWOPER (date is completion of 40 Hour Training) [Anchor QEA, LLC]	21/06/2022	21/06/2023
Medical Surveillance Exam [Occupational Health Monitoring]	14/07/2022	14/07/2023
Washington L&I WAC 296-800-140 Accident Prevention Program [Anchor QEA, LLC]	02/08/2022	-
Fieldwork Support Questionnaire	30/09/2022	-
Workspace - Identify Safety Items	30/09/2022	-

Individual User Report

Training Summary

User: Stephen Strehl

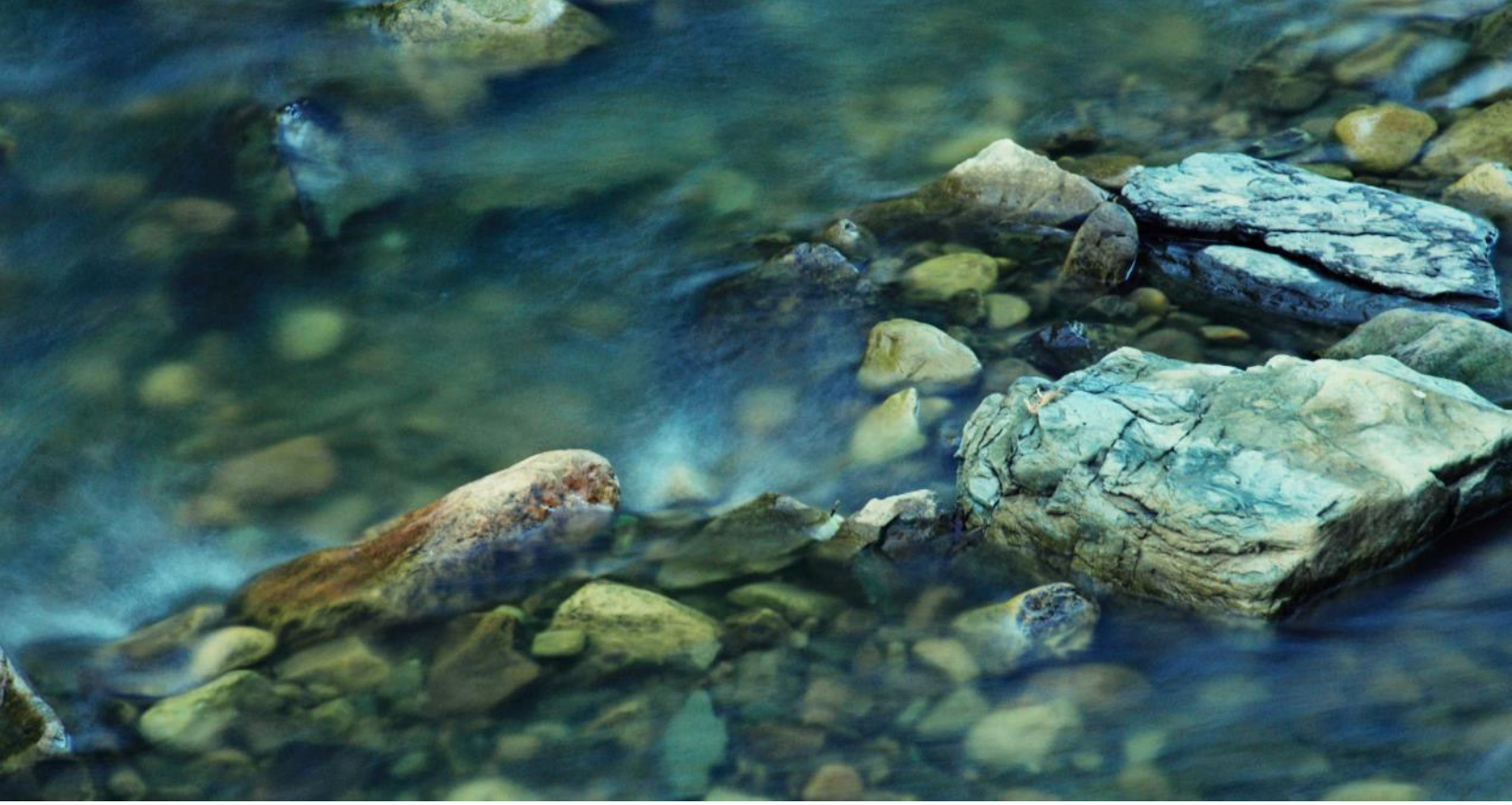
Report Date: April 21, 2023

Completed

Title	Completed	Expiry
2022 Driving Safety: The Basics [MARCOM_BIZ Library]	31/10/2022	31/10/2023
2022 Quarter 2 Quarterly Field Services Notes [Anchor QEA, LLC]	27/04/2022	-
2022 Quarter 3 Quarterly Field Services Notes [Anchor QEA, LLC]	27/07/2022	-
2022 Quarter 4 Quarterly Field Services Notes [Anchor QEA, LLC]	17/10/2022	-
2022 Using Fire Extinguishers Effectively [BIZ Library]	31/10/2022	31/10/2023
Adult First Aid/CPR/AED [ProTrainings]	05/08/2022	05/08/2024
Annual Respirator Clearance and Fit Test Exam [Occupational Health Monitoring]	03/04/2023	03/04/2024
Bloodborne Pathogens Course [ProTrainings]	04/08/2022	04/08/2023
CalOSHA Workplace Injury and Illness Prevention Program [Anchor QEA, LLC]	13/09/2021	-
Energy Control [Anchor QEA, LLC]	14/12/2022	14/12/2023
EPA Visible Emissions Evaluation Method 9 Course [OPACITEK Environmental Services]	10/01/2018	-
HAZWOPER 40 Hour Training [360training]	29/01/2018	-
HAZWOPER 8 Hour Refresher 2023 In-Person [Anchor QEA, LLC]	18/04/2023	18/04/2024
HAZWOPER Supervisor 8 Hour Initial [Safety Unlimited, Inc.]	25/08/2002	-
Inorganic Arsenic Hazard Awareness [Anchor QEA, LLC]	31/10/2022	31/10/2023
International Paper Contractor EHS Specialist Qualification [International Paper]	13/01/2023	13/01/2026
Lead in Contrstuction Training [Wasatch Environmental]	28/02/2018	-
Medical Surveillance Exam [Occupational Health Monitoring]	06/09/2022	06/09/2023
Mercury & Heavy Metals Testing [Occupational Health Monitoring]	17/10/2022	-

Mining Safety & Health Administration - MSHA [The Safety Consortium]	03/07/2019	-
OSHA Respiratory Protection Training [Safety Unlimited, Inc.]	13/05/2022	13/05/2023
OSHA Respiratory Protection [Safety Provisions]	29/12/2022	29/12/2023
Spill Prevention and Response [Anchor QEA, LLC]	10/01/2020	-
UST Groundwater and Soil Sampler Certificate [State of Utah]	15/03/2019	-
Vaccination HEP A (1st) [Occupational Health Monitoring]	09/08/2019	-
Vaccination HEP B (1st) [Occupational Health Monitoring]	09/08/2019	-
Vaccination HEP B (2nd) [Occupational Health Monitoring]	09/02/2020	-
Vaccination HEP B (3rd) [Occupational Health Monitoring]	31/08/2020	-
Vaccination Tetanus [Occupational Health Monitoring]	09/08/2019	09/08/2029
Washington L&I WAC 296-800-140 Accident Prevention Program [Anchor QEA, LLC]	13/05/2021	-
Emergency Response Plan Annual Review - Seattle	14/02/2023	14/02/2024

Appendix E
Pandemic and Epidemic Safety Plan



November 2022

ANCHOR QEA

Pandemic and Epidemic Safety Plan

PLAYING IT SAFE

Stop Play Record Rewind

November 2022

Pandemic and Epidemic Safety Plan

TABLE OF CONTENTS

TABLES

ABBREVIATIONS

CDC	U.S. Centers for Disease Control and Prevention
EPA	U.S. Environmental Protection Agency
H&S	Health and Safety
OSHA	Occupational Safety and Health Administration
PPE	personal protective equipment

1 Introduction and Background

Anchor QEA, LLC, and all subsidiaries (Anchor QEA) has developed this Pandemic and Epidemic Safety Plan, which applies to both office and field work. The objective of this Safety Plan is to provide operational guidelines that address the challenges presented by a pandemic or epidemic and ensure consistency in Anchor QEA's response actions across the firm. We have developed this Safety Plan to support operational efforts. There are a lot of issues to consider, but the underlying priority is protecting employees, coworkers, and families. This plan will be applied pre- and post-pandemic in addition to during a designated pandemic or epidemic at the discretion of the Health and Safety (H&S) Program Lead, Director of Health and Safety, Chief Executive Officer, and/or Managing Committee. This plan may require periodic updates as conditions change.

These guidelines take the recommendations from the U.S. Centers for Disease Control and Prevention (CDC) into account, in addition to local and state laws and requirements. The following principles are the basis of the operational guidelines presented in this Safety Plan:

- Apply operational decisions consistent with applicable orders, requirements, and regulations.
- Require anyone who is sick to stay home.
- Focus on efforts to protect all employees.
- Require employees and visitors to self-check prior to entry.
- Evaluate guidelines and communication protocols for those buildings with common areas not in Anchor QEA's control.
- Clean, disinfect, and evaluate ventilation systems.
- Provide sustainable supplies of hand sanitizer, disinfectant wipes, and other personal cleaning supplies.
- Communicate immediately to office staff, visitors, and building management of a primary exposure situation as appropriate.
- Implement contact tracing of employees who have been confirmed or presumptive confirmed.
- Continue field work in accordance with this Safety Plan.
- Field programs will follow this Safety Plan unless the client, prime contractor, federal, state, or local government establish more restrictive measures, in which case the more restrictive measures will be followed.
- Updated information can be found at the CDC website (https://www.cdc.gov/), as well as state and local health agency websites.
- Field project schedules, modifications, and regulatory requirements will be discussed with the client representatives.
- All personnel have Stop Work Authority.

2 Plan Requirements

The objective of this Safety Plan is to provide operational guidelines that address pandemics and epidemics in addition to maintaining consistency in Anchor QEA's response actions across the organization.

If you have questions or concerns, please direct those to your Office Lead, Staff Manager, Project Manager, or H&S Program Lead.

Some site owners or prime contractors may conduct temperature readings or screening prior to entering an office or site, which is in accordance with some current guidance. Some site owners or prime contractors may want to record actual temperature readings, test results, or information other than general "yes" or "no" questions related to travel, symptoms, vaccination status, or other items. If you choose not to participate in the recording of screening information, the site owner or prime contractor may not allow you to access the site. You should immediately contact your Field Lead, Staff Manager, or Project Manager to discuss alternative work and available options.

Prior to Coming to Work

If an employee has had close contact with a confirmed case within the prior 10 days, we require that they be cleared by WorkCare through the screening process:

- **Regardless of vaccination status, if employees feel that they are sick or showing symptoms, they are required to stay home and not report to work (office or field).**
  - If employees are showing symptoms, they are to contact WorkCare and/or their healthcare provider for medical advice. If employees feel the need to visit a medical professional, it is recommended that the medical office be contacted first to determine when it is appropriate to visit.
  - They should call their Staff Manager immediately and notify them that they are sick. Showing up to work with symptoms will result in the employee being asked to leave to avoid potentially exposing others to an infectious disease.
- If employees show any symptoms while at work, they will be asked to leave and not return until they have been cleared by WorkCare.
- Exposure to, or close contact with, means being within 6 feet of an individual for 15 minutes or greater in a 24-hour period or being exposed to their cough or sneeze.
- If you meet the criteria listed for Primary or Secondary exposure listed in the Case Response section, you should take the following measures:
  - Do not report to work until cleared by WorkCare.
  - Contact your Staff Manager and Health and Safety.

- If masks (i.e., N95 or KN95) are used, they should be used in accordance with the Occupational Safety and Health Administration (OSHA) standard 1910.120, stating, in part, that the user must be fit-tested and in a surveillance program. However, if employees wish to provide their own N95 or KN95 mask, they must complete appropriate acknowledgements with Health and Safety prior to use.

Vaccination Policy

People are considered fully vaccinated 2 weeks after they have received the second dose in a two-dose series, or 2 weeks after they have received a single-dose vaccine. People are asked to maintain current vaccination by receiving a booster dose when eligible.

At this time, Anchor QEA does not require employees to be vaccinated except where required by law or regulation. However, there are locations and projects that may require additional vaccinations or an approved accommodation. In those cases, Anchor QEA will follow those requirements and only assign employees who meet the necessary requirements. For employees to be considered fully vaccinated against an infectious disease, their information must be uploaded to the WorkCare screening portal or recorded in other designated locations.

Screening

A daily self-check protocol is being instituted to replace the daily screening through WorkCare in an attempt to prevent sick or symptomatic employees from coming to work and spreading infection. Employees will self-check themselves for any symptoms that could be consistent with an infectious disease as listed in this plan or by CDC. If an employee has symptoms that could be consistent with disease, they are not to report to work, and if already at work, they should notify their Staff Manager and Health and Safety or Human Resources and return home. They should complete a Risk Stratification Survey through WorkCare and not return until cleared. Employees who report for work are stating that they do not have symptoms that could be consistent with an infectious disease, or they have been cleared by a healthcare professional.

Visitors

- Visitors are allowed; however, if they have any symptoms that could be consistent with an infectious disease they should not visit.
- Meetings with outside parties should take place virtually, when possible.
- Delivery personnel must follow all current protocols.

Case Response

According to the CDC, symptoms can appear 2 to 14 days after exposure. Symptoms or combinations of symptoms that may be consistent with an infectious disease include the following:

- Fever (100.4°F [37.8°C] or greater) or chills
- Cough
- Shortness of breath or difficulty breathing
- Fatigue
- Muscle or body aches (longer than 48 hours)
- Headache
- Sore throat
- Congestion or runny nose
- Nausea or vomiting
- Diarrhea
- New loss of taste or smell
- Positive test

If you have symptoms that are consistent with the above or others designated by CDC but have not tested positive, regardless of vaccination status, you are to not go into work until you have been cleared to return by WorkCare. Immediately contact your Staff Manager and Health and Safety or Human Resources. You should additionally contact the Project Manager if working in the field for a project.

Regarding exposures, there are two general scenarios that now apply, as follows:

1. **Primary Exposure:** These are employees who have tested positive for or have symptoms consistent with an infectious disease. If you have tested positive for an infectious disease, you must be in self-isolation and those with whom you have had close contact in the work environment within the time specified by the CDC and/or WorkCare will be notified. Health and Safety will work with the Office Lead and Human Resources to notify the Anchor QEA employees (and building management if applicable) who were identified. Project Managers will be responsible for notification of clients and other contractors with whom you were in close contact. You must not return to work until you have been cleared by WorkCare. The exception to this would be if your primary physician recommends more restrictive measures.
2. **Secondary Exposure:** These are employees who, within the time specified by the CDC and/or WorkCare, have had close contact with someone who has tested positive for an infectious disease or has symptoms consistent with an infectious disease. You must follow the direction of WorkCare and may not return to work until cleared by WorkCare. If you start to have symptoms or test positive, follow the appropriate guidance for Primary Exposure noted above.

In the event there is a documented case of an employee becoming infected with an infectious disease or symptoms consistent with an infectious disease (Primary Exposure), management will take immediate action as follows:

- The employee should be immediately self-isolated until they have been cleared by WorkCare.
- Notify the Staff Manager, Health and Safety, and Project Manager (if in the field) immediately.
- The employee will identify those with whom they have had close contact in the work environment within the time specified by CDC and/or WorkCare.
- Employees who came in close contact with the individual will be notified. Health and Safety will work with the Office Lead and Human Resources to notify the Anchor QEA employees who were identified. Project Managers will be responsible for notification of clients and other contractors with whom the individual was in close contact.
- Confidentiality for the employee should be maintained.

If an employee has had close contact with someone diagnosed with an infectious disease (Secondary Exposure) within the current time specified by the CDC and/or WorkCare, the Staff Manager, Office Lead, and/or Health and Safety will take immediate action as follows:

- If the employee is asymptomatic, have them wear a well-fitting face covering until 10 days have passed since the exposure.
- If the employee tests positive or develops symptoms, this becomes a Primary Exposure scenario, and that guidance should then be followed.

Workplace Requirements

All work locations are to follow the guidance in this document at a minimum. In locations where state or local requirements require specific plans, forms, risk evaluations, or other documents, those documents will be prepared for those specific instances. For field projects, follow the site-specific Health and Safety Plan personal protective equipment (PPE) requirements in addition to this document.

Travel Considerations

Travel will be considered based upon the current levels of transmission, restrictions, and overall risk to the employees at the time. They may range from no restrictions to stopping all travel.

- Employees must follow the same prevention guidelines off site, which includes travel, hotel, and other activities, to address potential exposures outside the workplace.
- When at hotels, consider disinfecting your own room with U.S. Environmental Protection Agency (EPA)-registered cleaners or alternatives, and consider using the "No Housekeeping" sign to minimize the people coming into your room.
- When traveling, follow all requirements in place for the location(s) that you visit, including any requirements for transportation to include air travel.

Face Covering and Physical Distancing Requirements

- As always, regardless of whether required at the time, individuals are permitted to wear a face covering if they desire as long as there is no safety risk.
- In some instances, a location, local area, or state may have more restrictive requirements in place. All individuals must follow the more restrictive requirements in those cases.
- Those who are at high or increased risk should consult with their healthcare provider about whether they need to wear a mask/face covering or take other precautions.
- Physical distancing, 6 feet or greater, is also an effective method to reduce the risk associated with contracting an infectious disease.
- All employees should have a face covering available in case they are requested to wear one when in close contact or enclosed situations.

Designated Coordinators

Anchor QEA will designate the following Coordinators in the workplace:

- For office locations, the Office Lead will be the Coordinator with support from the H&S Office Representative(s).
- For field sites, the Field Lead or Senior Person will be the Coordinator with support from the Project Manager.
- The H&S Program Lead and H&S Coordinator(s) will be the Corporate Coordinators with support from the Task Force and Managing Committee.

The responsibilities of the Coordinators are as follows:

- Ensure that information on required workplace safety protocols is provided to employees and all other individuals likely to be present at workplaces.
  - Communicate the required workplace safety protocols and related policies by email, websites, memoranda, flyers, or other means, and post signage at covered workplaces that sets forth the requirements and workplace safety protocols in a readily understandable manner as necessary.
  - This includes communicating the workplace safety protocols and requirements related to face coverings and physical distancing to visitors and all other individuals present at workplaces.
- If the designated Coordinator (or support person) becomes aware of individuals failing to comply with the requirements established at that time, do the following:
  - Ask the individual to comply.
  - If they still do not wish to comply, ask them to leave the workplace.
    - If they are a visitor ensure their company is notified.
    - If they are an employee notify Human Resources.

- If a location has more restrictive requirements, individuals will follow the more restrictive requirements.

The Corporate Coordinators will also be responsible for the following:

- Work with WorkCare and/or others to maintain proper vaccination documentation as appropriate.
- Provide support to the office and field Coordinators.

Prevention and Cleaning Requirements

An important step to control spread of the virus in the workplace focuses on hygiene and cleaning:

- All employees and management staff will follow CDC guidance regarding hand washing: https://www.cdc.gov/handwashing/index.html. Sanitizing wipes or gel will be made readily available around the office.
- All employees will be responsible for multiple daily cleaning of high-touch surfaces.
- Employees should follow published guidance to limit transmission outside of and at work: https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/prevention.html.
- The following link provides a list of EPA-recommended cleaning products able to kill the virus, as well as some initial guidance with alternatives if supplies run out: https://cfpub.epa.gov/wizards/disinfectants/. If these products are not available, then either a diluted bleach solution or 70% alcohol solution will work. The following link provides general recommendations for routine cleaning and disinfection: https://www.cdc.gov/coronavirus/2019-ncov/community/disinfecting-building-facility.html#anchor_1617548446719.
- Catch coughs and sneezes with a disposable tissue, etc. and throw away, then wash hands. If tissues are not available, direct coughs and sneezes into elbow.
- Avoid touching your own mouth, nose, or eyes.
- All employees will have their own PPE and will not share with others. Respirators and PPE will be cleaned/disinfected when doffing, along with a thorough arm, hand, and face washing when exiting.

Disinfection

- A sustainable supply of disinfectant wipes will be available for employees to wipe down surfaces that are touched in restrooms and other common areas when they leave the area.
- Staff Managers should still maintain regular contact with personnel even when they return to the office.

Table 1
Supply Recommendations

Item	Specifications	Required On-Hand Quantity*
Face coverings	Face coverings meeting CDC guidelines. Employees are responsible for their own face coverings and cleaning because use outside the office (on the bus, at the store, getting coffee, on the elevator) is important to avoid bringing the virus to the office.	Anchor QEA will provide face coverings as necessary.
Gloves	Disposable gloves of sufficient material to be used when cleaning common touch surfaces	Sustainable supply
Disinfectant spray or wipes	Wipes or manufactured disinfecting material. If using a solution, it must meet EPA guidance and be made fresh daily.	Sustainable supply
Hand sanitizer and motion sensor-activated dispensers	Hand sanitizer meeting CDC guidelines	Sustainable supply
Hand soap	Premanufactured soap available at various sink locations	Sustainable supply
Paper towels	Rolls or refills for hand towel machines that are already in place or are installed prior to opening	Sustainable supply
Spray bottles	Spray containers for use with disinfectant solutions that are mixed on site	As needed; sustainable supply

Note:
*Required On-Hand Quantity must be maintained in a sustainable supply. When quantities drop to a critical level and quantities cannot be immediately increased, appropriate actions should be taken.

Table 2
Office Responsibilities

Responsibility	Responsible Person(s)	Comments
Tracking State Requirements	Office Lead or Project Manager	
Office Reclosure	Office Lead, Anchor QEA Managing Committee, and/or H&S Program Lead	"Stop Work" can be applied as necessary
Office Access	Office Lead	
Workspace Configurations	Office Lead or Project Manager	
Shared Areas	Office Lead or Project Manager	
Staff Office Rotations	Office Lead or Project Manager	If needed
Screening (Staff/Visitors) – Oversight	Office Lead or Project Manager	
Local Field Project Staffing	Regional Leads, Project Managers, and Health and Safety	
Cleaning – Oversight	All	
Exposure Response (Source Tracing)	Health and Safety or Human Resources and Office Lead or Project Manager	
Office Procedures – Review and Modification	H&S Program Lead or Human Resources and Office Lead or Project Manager	If needed

3 Source Materials

CDC (Centers for Disease Control and Prevention), 2021. CDC website: cdc.gov.

Lear Corporation, 2020. *Safe Work Playbook: An interactive guide for COVID-19 Pandemic Preparedness and Response Second Edition*. June 26, 2020.

Lotito, M.J., M.J. Ackie, and B.J. Sarchet, 2020. *Back to Work? Assessing Whether, When and How to Re-Open for Business*. Littler Workplace Policy Institute. Webinar. April 27, 2020.

Safer Federal Workforce Task Force, 2021. *COVID-19 Workplace Safety: Guidance for Federal Contractors and Subcontractors*. September 24, 2021. Available at: https://www.saferfederalworkforce.gov/downloads/Draft%20contractor%20guidance%20doc_20210922.pdf

Appendix F
Heat Exposure Safety Plan

Field Program Heat Exposure Management Plan

Date: _____

Project No: _____

Project Name: _____

This Field Program Heat Exposure Management Plan (Plan) is an addendum to the existing project-specific Health and Safety Plan (HASP) for field activities. All personnel who have previously signed acknowledging the HASP must sign off acknowledging this Plan. Acknowledgement of this Plan will be included with future acknowledgements of the overall HASP. This Plan is intended to be used primarily from May to September of each year; however, depending on temperatures it may also be needed during other months.

Heat-related illnesses can happen if workplace activities in a hot environment overwhelm the body's ability to cool itself. This becomes more likely if any of the risk factors are present. Examples include working in a hot environment without adequate access to water for rehydration, working in protective gear that does not allow air circulation across the skin, or working where the humidity is too high for sweat to evaporate.

This Plan should be applied for anyone working outdoors more than 15 minutes in any 60-minute period in heat index temperatures:

- As low as 52°F when wearing clothing that is non-breathable or provides a vapor barrier like rain gear, chemical resistant suits, or Level A suits
- Starting at 77°F when wearing double layer woven clothing like sweatshirts, coveralls, and jackets on top of other clothes
- At 80°F when wearing any other type of clothing like typical shirts and pants

Some individuals are more susceptible to heat stress than others—for example, individuals who are not acclimatized or who come to work dehydrated.

Prevention Measures

The field team shares responsibility for safety at the work site. This includes watching out for yourself and others because heat illness can become a life-threatening condition quickly if unnoticed or ignored. Speak up if you notice anything that could be unsafe or result in someone getting hurt or sick.

Set up the Work Site for Shade

Before work begins, the Field Lead will assess shade options for the work site. Shade such as trees, walls, or structures like a portable canopy can be used. Fans can help if the air temperature does not go above 95°F, but if air-conditioned spaces are available, like cabs, they can be used to cool individuals off. The Field Lead is responsible to ensure that equipment is available, functional,

transported, and set up properly. The shade area must either be open to the air or provide mechanical ventilation for cooling.

The amount of shade present must be at least enough to accommodate the number of staff on recovery or rest periods, so that they can sit in a normal posture fully in the shade. The shade must be located as close as practical to the areas where staff are working. Shade present during meal periods must be large enough to accommodate the number of staff on the meal period that remain on site. If shade cannot be provided due to safety or feasibility concerns, alternative cooling measures must be implemented.

Schedule Work to Reduce Heat Exposure

The Field Lead, in coordination with the Project Manager, will consider changes to shift timing to avoid working during the hottest period of the day. This could include starting earlier, working in the evening, or splitting the day with a break during the hottest part of the day.

Stay Hydrated

Do not wait to be thirsty to drink water, and do not drink it all at once. In fact, it is best to start drinking water before work. Drink small amounts often throughout the day to stay hydrated. Additional water breaks are allowed during hot days. Potable water should be cool (66ºF to 77ºF) or cold (35ºF to 65ºF). During moderate activity, in moderately hot conditions, staff should drink about 8 ounces of liquid every 15 to 20 minutes.

Sports drinks low in sugar are okay but should not completely replace water. Avoid drinks with caffeine and high sugar content like sodas because they will not hydrate you.

There should be enough water to allow each staff member to drink at least a quart of water each hour. (Drink at least 1 cup every 15 to 20 minutes.)

The Field Lead will ensure that water is available to staff and that it is consumed on a regular basis.

Encourage staff to eat regular meals and snacks because these provide enough salt and electrolytes to replace those lost through sweating if enough water is consumed.

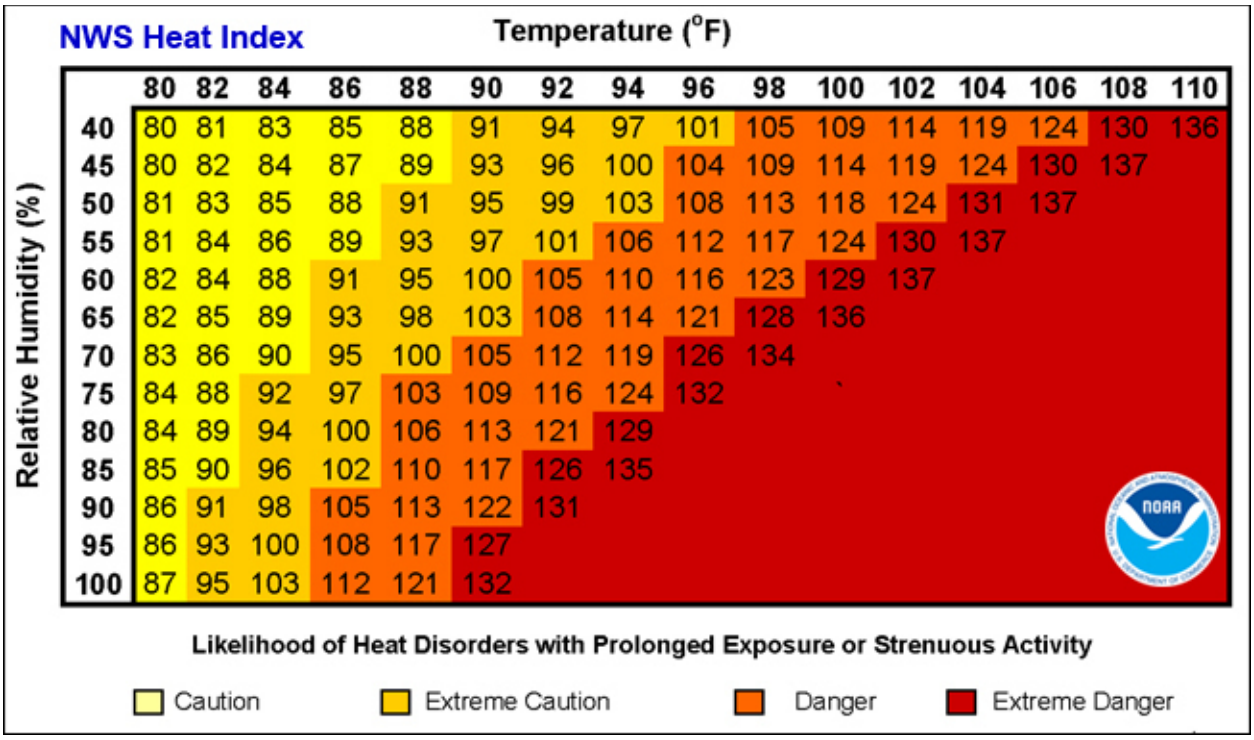
Allow Time to Adjust to Heat (Acclimatization)

It takes about 2 weeks to fully adjust to hot working conditions. This adjustment is lost if you are away from the hot conditions for a week or more. Acclimatization is especially critical for heavy work in hot temperatures.

Start with light physical work and/or short durations of work time, and slowly increase each day. Increase by 20% (of the total shift) each day for non-acclimatized staff.

Training

Each year, staff who may encounter the working conditions listed above will be provided with safety training on the dangers of outdoor heat exposure, the steps we take to protect them, and actions they must follow to prevent heat-related illness. This information will additionally be covered in tailgate meetings at the project site.



Relative Humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Source: https://www.weather.gov/images/safety/heatindexchart-650.jpg

High Heat Practices

The following additional high heat practices must be implemented when the ambient heat index exceeds 90°F:

- Ensure that effective communication by voice, observation, or electronic means is maintained so that staff at the work site can contact a Supervisor when necessary. An electronic device, such as a mobile phone or text messaging device, may be used for this purpose only if reception in the area is reliable.
- Ensure that staff are observed for alertness and signs and symptoms of heat illness and monitored to determine whether medical attention is necessary by implementing one or more of the following:
  - Establish regular communication with staff working alone, such as by radio, mobile phone, or other alternative means.

  - Create a mandatory buddy system.
  - Implement other equally effective means of observation or communication.
- The Field Lead must designate and equip one or more staff on the work site as authorized to call for emergency medical services and must allow other staff to call for emergency services when designated staff are not immediately available (such a practice supplements existing requirements to ensure that emergency medical care is immediately available in all workplaces).
- The Field Lead must ensure that each staff member takes a minimum 10-minute preventative cool-down rest period in the shade at least every 2 hours, regardless of the overall length of the shift.

Responding to Heat-Related Illness

Let a Supervisor or someone nearby know if you or a coworker are experiencing any signs or symptoms of heat-related illness and take immediate action to ensure things do not get dangerously worse.

- Time is critical. Get the individual away from the hot area into a cool shaded area. Quick action increases the chances for a full recovery.
- Let the individual rest and drink cool water.
- Remove any PPE as appropriate.
- Use ice packs or cooling towels as appropriate and available.
- Never leave an individual who is experiencing heat-related problems alone; things could get worse.
- If the individual is a lone worker, an Anchor QEA representative will stay on the line with the individual. Also, in the case of a lone worker, emergency services will be called to the location of the individual unless an Anchor QEA representative or representative of another company can quickly arrive at the location.
- If the individual does not respond quickly, call emergency medical services.
- Follow the steps in the main HASP document for notifying emergency services to include directions to the site.
- If the individual is in a remote or non-developed area with unidentified roads, you may need to have someone meet emergency services at the closest point to guide them to the victim's location.
- Notify Health and Safety.

If the individual receives medical attention, a written authorization must be obtained from the provider indicating that the individual can get back to work and whether there are any restrictions or limitations.

Risk Factors

The following are environmental risk factors for heat illness:

- Air temperature above 90°F
- Relative humidity above 40%
- Radiant heat from the sun and other sources
- Conductive heat sources such as dark-colored work surfaces
- Lack of air movement
- Physical effort needed for the work
- Use of nonbreathable protective clothing and other Personal Protective Equipment (PPE)

The following are personal risk factors for heat illness:

- Lack of acclimation to warmer temperatures
- Poor general health
- Dehydration
- Alcohol consumption
- Caffeine consumption
- Previous heat-related illness
- Use of prescription medications that affect the body's water retention or other physiological responses to heat such as beta blockers, diuretics, antihistamines, tranquilizers, and antipsychotics

Heat-Related Illnesses

Heat Rash

Heat rash is the most common health problem in hot work environments. It is caused by sweating and looks like a red cluster of pimples or small blisters. Heat rash usually appears on parts of the body that overlap or rub other parts of the body, such as in the groin area, under the arms or breasts, and in knee or elbow creases. If an individual has symptoms of heat rash, provide a cooler, less humid work environment, if possible. Advise the individual to keep the area dry and not to use ointments and creams that make the skin warm or moist, which can make the rash worse.

Heat Exhaustion

Heat exhaustion can best be prevented by being aware of one's physical limits in a hazardous environment on hot, humid days. The most important factor is to drink enough clear fluids (especially water, not alcohol or caffeine) to replace fluids lost to perspiration. Signs and symptoms of heat exhaustion typically include the following:

- Profuse sweating

- Weakness and fatigue
- Nausea and vomiting
- Muscle cramps (associated with dehydration)
- Headache
- Light-headedness or fainting (fainting or loss of consciousness is potentially serious and should be treated as a medical emergency)

When you recognize heat exhaustion symptoms in an individual, you must intervene; stop the activity, and move the individual to a cooler environment. Cooling off and rehydrating with water (or electrolyte-replacing sports drinks) is the cornerstone of treatment for heat exhaustion. If the individual resumes work before their core temperature returns to normal levels, symptoms may quickly return.

If there is no intervention and the body's temperature regulation fails, heat exhaustion can rapidly progress to heat stroke, a life-threatening condition!

Heat Stroke

Heat stroke requires an immediate emergency medical response. The individual may stop sweating, become confused or lethargic, and may even have a seizure! The internal body temperature may exceed 106°F. Signs and symptoms of heat stroke typically include the following:

- Absence of sweating
- Dry skin
- Agitation or strange behavior
- Dizziness, disorientation, or lethargy
- Seizures or signs that mimic those of a heart attack

Ensure that emergency responders are summoned immediately if heat stroke is suspected. While waiting for emergency responders to arrive, cool the individual; move the individual to an air-conditioned environment or a cool, shady area, and help the individual remove any unnecessary clothing. Do not leave the individual unattended. Heat stroke requires immediate medical attention to prevent permanent damage to the brain and other vital organs that can result in death.

Responsibilities

Staff need to be aware of the following:

- How heat can make them sick, and how to recognize the common signs and symptoms of heat-related illness in themselves and coworkers. The four most common conditions are heat rash, heat cramps, heat exhaustion, and heat stroke.

- The environmental factors that increase risk for heat-related illness such as higher temperatures, humidity, sunlight (working under direct sunlight makes it feel about 15 degrees hotter), additional sources of heat like powered equipment and asphalt, no wind, level of physical activity, and wearing of PPE or layers of clothing
- Personal factors that may increase susceptibility to heat-related illness including age, not being acclimatized, having medical conditions such as hormonal and heart issues and diabetes, dehydration, and use of substances that can affect the body's response to heat like drugs, alcohol, caffeine, nicotine, and medications
- The importance of removing heat-retaining PPE such as non-breathable chemical resistant clothing during all breaks to allow the body to cool down
- How to stay well hydrated by drinking small quantities of water or other acceptable beverages frequently throughout the day
- The importance of acclimatization (to get used to the conditions). It takes about 5 days to start and 2 weeks to be fully acclimated
- How to immediately report signs or symptoms of heat-related illness they experience or observe in coworkers, and how to immediately respond to prevent the situation from becoming a medical emergency. How to identify and what to do during a heat-related medical emergency (e.g., potential heat stroke)

Supervisors need to know the following (in addition to what is detailed for staff above):

- The procedures to follow to implement the heat-related illness prevention plan, including the acclimatization schedule, how to keep track of environmental conditions throughout the day, when to increase the number of breaks or stop work early, checking that staff are accessing shade and water (especially for mobile operations), encouraging them to stay hydrated, and communicating with lone workers to ensure they are safe. The free OSHA-NIOSH Heat Safety Tool app could be helpful: https://www.cdc.gov/niosh/topics/heatstress/heatapp.html
- When to provide PPE like cooling vests and gel-filled bandanas
- What the Supervisor needs to do if an individual shows signs and symptoms of possible heat-related illness, including appropriate emergency response procedures and how to transport any affected staff to a medical service provider

Sources

https://osha.oregon.gov/OSHAPubs/pubform/heat-sample-program.pdf

https://www.lni.wa.gov/safety-health/_docs/HRIAPPAddendum.doc

Heat Exposure Management Plan Acknowledgement

Project Number: _____

Project Name: _____

My signature below certifies that I have read and understand the policies and procedures specified in this Field Program Heat Exposure Management Plan.

Date	Name (print)	Signature	Company

Responsibility is taken, not given. Take responsibility for safety.