Pre-Remedial Design Investigation Project Plans – Marine Unit

R.G. Haley Site
Bellingham, Washington

for
City of Bellingham

March 18, 2022

GeoEngineers
Earth Science + Technology

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File No. 0356-114-08

March 18, 2022

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Table of Contents

LIST OF TABLES

LIST OF FIGURES

APPENDICES

ABBREVIATIONS AND ACRONYMS

AO	Agreed Order
bgs	below ground surface
CAP	Cleanup Action Plan
City	City of Bellingham
cPAHs	carcinogenic polycyclic aromatic hydrocarbons
Ecology	Washington State Department of Ecology
EDR	Engineering Design Report
EPA	United States Environmental Protection Agency
Haley	R.G Haley International Corp
HASP	Health and Safety Plan
IHS	indicator hazardous substances
ISS	in-situ soil solidification
JARPA	Joint Aquatic Resource Permit Application
LNAPL	light non-aqueous phase liquid
MNR	monitored natural recovery
MTCA	Model Toxics Control Act
NAPL	Non-Aqueous Phase Liquid
OC	organoclay
OHWM	ordinary high water mark
OSHA	Occupational Safety and Health Act
PAHs	polycyclic aromatic hydrocarbons
PCP	pentachlorophenol
PRDI	Pre-Remedial Design Investigation
QAPP	Quality Assurance Project Plan
RCW	Revised Code of Washington
RI/FS	Remedial Investigation/Feasibility Study
SAP	Sampling and Analysis Plan
SEPA	State Environmental Policy Act
Site	R.G Haley Site
SMS	Sediment Management Standards
TPH	total petroleum hydrocarbons
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WISHA	Washington Industrial Safety and Health Act

1.0 INTRODUCTION

This Pre-remedial Design Investigation (PRDI) Project Plan has been prepared to describe additional sampling and analysis to be performed in the in-water portion of the R.G. Haley International Corp Site (Haley Site or Site) to support remedial design. The Haley Site is located south of the downtown business district in Bellingham, Washington (Figure 1). Wood products were treated with pentachlorophenol at the Site between approximately 1948 and 1985. Remedial actions will be completed at the Site pursuant to requirements of the Washington State Model Toxics Control Act (MTCA) (Chapter 173-340 of the Washington State Administrative Code (WAC)) and Sediment Management Standards (SMS) (Chapter 173-204 WAC). Design and permitting activities supporting Site cleanup are being conducted under Agreed Order (AO) No. DE 15776, (Ecology 2018a) between the Washington State Department of Ecology (Ecology) and the City of Bellingham (City).

This PRDI Project Plan describes field activities to be performed to characterize the following (see Figure 4 for identified areas):

- Intertidal sediment and porewater at the base of the planned excavation in Zone 1a to refine the depth of excavation and to provide information to support design of the amended sand cap within the sediment excavation area.
- Intertidal sediment and porewater at the base of the planned amended cap in Zone 1b to provide information to support design of the amended sand cap.
- Conditions within the existing organoclay (OC) cap placed during the 2013 interim action and estimate the organoclay usage rate within the existing cap to inform the design of the amended sand caps to be placed in Zones 1a and 1b.

The planned field activities and laboratory analyses to complete the characterization tasks identified above are described in subsequent sections of this project plan following a description of the planned remedial actions. More detailed descriptions of the field activities and laboratory analyses are presented in the Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP) provided in Appendix A and B, respectively. A Health and Safety Plan (HASP) is provided in Appendix C.

1.1. Cleanup Action Summary

The R.G. Haley International Corp wood treatment facility was formerly located in the upland portion of the Haley Site. Operations at the facility resulted in contamination to the upland and adjacent in-water area that is part of Bellingham Bay. The Site is subdivided into two units that are separated by the ordinary high water mark (OHWM) that include the Upland Unit and the Marine Unit as shown on Figure 2.

The components of the Haley Site cleanup action are summarized below and shown on Figure 3:

- In-situ soil solidification (ISS) will be performed within the area of potentially mobile light non-aqueous phase liquid (LNAPL) near the shoreline.
- A low-permeability cap will be constructed throughout the upland unit where soil exceeds cleanup levels. The cap will include a gas collection layer to prevent build-up of landfill gas and pressure below

the low-permeability layer. The upland cap will also be designed to reduce stormwater infiltration and convey runoff to surface water.

- LNAPL-impacted sediment in the intertidal area adjacent to the shoreline will be excavated. Sediment remaining at the base of the excavation will be capped with clean sand and armored to prevent erosion. The cap design will include the use of amendments added to the sand cap material to enhance chemical containment. The excavated sediment will be consolidated under the upland cap.
- An amended sand cap will be placed and armored in the intertidal and shallow subtidal areas outside of the sediment removal area. This includes areas where sediment concentrations exceed benthic criteria and locations where bioaccumulative constituents are present at concentrations that are not anticipated to naturally recover within 10 years of implementation of the remedial actions.
- Thin layer capping will be completed farther offshore of the sediment excavation and amended cap areas. Thin layer capping includes placement of a 1-foot layer of gravelly sand to isolate underlying contaminated sediment and protect from potential erosion.
- Monitored natural recovery (MNR) will be used in areas where contaminant concentrations in surface sediment exceed cleanup levels but are expected to achieve cleanup levels within 10 years as a result of the natural deposition of sediment. MNR will be implemented predominantly in the subtidal portion of the Marine Unit.

2.0 SEDIMENT EXCAVATION AND CAPPING CLEANUP ACTIONS

The focus of this PRDI Project Plan is to more precisely characterize contaminant conditions in sediment and porewater in the intertidal areas that are proposed for excavation and amended sand capping and that are subject to groundwater flux through the existing sediment and into the cap material. The Draft Engineering Design Report (EDR) identifies sediment excavation and capping areas based on existing analytical data from the Remedial Investigation and Supplemental Sediment Investigation. One sediment excavation and capping zone and three sediment capping zones are planned as part of the Marine Unit cleanup action as shown on Figure 4 and described in the following sections:

Zone 1a: Excavation and Amended Cap Area

- Zone 1a is an area of high groundwater flux and contaminant concentrations in sediment and residual NAPL that is proposed to be excavated prior to placement of amended sand cap material. Contaminated sediment is currently planned to be excavated up to approximately 7 feet below the existing mudline to reduce contaminant mass and facilitate placement of a sediment cap to contain underlying residual contaminants. Additional excavation may be completed at the base of the current design excavation if NAPL is identified during this investigation.
- Sediment excavation is to be performed in the area with petroleum hydrocarbon concentrations indicative of potentially mobile NAPL and locations where petroleum sheen and seepage were previously observed. The area also includes locations with elevated concentrations of other associated Indicator Hazardous Substances (IHSs) including pentachlorophenol (PCP), 1- and 2-methylnaphthalene, carcinogenic polycyclic aromatic hydrocarbons (cPAH), and dioxin and furans.
- A 2-foot-thick sand cap amended with OC or OC and activated carbon will be placed at the base of the sediment excavation to contain potential LNAPL and other residual contaminants present in sediment below the excavation.

- A geotextile will be placed beneath and on top of the amended sand cap material so that the cap material doesn't migrate into underlying and overlying materials and to promote uniform settlement to maintain cap thickness and integrity.
- The amended sand cap chemical containment layer will be protected with armor rock to prevent erosion.

Zone 1b: Amended Cap Area

- Zone 1b is an area of high groundwater flux and contaminant concentrations in sediment but where residual NAPL is not present.
- A 2-foot-thick sand cap amended with OC and activated carbon will be placed to contain residual contaminants in sediment.
- A geotextile fabric will be placed beneath and top of the amended sand cap material so that the cap material doesn't migrate into underlying and overlying materials and to promote uniform settlement to maintain cap thickness and integrity.
- The amended sand cap chemical containment layer will be protected with armor rock to prevent erosion.

Zone 2: Amended Cap Area

- A 2-foot thick sand cap amended with OC will be placed farther off-shore and adjacent to Zone 1 where groundwater flux is lower than nearshore areas.
- A geotextile fabric will be placed beneath and on top of the amended sand cap material so that the cap material doesn't migrate into underlying and overlying materials and to promote uniform settlement to maintain cap thickness and integrity.
- The amended sand cap chemical containment layer will be protected with a cobble and gravel armor layer to prevent erosion.

Zone 3: Amended Cap Area

- A 1-foot thick sand cap amended with activated carbon will be placed in areas farther offshore where groundwater flux is controlled more by diffusion than advection.
- A geotextile fabric will be placed beneath and on top of the amended sand cap material so that the cap material doesn't migrate into underlying and overlying materials and to promote uniform settlement to maintain cap thickness and integrity.
- The amended sand cap chemical containment layer will be protected with a cobble and gravel armor layer to prevent erosion.

3.0 INTERTIDAL SEDIMENT AND POREWATER SAMPLING IN THE SEDIMENT EXCAVATION AND CAPPING AREA - ZONE 1A

The objective of the sampling and analysis to be performed in the sediment excavation and capping area is to collect additional data for the purpose of refining the design in the area of highest contaminant concentrations. Intertidal sediment and porewater data will be collected to confirm the vertical extent of

NAPL-impacted sediment in Zone 1a. This data will be used to refine the design of excavation and amended capping in Zone 1a. Sediment samples will be collected along four (4) transects within Zone 1a from elevations ranging from the ordinary high water mark (OHMW) to approximately +1 foot NAVD88 during low tidal conditions when the target locations are exposed and in dry conditions. Sample depths will be based on the minimum depth of excavation presented in the EDR, and the maximum depth of excavation based on constructability considerations.

The minimum depth of excavation presented in the EDR are based on the concept of removing at least 5 feet of sediment at the existing OHWM to remove enough sediment to prevent the final cap surface in the excavation area from exceeding the current elevation. The base of the minimum excavation depth presented in the EDR is sloped at 10:1 down to an approximate elevation of +1 foot NAVD88, which is the outer limit of where a marine coffer dam could be placed. The maximum depth of excavation will be deeper near the shoreline if LNAPL is observed in sediment below the minimum excavation depth presented in the EDR. The maximum depth of excavation would not be deeper than +1 foot NAVD88 to not cause slope stability issues at the shoreline and so as not to undermine the cofferdam. Therefore, the maximum depth would be to +1 foot NAVD88 across the entire based of the of the sediment excavation.

Samples will be collected from sediment that would be expected to be exposed at the planned sediment excavation limits. For each transect three (3) sediment sample locations will be completed as shown on Figure 4. Sampling and analysis to be completed in Zone 1a is summarized in Table 1 and includes the following:

- In each of the four transects, sediment samples will be collected from the two (2) sample locations with the highest elevations on the shoreline (eight locations in total including Z1A-1, Z1A-2, Z1A-4, Z1A-5, Z1A-7, Z1A-8, Z1A-10 and Z1A-11) using sonic drilling methods during low tidal conditions when the target locations are exposed and in dry condition. Figure 5 presents a cross section that illustrates the target sample locations and sample depths. Sediment samples will be collected from approximate 2-foot intervals (Table 1).
- In each of the four transects, a porewater sample will be collected from the one (1) sample location with the highest elevation on the shoreline (four locations in total including Z1A-1, Z1A-4, Z1A-7 and Z1A-10) for porewater extraction. The target depth interval for collection of sediment for porewater analysis will be non-NAPL impacted sediment from the base of the minimum depth of excavation identified in the EDR or from the base of the maximum depth of excavation (due to constructability), if NAPL is observed in the minimum depth sample.
- In each of the four transects, a sediment sample will be collected from the one (1) sample location with the lowest elevation on the shoreline (four locations in total including Z1A-3, Z1A-6, Z1A-9 and Z1A-12) using hand tools during low tidal conditions when the target locations are exposed and in the dry (Figure 5). The sediment sample will be collected from the surface to a depth of 2 feet.
- In each of the four transects, a porewater sample will be collected from the one (1) sample location with the lowest elevation on the shoreline (four locations in total including Z1A-3, Z1A-6, Z1A-9 and Z1A-12) using a push point probe during low tidal conditions when the target locations are exposed and in the dry. The porewater sample will be collected from an approximate depth of 1 foot.
- Sediment samples will be analyzed for:

- Diesel- and heavy oil-range total petroleum hydrocarbons by NWTPH-Dx with and without using silica gel cleanup.
- Polycyclic aromatic hydrocarbons (PAHs)[1] by United States Environmental Protection Agency (EPA) 8270.
- Pentachlorophenol by EPA 8270.
- Total organic carbon by EPA 9060A.

- Porewater samples will be collected using the following two methods:
  - For the four (4) sample locations at the highest elevation on the shoreline, sediment samples will be collected using sonic drilling methods and submitted to the laboratory for porewater extraction by centrifugation. Up to approximately 10 liters (340 ounces) of sediment material is needed to obtain the volume required for porewater analyses. If sediment recovery is difficult, replicate cores may be completed or sample material could be combined from adjacent core locations to get an adequate volume of porewater for analysis.
  - For the four (4) sample locations at the lowest elevation on the shoreline, porewater samples will be collected by using a PushPoint probe sampler connected to a peristaltic pump.
- Sediment porewater samples will be analyzed for:
  - Diesel- and heavy oil-range total petroleum hydrocarbons by NWTPH-Dx.
  - PAHs by EPA 8270.
  - Pentachlorophenol by EPA 8041A.
  - Total organic carbon by EPA 9060A.

Table 1 provides the proposed sample locations, depth intervals and analyses. Additional details for sample collection and laboratory analysis procedures are included in the SAP (Appendix A) and QAPP (Appendix B).

4.0 INTERTIDAL SEDIMENT AND POREWATER SAMPLING IN SEDIMENT CAPPING AREA - ZONE 1B

The objective of the sampling and analysis in the sediment capping area is to collect additional data for the purpose of refining the design of amended capping within Zone 1b. Intertidal sediment and porewater data will be collected to provide additional data for designing the amended cap. Two (2) samples will be collected to the north (Z1B-3 and Z1B-4) and two (2) samples to south (Z1B-1 and Z1B-2) of the sediment excavation and capping area (Zone 1a) as shown in Figure 4 during low tidal conditions when the target locations are exposed and in dry conditions. Sampling and analysis to be completed in Zone 1b is summarized in Table 1 and includes the following:

- Sediment samples will be collected from surface to 2 feet deep using hand tools at an approximate elevation of +5 feet NAVD88. The sediment samples will be analyzed for:
  - Diesel- and heavy oil-range total petroleum hydrocarbons by NWTPH-Dx with and without using silica gel cleanup.

[1] PAHs identified as indicator hazardous substances (IHS) for the Site will be analyzed including 1-methylnaphthalene, 2-methylnaphthalene, acenaphthene, fluoranthene, naphthalene, phenanthrene, (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene and indeno(1,2,3-cd)pyrene).

- PAHs by United States EPA 8270.
- Pentachlorophenol by EPA 8270.
- Total organic carbon by EPA 9060A.

- Porewater samples will be collected at the four sample locations in Zone 1b using a PushPoint probe sampler attached to a peristaltic pump to extract porewater from a depth of approximately 1 foot. Sediment porewater samples will be analyzed for:
  - Diesel- and heavy oil-range total petroleum hydrocarbons by NWTPH-Dx.
  - PAHs by United States EPA 8270.
  - Pentachlorophenol by EPA 8041A.
  - Total organic carbon by EPA 9060A.

Table 1 provides the proposed sample locations, depth intervals and analyses. Additional details for sample collection and laboratory analysis procedures are included in the SAP (Appendix A) and QAPP (Appendix B).

5.0 EVALUATE CONDITIONS OF ORGANOCLAY CAP MATERIAL FROM 2013 INTERIM ACTION

The objective of sampling and analysis of the organoclay amended sand cap placed as part for the 2013 Interim Action is to evaluate the usage rate of the organoclay in the cap. The organoclay amended sand cap to be sampled is documented in the Interim Action Construction Completion Report (GeoEngineers 2014). Figure 6 illustrates the typical construction of the interim action cap and the proposed sample locations and depths. The organoclay amended sand cap material will be inspected and sampled at two (2) locations within the interim action cap area (OCM-1 and OCM-2) as shown in Figure 4. The following field sampling procedures and analysis will be completed in the interim action cap area:

- Remove quarry spall armor layer to expose underlying geotextile within an approximately 2-foot square area.
- Cut a 6-inch-diameter hole in the geotextile to access underlying organoclay amended sand cap material.
- Collect one (1) sample of the organoclay amended sand cap material across the full 6-inch thickness of the cap and submit to the laboratory for the following analysis:
  - Total organic carbon by EPA 9060A.
- Collect one (1) sample of the sediment immediately below the organoclay amended sand cap material and submit to the laboratory for the following analyses:
  - Diesel- and heavy oil-range total petroleum hydrocarbons by NWTPH-Dx with and without using silica gel cleanup.
  - PAHs by EPA 8270.
  - Pentachlorophenol by EPA 8270.
  - Total organic carbon by EPA 9060A.
- Restore the interim action cap by filling the sample collection location with bentonite chips, covering the location with geotextile and replacing the quarry spall cap armor over the geotextile.

Table 1 provides the proposed sample locations, depth intervals and analyses. Additional details for sample collection and laboratory analysis procedures are included in the SAP (Appendix A) and QAPP (Appendix B).

6.0 PROCEDURES FOR THE INADVERTENT DISCOVERY OF CULTURAL RESOURCES

The PRDI includes ground disturbing activities within an area of potential historic archaeological resources. Previous cultural resources work was completed at the Site for the 2013 Interim Action and an archaeological assessment (Cultural Resources Consultants, 2013) was completed. Conclusions from the assessment was that although the DAHP archaeological predictive model probability indicates a high potential for cultural resources, the geologic conditions, historic land use patterns and degree of disturbance (at least 10 feet of fill above the pre-contact-era surface) indicate that it would be unlikely for this project to encounter archeological deposits.

If potential archaeological resources are identified during field investigation activities, notification, response actions, and consultations will be completed as detailed in the Inadvertent Discovery Plan included in Appendix D.

7.0 PERMITS AND AUTHORIZATIONS

Under RCW 70.105D.090, remedial actions conducted under an MTCA agreed order are exempt from the procedural requirements of Chapters 70.94, 70.95, 70.105, 77.55, 90.48, and 90.58 RCW, and the procedural requirements of laws requiring or authorizing local government permits or approvals for the remedial action. However, exempted remedial actions still must comply with the substantive requirements of these laws. These exemptions apply to the proposed sediment sampling activities. DNR has previously indicated that no authorization is necessary from DNR for sediment sampling conducted on state-owned land under a MTCA investigation. DNR will be contacted to confirm the applicable requirements for the proposed sampling in this PRDI Project Plan.

Regarding State Environmental Policy Act review, under WAC 197-11-800(17), the proposed sampling activities are categorically exempt.

Any remaining applicable state or local agency substantive requirements will be identified through review of a Joint Aquatic Resource Permit Application (JARPA), as described in the following paragraph.

Procedural requirement exemptions for activities conducted under a MTCA agreed order do not apply for federal permits. Sediment investigations typically fall under the Nationwide Permit #6, which governs survey activities. Because of the federal nexus, a biological evaluation will likely be required to allow consideration of potential impacts to protected species and critical habitats. Accordingly, a JARPA will be completed to comply with federal regulations under the Clean Water Act and Endangered Species Act. The JARPA will also be used to coordinate with state and local agencies to identify substantive requirements for the investigation activities.

8.0 HEALTH AND SAFETY

Field activities will be performed in accordance with the requirements of the Washington Industrial Safety and Health Act (WISHA; RCW 49.17) and the Federal Occupational Safety and Health Act (OSHA; 29 Code of Federal Regulations [CFR] 1910, 1926). These regulations include requirements that workers are to be protected from exposure to contaminants. A Site-specific health and safety plan (HASP) describing actions that will be taken to protect the health and safety of GeoEngineers personnel is presented in Appendix C. Companies providing services for this project on a subcontracted basis will be responsible for developing and implementing their own HASP.

9.0 REPORTING

The results from the additional characterization of sediment and porewater will be presented in a report provided to Ecology for review and approval. Validated analytical data will be uploaded to Ecology's Environmental Information Management (EIM) database. The results of the characterization will be used to support completion of the 90% design documents for remedial actions at the Haley Site.

10.0 SCHEDULE

Permitting for the intertidal sediment sampling will be completed in Winter 2022. The intertidal sediment sampling field work will need to be completed at appropriate low tides to access the sediment sampling locations when they are exposed and in dry conditions. It is expected that field work will be completed during mid to late Spring or early Summer 2022 within appropriate tidal windows and pending U.S. Army Corps of Engineers issuing a sediment sampling permit. Additional scheduling and coordination for this work will be completed following submittal of the PRDI Project Plans to Ecology and pending Ecology's review.

11.0 REFERENCES

Cultural Resources Consultants, Inc. Cultural Resources Overview for the RG Haley Project, Bellingham, Whatcom County, WA. May 22, 2013.

Ecology 2018a. Agreed Order No. DE 15776 between the Washington State Department of Ecology and the City of Bellingham, for the R.G. Haley Site. June 1, 2018.

Ecology 2018b. "Final Cleanup Action Plan, R.G. Haley International Corporation Site, Bellingham, Washington." April 2018.

GeoEngineers 2014. "Interim Action Completion Report, R.G. Haley Site." Prepared for the City of Bellingham. February 12, 2014.

GeoEngineers 2016. "Final Remedial Investigation/Feasibility Study Report, R.G. Haley Site." Prepared for the City of Bellingham. February 1, 2016.

GeoEngineers 2018a. Pre-Remedial Design Investigation Project Plans – Upland. R.G. Haley Site; Bellingham, Washington. November 27, 2018.

GeoEngineers 2018b. Pre-Remedial Design Investigation Project Plans – Habitat Survey. R.G. Haley Site; Bellingham, Washington. August 22, 2018.

GeoEngineers 2018c. Supplemental Sediment Investigation Report; R.G. Haley Site; Bellingham, Washington. January 10, 2018.

GeoEngineers 2021. Public Review Draft Engineering Design Report, R.G. Haley International Corporation Site, Bellingham, Washington. December 6, 2021.

TABLES

GeoEngineers

Table 1

Proposed Sample Locations, Objectives and List of Analyses

Preliminary Remedial Design Investigation (PRDI) Work Plan Addendum - Sediment and Porewater Characterization to Support Remedial Design
R.G. Haley Site
Bellingham, Washington

Sample			Proposed Location[1]				List of Analyses								Objectives[6]
			Coordinates[2]												
Identification	Collection Method	Number of Samples for Analysis	Northing	Easting	Sample Depth Interval[3] (feet below sediment surface)	Sample Depth Interval[3] (Elevation in feet NAVD88)	Diesel- and Oil-Range Petroleum Hydrocarbons (NWTPH-Dx)	Diesel- and Oil-Range Petroleum Hydrocarbons (NWTPH-Dx with acid silica gel cleanup)	PAHs[4] and Pentachlorophenol (EPA 8270E)	PAHs[4] (EPA 8270E)	Pentachlorophenol (EPA 8041A)	TOC in Solids (SW 9060A)	TOC in Water (SW 9060A)	Porewater Extraction[5]	
Sediment Excavation and Capping Zone 1a															
Zone 1a Sediment Core Samples															Characterize intertidal sediment and porewater at the base of the sediment excavation area (Zone 1a) to refine the depth of excavation and support design of the amended sand cap.
Z1A-1-SC	Sonic Drilling	2	639405.86	1239975.42	5 to 7	3.5 to 1.5	X	X	X			X			
					7 to 9	1.5 to -0.5	X	X	X			X			
Z1A-2-SC	Sonic Drilling	1	639421.39	1239967.66	4 to 6	1.7 to -0.3	X	X	X			X			
Z1A-4-SC	Sonic Drilling	2	639468.25	1240079.38	3 to 5	4.4 to 2.4	X	X	X			X			
					5 to 7	2.4 to 0.4	X	X	X			X			
Z1A-5-SC	Sonic Drilling	1	639485.29	1240070.65	2.5 to 4.5	1.5 to -0.5	X	X	X			X			
Z1A-7-SC	Sonic Drilling	2	639548.94	1240193.44	5 to 7	2.75 to 0.75	X	X	X			X			
					7 to 9	0.75 to -1.25	X	X	X			X			
Z1A-8-SC	Sonic Drilling	1	639564.74	1240187.04	3 to 5	1 to -1	X	X	X			X			
Z1A-10-SC	Sonic Drilling	2	639620.76	1240325.47	0.5 to 2.5	7.5 to 5.5	X	X	X			X			
					2.5 to 4.5	5.5 to 3.5	X	X	X			X			
Z1A-11-SC	Sonic Drilling	1	639637.79	1240316.75	2 to 4	3.75 to 1.75	X	X	X			X			
Zone 1a Sediment Core Porewater Extraction Samples															
Z1A-1-PW	Sonic Drilling	1	639405.86	1239975.42	5 to 9	3.5 to -0.5	X			X	X		X	X	
Z1A-4-PW	Sonic Drilling	1	639468.25	1240079.38	3 to 7	4.4 to -0.4	X			X	X		X	X	
Z1A-7-PW	Sonic Drilling	1	639548.94	1240193.44	5 to 9	2.75 to -1.25	X			X	X		X	X	
Z1A-10-PW	Sonic Drilling	1	639620.76	1240325.47	0.5 to 4.5	7.5 to 3.5	X			X	X		X	X	
Zone 1a Manual Sediment Samples															
Z1A-3-MS	Hand Tools	1	639445.58	1239955.55	0 to 2	1 to -1	X	X	X			X			
Z1A-6-MS	Hand Tools	1	639510.76	1240055.66	0 to 2	1 to -1	X	X	X			X			
Z1A-9-MS	Hand Tools	1	639584.29	1240178.11	0 to 2	1 to -1	X	X	X			X			
Z1A-12-MS	Hand Tools	1	639658.26	1240304.96	0 to 2	1 to -1	X	X	X			X			
Zone 1a Manual Porewater Samples															
Z1A-3-PW	Push Point	1	639445.58	1239955.55	0.5 to 1.5	0.5 to -0.5	X			X	X		X		
Z1A-6-PW	Push Point	1	639510.76	1240055.66	0.5 to 1.5	0.5 to -0.5	X			X	X		X		
Z1A-9-PW	Push Point	1	639584.29	1240178.11	0.5 to 1.5	0.5 to -0.5	X			X	X		X		
Z1A-12-PW	Push Point	1	639658.26	1240304.96	0.5 to 1.5	0.5 to -0.5	X			X	X		X		

Sample			Proposed Location[1]				List of Analyses								Objectives[6]
			Coordinates[2]												
Identification	Collection Method	Number of Samples for Analysis	Northing	Easting	Sample Depth Interval[3] (feet below sediment surface)	Sample Depth Interval[3] (Elevation in feet NAVD88)	Diesel- and Oil-Range Petroleum Hydrocarbons (NWTPH-Dx)	Diesel- and Oil-Range Petroleum Hydrocarbons (NWTPH-Dx with acid silica gel cleanup)	PAHs[4] and Pentachlorophenol (EPA 8270E)	PAHs[4] (EPA 8270E)	Pentachlorophenol (EPA 8041A)	TOC in Solids (SW 9060A)	TOC in Water (SW 9060A)	Porewater Extraction[5]	
Sediment Capping Zone 1b															
Zone 1b Manual Sediment Samples															Characterize intertidal sediment and porewater at the base of the planned amended sand cap outside the sediment excavation area (sediment cap Zone 1b) to support design of the amended sand cap.
Z1B-1-MS	Hand Tools	1	639339.39	1239744.56	0 to 2	5.75 to 3.75	X	X	X			X			
Z1B-2-MS	Hand Tools	1	639354.42	1239847.73	0 to 2	4.5 to 2.5	X	X	X			X			
Z1B-3-MS	Hand Tools	1	639696.96	1240404.05	0 to 2	6.5 to 4.5	X	X	X			X			
Z1B-4-MS	Hand Tools	1	639789.69	1240511.24	0 to 2	4.5 to 2.5	X	X	X			X			
Zone 1b Manual Porewater Samples															
Z1B-1-PW	Push Point	1	639339.39	1239744.56	0.5 to 1.5	5.25 to 4.25	X			X	X		X		
Z1B-2-PW	Push Point	1	639354.42	1239847.73	0.5 to 1.5	4 to 3	X			X	X		X		
Z1B-3-PW	Push Point	1	639696.96	1240404.05	0.5 to 1.5	6 to 5	X			X	X		X		
Z1B-4-PW	Push Point	1	639789.69	1240511.24	0.5 to 1.5	4 to 3	X			X	X		X		
Interim Action Cap Area															
Interim Action Manual Cap Material and Sediment Samples															Evaluate conditions within the existing organoclay cap placed during the 2013 interim action and estimate the usage rate to support design of the amended sand cap.
OCM-1-CAP	Hand Tools	2	639479.15	1240022.45	1 to 1.5	6 to 5.5						X			
OCM-1-MS	Hand Tools				1.5 to 2.5	5.5 to 4.5	X	X	X			X			
OCM-2-CAP	Hand Tools	2	639444.46	1240046.73	1 to 1.5	6 to 5.5						X			
OCM-2-MS	Hand Tools				1.5 to 2.5	5.5 to 4.5	X	X	X			X			

Notes:

[1] Approximate locations are shown on Figure 4.

[2] Coordinates are presented in North American Datum of 1983 (NAD83), Washington State Plane North.

[3] Depth is presented in feet (ft) below mudline (bml) and approximate elevation in feet North American Vertical Datum of 1988 (NAVD88). Depth and elevation are based on existing bathymetric elevations of proposed sample location.

[4] PAH analytes include 1-methylnaphthalene, 2-methylnaphthalene, acenaphthene, fluoranthene, naphthalene, phenanthrene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene and indeno(1,2,3-cd)pyrene).

[5] The actual sediment sample intervals for porewater extraction will be determined in the field based on observed depth of NAPL-impacted sediment and volume of sediment needed to obtain sufficient porewater to perform analyses.

[6] See Work Plan for further detail of sampling and analysis data objectives.

A = Archive at laboratory

ASTM = ASTM International

EPA = U.S. Environmental Protection Agency

cPAH = carcinogenic Polycyclic Aromatic Hydrocarbons

PAH = Polycyclic Aromatic Hydrocarbons

TPH = Total Petroleum Hydrocarbons

TOC = Total Organic Carbon

FIGURES

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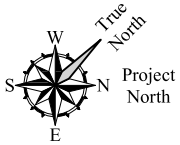

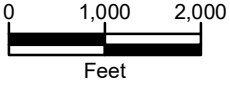

Reference: Whatcom County GIS, City of Bellingham GIS, Aerial from Esri, 2017.

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3. It is unlawful to copy or reproduce all or any part thereof, whether for personal use or resale, without permission.

Projection: NAD 1983 UTM Zone 10N

Vicinity Map

R.G. Haley Site
Bellingham, Washington

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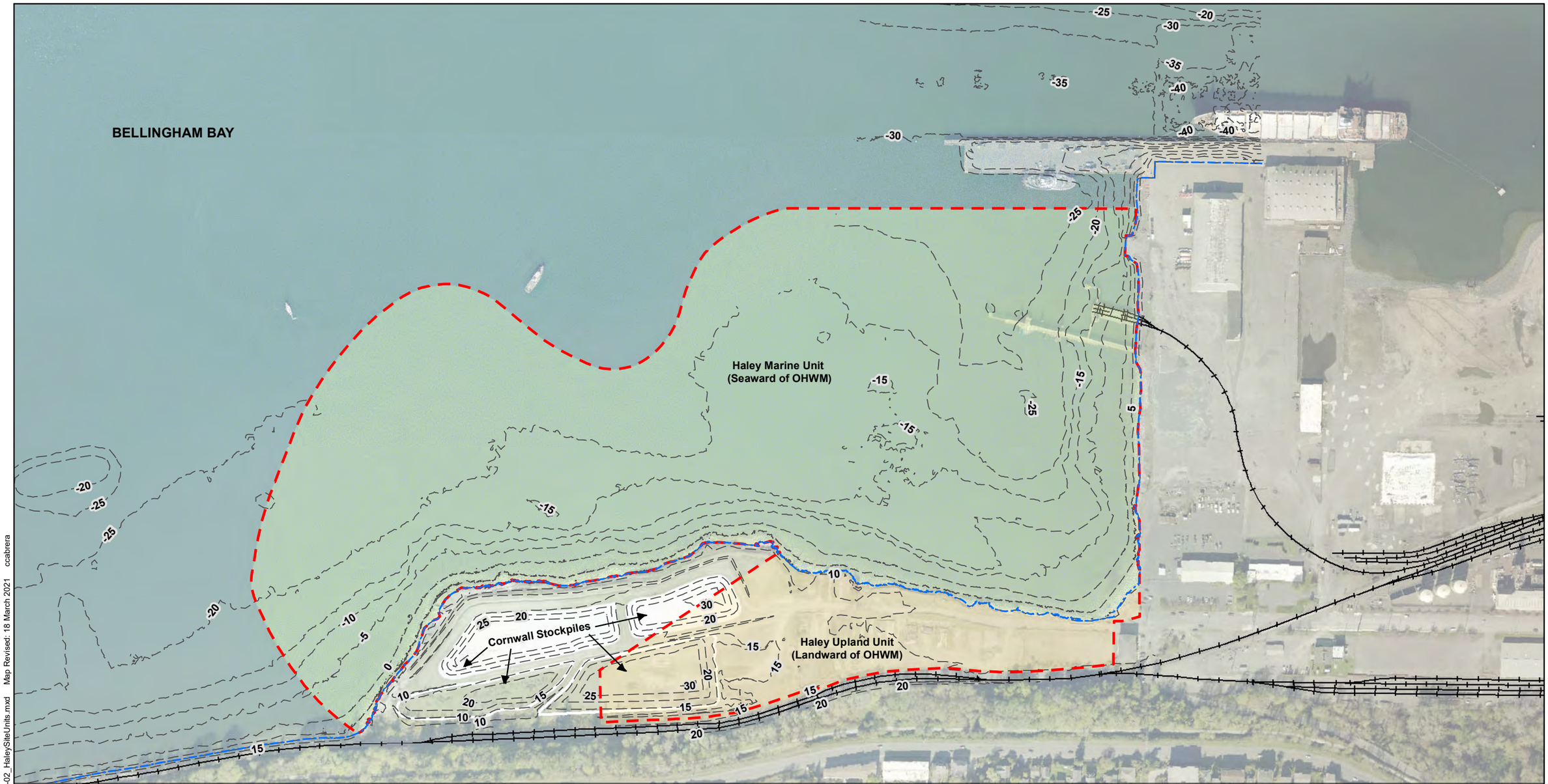
Figure 1

Path: P:\0\00356114\GIS\MXDs\2018_EDRFigures\Fig_1-01_VicinityMap.mxd Map Revised: 11 July 2019 glohrmeyer



W True North S N E Project North

0 150 300 Feet

Haley Cleanup Area Boundary
OHWM
BNSF Railroad
Elevation Contour (5ft-Interval)
Haley Marine Unit
Haley Upland Unit

Data Source: Aerial from City of Bellingham, 2016.
NAVD88 vertical datum.
Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet
Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3. Base survey by Wilson Engineering & Surveying 10/28/15, updated along north shoreline 5/8/2019
4. 2016 Hilton Avenue Stockpile topography provided from April 30, 2018 Cornwall Site EDR

Haley Site Units

R.G. Haley Site
Bellingham, Washington

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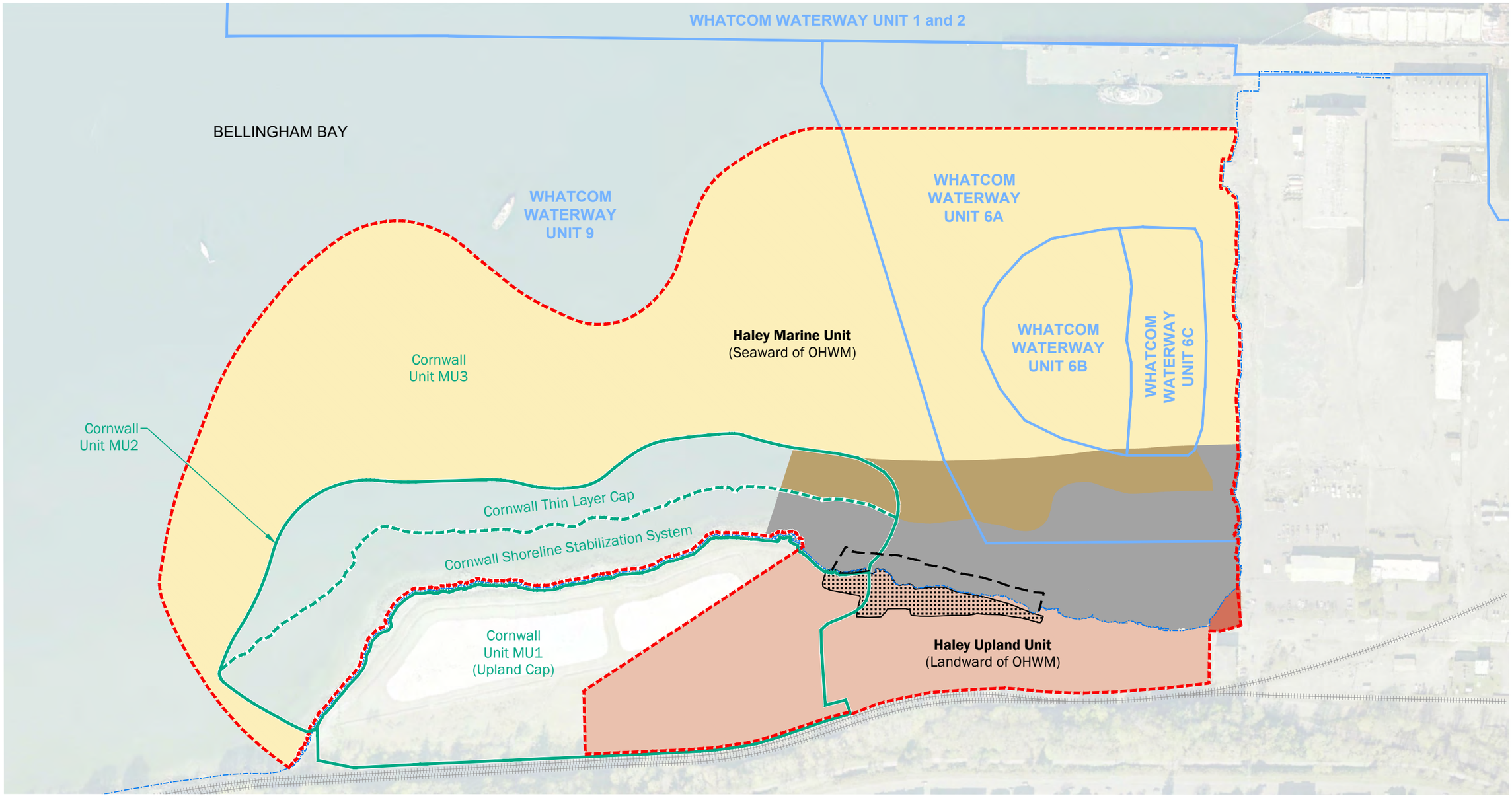
Figure 2

Path: P:\0\0356114\GIS\MXDs\2018_EDRFigures\Fig_1-02_HaleySiteUnits.mxd Map Revised: 18 March 2021 ccabrera



Legend

- Haley Cleanup Area Boundary
- OHWM
- Low-Permeability Upland Cap
- Upland Pavement Cap
- Organoclay and Activated Carbon Amended Sand Caps
- Gravelly Sand Thin Layer Sediment Cap
- Monitored Natural Recovery
- Approximate ISS Area
- Extent of Sediment Removal

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Aerial Photo from City of Bellingham, 2016.

Projection: WA State Plane, N Zone, NAD83, US Foot
Vertical Datum: NAVD88

W, True North, S, N, Project North, E

250 0 250
Feet

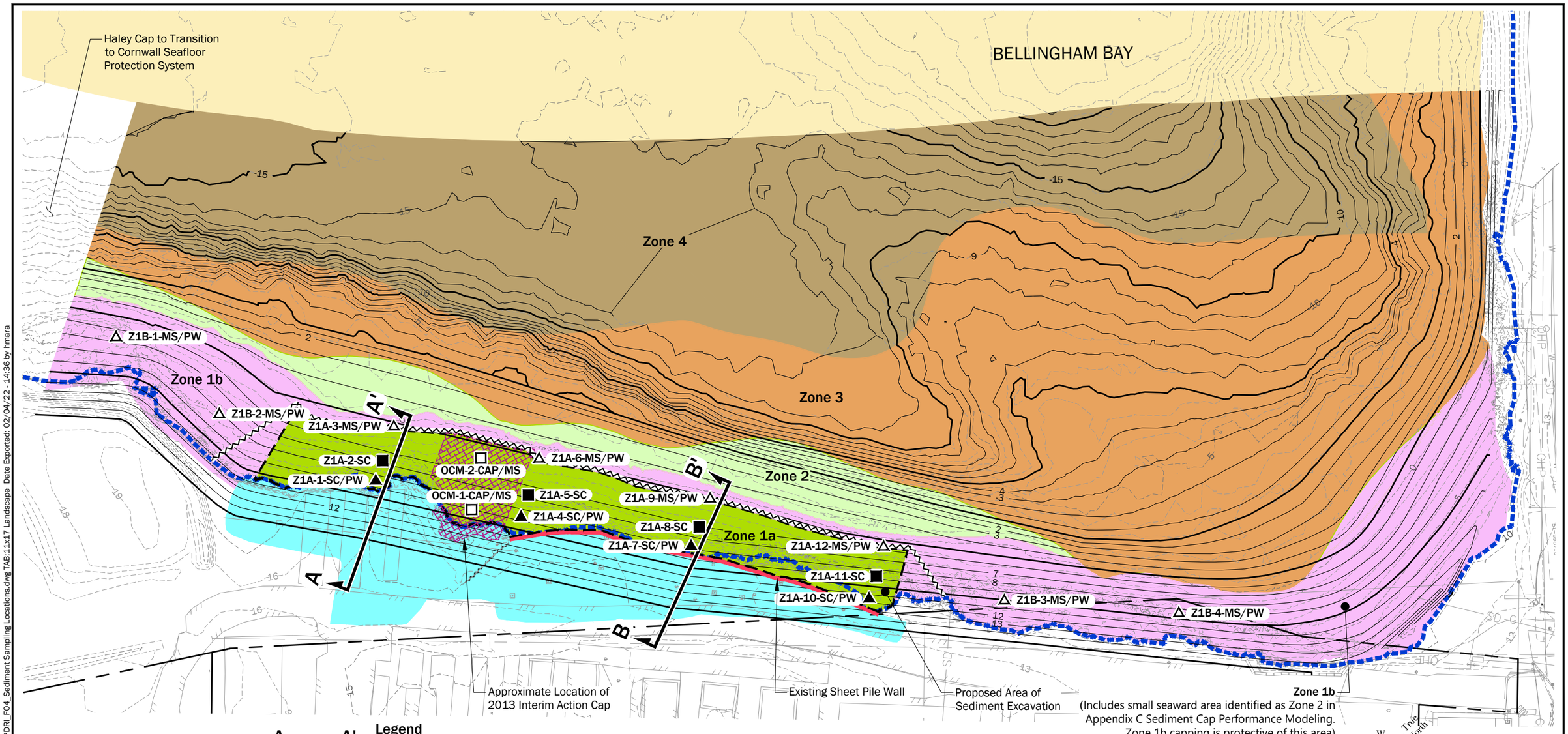
Cleanup Action Components

R.G. Haley Site
Bellingham, Washington

GeoEngineers

Figure 3

P:\0\0356114\CAD\08\Task 600_04 PDRI Addendum\035611408_PDRI_F03_Cleanup Action Components.dwg TAB:11x17 Landscape Date Exported: 12/01/21 - 13:31 by tmichaud



Legend

- A — A' Typical Cross-Section
- Haley Marine Unit Boundary (OHWM)
- Extent of Sediment Removal
- 10 Proposed Top of Cap Chemical Containment Layer Elevation Contour in Feet (NAVD88)
- Approximate Location of Temporary Cofferdam during Sediment Excavation
- Existing Sheet Pile Wall
- Approximate Location of 2013 Interim Action Cap
- ▲ Proposed Location for Sediment and Porewater Sampling by Sonic Drilling Methods
- ■ Proposed Location for Sediment Sampling by Sonic Drilling Methods
- △ Proposed Location for Sediment and Porewater Sampling by Manual Collection Methods
- □ Proposed Location for Organoclay/Sediment Sampling by Manual Collection Methods

Sediment Cap Zones

- Zone 1a - High-Content Organoclay Amended Sand Cap
- Zone 1b - Organoclay and Activated Carbon Amended Sand Cap
- Zone 2 - Organoclay Amended Sand Cap
- Zone 3 - Activated Carbon Amended Sand Cap
- Zone 4 - Combined Gravelly Sand Thin-Layer Containment Cap and Seafloor Erosion Protection
- Monitored Natural Recovery
- Approximate Maximum Potential Extent of Upland ISS

Notes:

1. Generalized contours shown for discussion purposes; they will be refined including in transition to bank and railroad areas.
2. The locations of all features shown are approximate.
3. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Base survey by Wilson Engineering & Surveying 10/28/15.

Projection: WA State Plane, N Zone, NAD83, US Foot
Vertical Datum: NAVD88

W True North S N Project North E

80 0 80
Feet

Proposed Sediment and Porewater Sampling Locations

R.G. Haley Site
Bellingham, Washington

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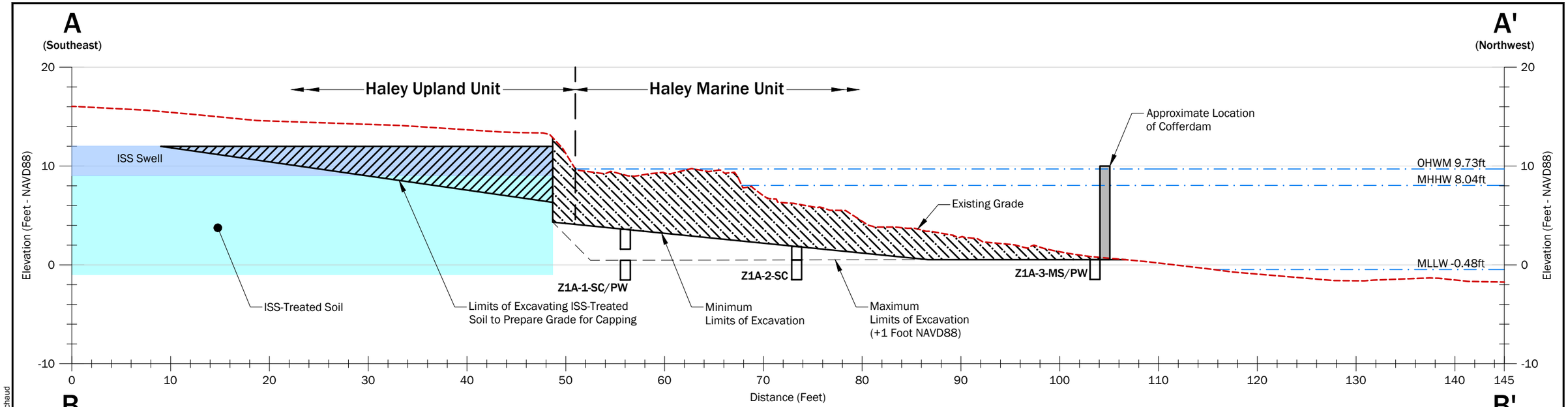
Figure 4

P:\0\0356114\CAD\08\Task 600_04 PDRI Addendum\035611408_PDRI_F04_Sediment Sampling Locations.dwg TAB:11x17 Landscape Date Exported: 02/04/22 - 14:36 by hmara



Legend

- Z1A-1-SC/PW — Proposed Sample Interval (2-ft Sample Interval)
- Existing Grade
- Debris Removal and Contaminated Sediment Excavation
- Potential Additional NAPL Excavation
- Excavation of ISS-Treated Soil
- Extent of ISS-Treated Soil, to be Completed Prior to Grading
- Estimated ISS-Swell

10 0 10
Horizontal Scale in Feet

10 0 10
Vertical Scale in Feet
Vertical Exaggeration: 1X

Typical Cross-Sections

R.G. Haley Site
Bellingham, Washington

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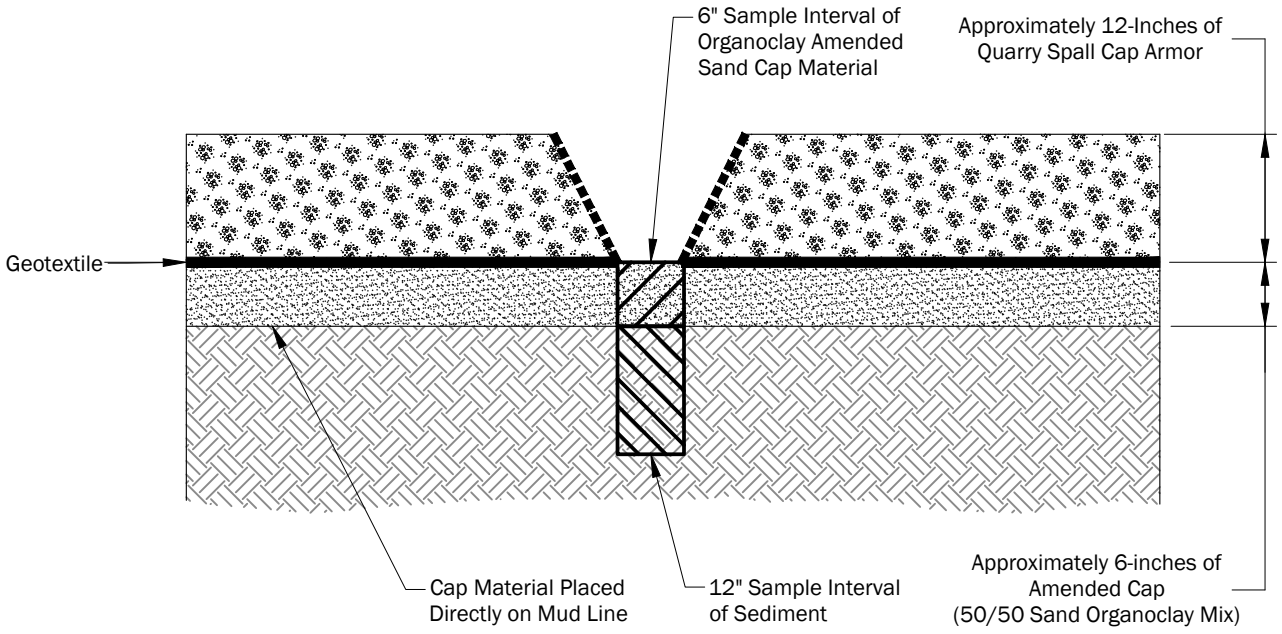
Figure 5



Legend

Proposed Sample Interval

Approximate Manual Excavation Slope

Interim Action Cap Detail and Proposed Sample Intervals

R.G. Haley Site
Bellingham, Washington

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Figure 6

APPENDICES

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APPENDIX A
Sampling and Analysis Plan

Sediment Sampling and Analysis Plan

R.G. Haley International Site
Bellingham, Washington

for
City of Bellingham

March 18, 2022

GeoEngineers
Earth Science + Technology

Sediment Sampling and Analysis Plan

R.G. Haley International Site
Bellingham, Washington

File No. 0356-114-08

March 18, 2022

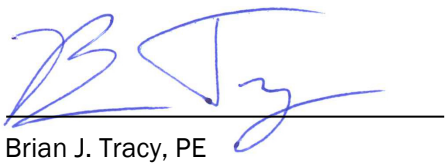
Prepared for:

City of Bellingham
210 Lottie Street
Bellingham, Washington 98225

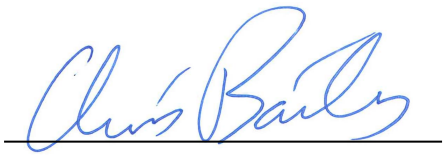
Attention: Craig Mueller and Amy Kraham

Prepared by:

GeoEngineers, Inc.
2101 4th Avenue, Suite 950
Seattle, Washington 98121
206.728.2674



Brian J. Tracy, PE
Senior Project Manager



Chris Bailey
Senior Engineer, PE

Iain H. Wingard
Principal

BJT:CB:IHW:ch

Table of Contents

APPENDIX A
SEDIMENT SAMPLING AND ANALYSIS PLAN

1.0 INTRODUCTION

This sampling and analysis plan (SAP) describes field procedures for the additional characterization of sediment and porewater that will be conducted at the R.G. Haley International Corp Site (Haley Site or Site). The purpose and objectives of the additional investigation are discussed in the Pre-Remedial Design Investigation (PRDI) Project Plans – Marine Unit. The purpose of this SAP is to describe field activities, sampling locations and sampling procedures that will be used during the investigation.

This SAP will be used in conjunction with the PRDI Project Plan, Quality Assurance Project Plan (QAPP) (Appendix B), Health and Safety Plan (HASP) (Appendix C) and Inadvertent Discovery Plan (IDP) (Appendix D). The QAPP identifies quality assurance/quality control (QA/QC) procedures that will be implemented during sampling activities and laboratory analyses. The HASP identifies site hazards and safety protocols to be followed during investigation activities. The IDP identifies the procedures to be followed if cultural resources are encountered during investigation activities.

Site conditions may make it necessary to modify the procedures described in this SAP. Any significant variations or modifications that become necessary during the field investigation will be communicated to and discussed with the City of Bellingham (City) and Washington State Department of Ecology (Ecology). Variations or modifications implemented during the investigation and the reason for the modification will be documented in field records.

2.0 SAMPLING OBJECTIVE AND GENERAL APPROACH

The objective of the investigation presented in this SAP is to further characterize sediment and porewater within the Marine Unit in the areas planned to be excavated and/or capped with amended sand as part of the cleanup action. Additional characterization is needed to support design of sediment excavation and/or capping to meet the requirements of the Marine Unit cleanup action. The investigation is being performed to characterize the following:

- Intertidal sediment and porewater at the base of the planned excavation in Zone 1a to confirm the depth of excavation to remove Non-Aqueous Phase Liquid (NAPL)-impacted sediment and provide input for design of the amended sand cap within the sediment excavation area.
- Intertidal sediment and porewater at the base of the planned amended cap in Zone 1b to provide information to support design of the amended sand cap.
- Conditions within the existing organoclay cap placed during the 2013 interim action and estimate the organoclay usage rate within the existing cap to inform the design of the amended sand caps to be placed in Zones 1a and 1b.

Contaminants identified in Site sediment during previous investigations that are to be further characterized using the procedures specified in this SAP include:

- Diesel- and heavy oil-range petroleum hydrocarbons,
- Polycyclic aromatic hydrocarbons (PAHs)[1]; and
- Pentachlorophenol.

The following sections describe personnel roles, sample collection methods and sample handling requirements for this investigation. Details on sample handling, processing and analyses are presented in the QAPP (Appendix C) including data quality objectives, recommended sample preparation, chemical analytical methods, sediment sample volumes and containers for conventional and chemical analyses, and storage temperatures and holding times.

3.0 PERSONNEL AND RESPONSIBILITIES

The following GeoEngineers personnel will have key roles and responsibilities for sediment and porewater sampling and analysis activities:

Project Management: Iain Wingard will be the project manager responsible for the overall quality assurance for sampling and analysis on this project to ensure that it meets the technical requirements.

Task Management: Brian Tracy will be the task manager for sampling and analysis tasks and will have responsibility for implementation of the sediment and porewater sampling and analysis program and data evaluation.

Field Coordinator: The Field Coordinator will be a GeoEngineers geologist, environmental scientist or engineer who will be responsible for performing sediment and porewater sample collection in accordance with the methods and procedures described in this SAP. Duties will include coordination of field sampling efforts and sample delivery to the laboratory. Responsibilities will also include complying with the site-specific HASP.

Quality Assurance Leader: Denell Warren will be the GeoEngineers QA Leader. The QA Leader is responsible for coordinating with the laboratory regarding all issues related to sample analyses and supporting the evaluation and reporting of all results to the project team. Specific responsibilities include:

- Serves as GeoEngineers' official contact for laboratory data QA concerns.
- Reviews and approves the laboratory QA Plan for laboratories subcontracted to GeoEngineers.
- Responds to laboratory data QA needs, answers laboratory requests for guidance and assistance, and helps resolve analytical issues or other related concerns.
- Monitors laboratory compliance with data quality requirements.

[1] PAHs identified as indicator hazardous substances (IHS) for the Site will be analyzed including 1-methylnaphthalene, 2-methylnaphthalene, acenaphthene, fluoranthene, naphthalene, phenanthrene, and carcinogenic PAHs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene and indeno(1,2,3-cd)pyrene).

- Ensures that appropriate testing and analytical procedures are followed and that proper QC checks are implemented.
- Reviews the overall quality of the analytical data generated.
- Maintains the authority to implement corrective actions as necessary.
- Ensures proper implementation of the QAPP.
- Provides oversight of the subcontracting laboratories.
- Conducts laboratory audits, as necessary, and data validation activities.
- Ensures that the electric data deliverable (EDD) from the laboratory is properly prepared and accurate.
- Processes the data and loads it into GeoEngineers internal data management system.
- Prepares the data for submittal to Ecology's Environmental Information Management (EIM) system.

Analytical Laboratory Manager (Subcontractor): The Laboratory Manager administers the Laboratory QA Plan and is responsible for QC. Specific responsibilities of the Laboratory Manager include:

- Ensures implementation of the Laboratory QA Plan.
- Serves as the laboratory point of contact.
- Activates corrective action as necessary.
- Issues the final laboratory QA/QC report.
- Administers QA sample analysis, where required.
- Complies with the requirements established in the project plans as related to laboratory services.
- Participates in QA audits and compliance inspections.

The laboratory's QA Manager will be determined once the Ecology-accredited laboratory to be used is confirmed.

4.0 SAMPLE COLLECTION AND HANDLING

4.1. Positioning

Sample location positions will be documented to the North American Datum of 1983 (NAD 83) in the field using a hand-held differential global positioning system (DGPS). Location control accuracy is to be within +/- 1 meter of the planned sampling locations. As necessary, rock and/or debris that is located at a sample location will be temporarily moved to complete sampling activities.

4.2. Sample Collection Methods

Prior to sample collection, all field staff and subcontractors assisting with field collection will read and become familiar with the sample collection field procedures in this SAP as well as the QAPP and IDP.

4.2.1. Sediment Core Collection Using Sonic Drilling Methods

Sediment cores will be completed using a track-mounted sonic drill rig during low tide conditions when the sample locations are exposed and in dry conditions. A crane will be mobilized and set up in the upland portion of the Site to lift and place the sonic rig to/from the intertidal area due to limited tidal windows for the drill rig to access the sample locations. Sediment cores will be advanced up to approximately 10-ft below mudline. Continuous sediment cores will be collected in 5-foot long increments. The sediment will be extruded from the core barrel for field screening and sampling. Upon completion of each sediment core the boring will be backfilled with bentonite. Sonic sediment coring will be completed by a licensed driller in the state of Washington. A representative from GeoEngineers' staff will be present to direct the drilling, examine and classify the sediment, and prepare a detailed log of each core.

The sediment core will be visually classified and documented in field boring logs and photos will be taken of the sampled material. The sample intervals will be collected from the core barrels recovered during sonic drilling. The sediment from each interval will be placed into a stainless-steel bowl for homogenization and sampling. After mixing, the sample will be placed in the appropriate containers for laboratory analysis as identified in the QAPP. The samples will be placed in coolers with ice for storage and throughout transport to testing laboratory.

If adequate sample volume cannot be obtained in a particular interval(s) at a core location, an adjacent core will be attempted within an approximate 10-foot radius of the original core to collect additional sample material.

4.2.2. Manual Sediment Sample Collection

Sediment from the surface to a depth of up to 2.5 feet will be collected manually at a total of 10 sample locations in Zones 1a and 1b and the interim action cap area. Sampling will be completed during low tide conditions when the sample locations are exposed and in dry conditions. Decontaminated shovels and hand trowels will be used to collect the sediment samples. Rock and/or other debris if present, will be temporarily removed from the sample location to complete the borings. If use of a hand tools is not feasible due to the presence of rocks at the proposed location, the sample location may be adjusted in the field. The sample location may be adjusted within an approximate 10-foot radius of the proposed location to complete the sampling. Samples will be collected from the sidewall(s) of the excavation to obtain sample material representative of the target sample interval.

Sample material will be visually classified and documented in field sample forms and photos will be taken of the sampled material. The sediment from the sample interval will be collected and placed into a stainless-steel bowl for homogenization and sampling. After mixing, the sample will be placed in the appropriate containers for laboratory analysis as identified in the QAPP. The samples will be placed in coolers with ice for storage and throughout transport to the testing laboratory.

After sediment sampling is complete, bentonite chips will be used to backfill the excavation and any rock that was moved to collect the sample we be placed on top of the bentonite.

4.2.3. Sediment Porewater Collection Using a PushPoint Probe

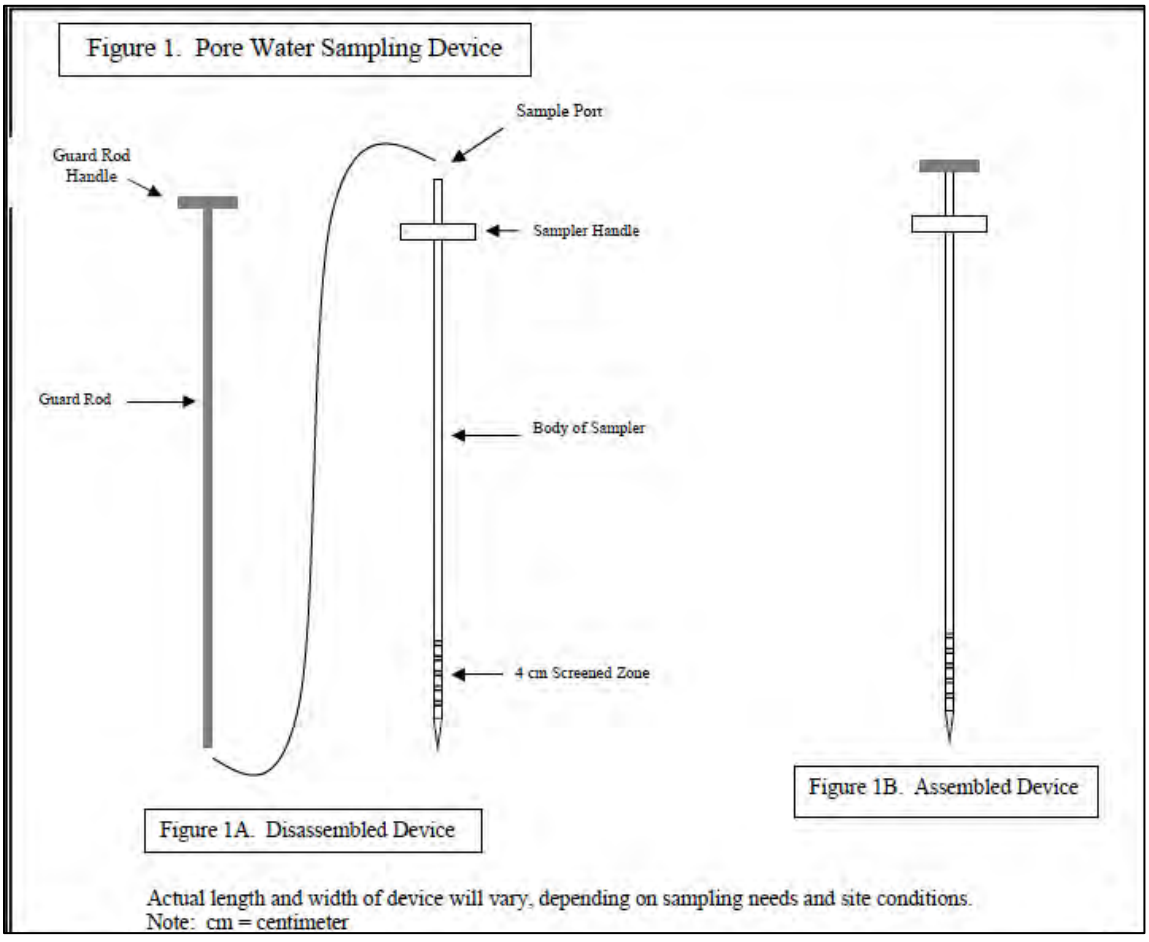
Sediment porewater samples will be collected manually from eight sample locations in Zones 1a and 1b. Porewater samples will be collected using a PushPoint™ mini piezometer sampling device manufactured

by MHE Products. The PushPoint mini piezometer sampling device consists of a pointed stainless-steel tube with a screened zone at one end and a sampling port at the other. The screened zone on the pointed end of the sampler is approximately 2 to 4 inches in length and consists of a series of very fine, machined slots to allow porewater to enter the sampler. A removable guard rod adds rigidity to the sampler during insertion into the sediment.

The sampling end of the porewater sampling device will be inserted into the sediment to the target depth of approximately 1 foot deep to collect porewater that represents the shallow subsurface interval between 0 to 2 feet deep. Porewater will be extracted from the PushPoint using a peristaltic pump.

The procedure for collecting porewater includes the following:

1. Insert guard-rod into the body of the PushPoint sampling devise (Figure 1) (EPA 2020).
2. Hold guard-rod and PushPoint sampler handles so that two handles are together and the guard-rod is fully inserted into the PushPoint sampler body during the insertion process.



3. Push the PushPoint mini piezometer into the sediment to the target depth (1 foot deep) using a gentle twisting motion.
4. When the target depth is reached (or refusal is encountered) remove the guard-rod from the PushPoint sampler body without disturbing the position of the deployed sampler. Once the guard-rod has been

removed from the PushPoint sampler, it should not be reinserted into the device unless the bore of the PushPoint has been thoroughly decontaminated.

5. Attach a peristaltic pump to the PushPoint sample-port using Teflon tubing. Withdraw porewater at a low-flow sampling rate (50-200 mL per minute). The first 20 to 50 mL of porewater will likely be turbid. This is the "development" water and should be discarded. If turbidity persists in the extracted porewater, the device may be re-positioned in the sediment to attempt to collect a sample with minimal suspended solids.
6. Once visually clear porewater is being withdrawn, representative samples can be collected into appropriate containers for laboratory analysis as identified in the QAPP.
7. The samples will be placed in coolers with ice for storage and throughout transport to the testing laboratory.

A total of approximately 1,750 mL of porewater is needed to collect the appropriate volume for these analyses. If sufficient porewater is not available from a sample location, an additional sample location or locations can be completed within 10 feet of the original location to collect sufficient water for analysis.

If additional porewater sample locations in the vicinity of the original location do not produce enough porewater for the desired sample analyses, the Project Manager will be notified and porewater from nearby sample locations may be combined to provide sufficient volume for analysis for the purposes of supporting cap design.

4.3. Field Procedures

This section provides general field procedures and standard practices that apply to sediment and porewater sample collection and analysis.

4.3.1. Field Logging

Information and observations from the sediment cores will be logged by the field personnel on core logs. Information on core logs will include the exploration location; drilling equipment; sample intervals/depths, sample recoveries, stratigraphy, and field screening results. For manual sediment sampling, sample collection information will be logged on sample collection forms by field personnel and will include the exploration location; sample intervals/depths, stratigraphy, and field screening results. Stratigraphy encountered will generally be described in accordance with ASTM D 2488 Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). In addition, identification of the Unified Soil Classification System (United State Geological Survey [USGS]) group symbol will be recorded on the sample collection forms and core logs.

Additional information will be recorded on the sample collection forms and core logs during sediment coring and sampling including the presence or absence of stratification, depth of apparent stratigraphic contacts, the type and occurrence of anthropogenic materials, and qualitative description of biota and debris. The visual absence or presence of wood debris in the sediment sample will also be recorded on the sample collection forms and core logs. If wood debris is present, the type or types of wood debris (e.g., saw dust, bark, processed lumber, chips, chunks, twigs, fibers, etc.), the estimated quantity (i.e., observed percent by volume) of each type of wood debris, and the depth interval where the wood is observed will be recorded on the sample collection forms and core logs.

A photograph will be taken of the sediment samples. Included in the camera's field of view will be a sheet of paper or whiteboard with the sample name written in large print. Care will be taken not to touch the sediment with the paper/whiteboard or with hands contaminated with whiteboard ink.

4.3.2. Field Screening

Sediment samples will be field-screened for evidence of possible contamination. Field screening results will be recorded on the sample collection forms and core logs. The following field screening methods will be used: (1) visual/olfactory screening and (2) water sheen screening.

4.3.2.1. VISUAL/OLFACTORY SCREENING

The sediment will be observed for unusual colors, staining or odor that may be indicative of contamination.

4.3.2.2. WATER SHEEN SCREENING

This is a qualitative field screening method that can help identify the presence or absence of petroleum hydrocarbons. A portion of the sediment sample will be placed in a pan containing distilled water. The water surface will be observed for signs of sheen. The following sheen classifications will be used:

- No sheen (NS) – No visible sheen on the water surface
- Slight sheen (SS) – Light, colorless, dull sheen; spread is irregular, slow; sheen dissipates rapidly
- Moderate sheen (MS) – Light to heavy sheen; may have some color/iridescence; spread is irregular to flowing, may be rapid; few remaining areas of no sheen on the water surface
- Heavy sheen (HS) – Heavy sheen with color/iridescence; spread is rapid; entire water surface may be covered with sheen

4.4. Equipment Decontamination

To prevent cross-contamination during sample collection, reusable sampling equipment will be decontaminated prior to collecting each sample using the following procedures. Deviations from these procedures, if any, will be documented in field notes.

4.4.1. Drilling Equipment

For large pieces of drilling equipment (such as augers, drill rods, drill bits, and those portions of the drill rig that may be positioned directly over a boring location) the equipment will be pressure-washed and, if necessary, scrubbed to remove visible dirt, grime, grease, oil, loose paint, rust flakes, etc. The equipment will then be rinsed with potable water.

Sampling devices will be cleaned using an aqueous Alconox® or Liqui-Nox® solution and a distilled water rinse before each sample is collected.

4.4.2. Reusable Sampling Equipment

When possible, disposable sampling equipment will be used to minimize the need for decontaminating equipment. Prior to and between sample collection, reusable sampling equipment that contacts porewater or sediment will be decontaminated. Reusable sampling equipment may include: core barrels; sediment porewater PushPoint probe; porewater sampling pumps, trowels, spoons, and other hand tools; mixing bowls and spoons; or sampling devices.

For sediment sampling equipment, excess sediment will first be removed from the equipment. The equipment will then be washed using an aqueous Alconox® or Liqui-Nox® detergent solution and a brush. Detergent will be used to clean surfaces of sampling tools that directly contact samples (e.g., PushPoint probe, hand tools). Decontaminated equipment will be temporarily staged on clean plastic sheeting, wrapped or covered with aluminum foil, and/or stored in a clean, dry place.

4.4.3. Sample Containers

Pre-cleaned sample bottles and jars will be supplied by the subcontracted analytical laboratory. The sample containers will be protected from contact with dust, dirt, and other potential sources of cross-contamination. Sample containers will not be reused.

4.4.4. Used Decontamination Water

Used decontamination water will be stored on-property in labeled 55-gallon drums for subsequent characterization and off-property disposal at a permitted facility.

4.5. Sample Containers and Labeling

Sediment and porewater samples obtained during this study will be placed in appropriate laboratory-prepared containers. Sample container type and size along with any use of preservatives are listed in the QAPP.

Sample containers will be labeled with the following information at the time of collection:

- Project name and/or number;
- Sample ID;
- Analysis being requested; and
- Date and time of collection.

The sample naming convention will be the following:

Manual Sediment Sample

Z1A-##-MS-D1-D2, where Z1A indicates the zone, either Zone 1a or 1b, ## indicates the sample location number, “MS” indicates manually collected sediment sample, and “D1-D2” is the sample depth interval in feet (e.g., 0-2). For example, sample number Z1A-3-MS-0-2 is a sample collected from Zone 1a, sample location 3 and a manually collected sample from the surface to 2 feet deep.

Subsurface Sediment Sample

Z1A-##-SC-D1-D2, where Z1A indicates the zone, either Zone 1a or 1b, ## indicates the sample location number, “SC” indicates sediment core, and “D1-D2” is the sample depth interval in feet (e.g., 6-8). For example, sample number Z1A-1-SC-6-8 is a sample collected from Zone 1a, sample location 1; and sediment core sample interval from 6 to 8 feet deep.

The Field Coordinator will document the sample numbers and monitor consistency of the sample numbers with the SAP and between the sample container labels, sample collection forms, core logs and the chain-of-custody.

4.6. Sample Storage and Shipping

Samples will be placed in a cooler with wet ice or "blue ice" immediately after they are collected. Excess space will be filled with non-compressible material. The original chain-of-custody record will be signed by a member of the field team. Chain-of-custody forms will be placed inside a large sealable bag and placed inside the cooler and field personnel will retain a copy. The chain-of-custody forms will accompany the samples during transport to the laboratory.

Transport and delivery may be performed by one of the following methods:

- Field personnel may transport and deliver samples that are being submitted to a local laboratory for analysis.
- Field personnel may transfer the samples to a courier service. Custody seals will be attached to coolers transferred to the laboratory using a courier service.
- Field personnel may have the samples shipped to the laboratory via a commercial express mailing service. Custody seals will be attached to coolers transferred to the laboratory using an express mailing service.

Upon transfer of sample possession, the chain-of-custody will be signed by the person relinquishing the samples (field personnel) and by the party receiving the samples (laboratory personnel).

Holding times will be observed during sample handling and storage. Holding times for the project analyses are summarized in the QAPP.

4.7. Field Instrumentation

Proper calibration of equipment and instrumentation facilitates accurate and reliable field measurements. Field and laboratory equipment used on the project will be calibrated and adjusted in general accordance with the manufacturer's recommendations. Methods and intervals of calibration and maintenance will be based on the type of equipment, stability characteristics, required accuracy, intended use, and environmental conditions.

4.8. Field Measurement Evaluation

Field data will be reviewed at the end of each day by following the quality control checks outlined below and procedures in the QAPP. Field data documentation will be checked against the applicable criteria as follows:

- Correct sample collection information.
- Correct field instrumentation and calibration.
- Correct sample collection protocol.
- Correct sample containers, preservation, and volume.

- Field QC samples collected at the frequency specified.
- Sample documentation and chain-of-custody protocols performed correctly and completely.
- Location (GPS) data are transferred to database and/or are recorded on sample collection forms and core logs.

4.9. Disposal of Investigation-Derived Waste

Investigation-Derived Waste (IDW) will be placed in labeled storage containers and stored on Site in a designated containment area, which will be enclosed by fencing. Each waste container will be labeled, secured, stored, and disposed according to applicable local, State, and Federal regulations.

Sediment cuttings from drilling activities will be placed in 55-gallon drums marked with the contents, date and contact information. Decontamination water will be placed in (separate) drums that will be labeled, secured and properly stored on-site in the designated waste storage area.

Disposable sampling material and personal protective equipment (e.g. gloves, paper towels, etc.) used in sample processing will be considered incidental waste. These materials will be placed in plastic garbage bags or other appropriate containers. At the completion of the field investigation, incidental waste will be removed from the staging area and disposed of as municipal waste at a local trash receptacle or city or county disposal facility.

4.10. Sample Analyses

Sample analyses are presented in Table 1 of the Project Plan. Target reporting limit and detection limit goals are included in the QAPP (Appendix B).

5.0 HEALTH AND SAFETY

GeoEngineers field staff will follow the site-specific health and safety procedures presented in the HASP (Appendix C). GeoEngineers field staff will conduct a safety meeting each morning before beginning daily field activities. The field staff have “stop work” authority for any activity deemed to be unsafe or not in accordance with the HASP.

6.0 REFERENCES

United States Environmental Protection Agency (EPA) 2020. “Porewater Sampling, Operating Procedure.” Region 4. LSASDPROC-513-R4. Effective Date May 13, 2020.

APPENDIX B
Quality Assurance Project Plan

Quality Assurance Project Plan

R.G. Haley International Site
Bellingham, Washington

for
City of Bellingham

March 18, 2022

GeoEngineers
Earth Science + Technology

Quality Assurance Project Plan

R.G. Haley International Site
Bellingham, Washington

File No. 0356-114-08

March 18, 2022

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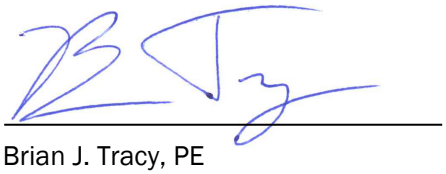

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Table of Contents

LIST OF TABLES

1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) has been prepared for the R.G. Haley International Corp Site (Haley Site or Site) for the Pre-Remedial Design Investigation (PRDI) Project Plans – Marine Unit for additional characterization to support design of the remedial action to be completed in the Marine Unit. This QAPP presents the objectives, procedures, organization, and specific quality assurance/quality control (QA/QC) activities designed to achieve the data quality objectives (DQOs) established for the project.

This QAPP was prepared following the United States Environmental Protection Agency (EPA) Requirements for Quality Assurance Project Plans (EPA 2001), Guidance for Quality Assurance Project Plans (EPA 2002) and Ecology's Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies (Ecology 2016). This QAPP has also been prepared in general accordance with requirements of the Washington State Model Toxics Control Act (MTCA) Cleanup Regulation (Chapter 173-340 WAC) and Sediment Management Standards (SMS) (Chapter 173-204 WAC).

Throughout the project, environmental measurements will be conducted to produce data that are scientifically valid, of known and acceptable quality, and meet established objectives. QA/QC procedures will be implemented so that the precision, accuracy, representativeness, completeness, and comparability (PARCC) of the data generated meet the specified DQOs to the maximum extent possible.

2.0 DATA QUALITY OBJECTIVES

The overall DQO for the project is to collect environmental sampling data of known, acceptable, and documentable quality. The specific objectives established for the project are the following:

- Implement the procedures outlined herein for field sampling, sample custody, equipment operation and calibration, laboratory analysis, and data reporting to ensure consistency and thoroughness of data generated.
- Achieve the level of QA/QC required to produce scientifically valid analytical data of known and documented quality. This will be accomplished by establishing criteria for data precision, accuracy, representativeness, completeness, and comparability, and by evaluating project data against these criteria.

The sampling design, field procedures, laboratory procedures, and QC procedures established for the project were developed to provide defensible data. Specific data quality factors that may affect data usability include quantitative factors (precision, bias, accuracy, completeness, and reporting limits) and qualitative factors such as representativeness and comparability. The specific DQOs associated with these data quality factors are discussed below. Method-specific DQOs for chemical laboratory analyses are presented in Tables B-1 and B-2.

2.1. Analytes and Matrices of Concern

Samples of sediment and sediment porewater will be collected during field activities. The chemical analyses to be performed on sediment for this project include the following:

- Diesel- and heavy oil-range total petroleum hydrocarbons by NWTPH-Dx with and without using silica gel cleanup.
- Polycyclic aromatic hydrocarbons (PAHs)[1] by United States Environmental Protection Agency (EPA) 8270.
- Pentachlorophenol by EPA 8270.
- Total organic carbon by EPA 9060A.

The chemical analyses to be performed on porewater for this project include the following:

- Diesel- and heavy oil-range total petroleum hydrocarbons by NWTPH-Dx.
- PAHs by EPA 8270.
- Pentachlorophenol by EPA 8041A.
- Total organic carbon by EPA 9060A.

2.2. Analytical Detection Limits

Analytical methods have quantitative limitations at a given statistical level of confidence that are often expressed as the method detection limit (MDL). Although results reported near the MDL provide insight to Site conditions, quality assurance dictates that analytical methods achieve a consistently reliable level of detection known as the practical quantitation limit (PQL), which is typically demonstrated with the lowest point of a linear calibration. The contract laboratory will provide numerical results for all analytes and report them as detected above the PQL or undetected at the PQL.

Laboratory PQLs for Indicator hazardous substances (IHSs) at the Site are presented in Tables B-1 and B-2 for sediment and porewater, respectively, and are considered target reporting limits (TRLs) because several factors may influence final reporting limits. First, moisture and other physical conditions affect detection limits. Second, analytical procedures may require sample dilutions or other practices to accurately quantify a particular analyte at concentrations above the range of the instrument. The effect is that other analytes could be reported as undetected but at a value higher than a specified TRL. Data users must be aware that high non-detect values, although correctly reported, can bias statistical summaries and careful interpretation is required to correctly characterize Site conditions.

2.3. Precision

Precision is the measure of mutual agreement among replicate or duplicate measurements of an analyte from the same sample and applies to field duplicate or split samples, replicate analyses, and duplicate spiked environmental samples (matrix spike duplicates). The closer the measured values are to each

[1] PAHs including 1-methylnaphthalene, 2-methylnaphthalene, acenaphthene, fluoranthene, naphthalene, phenanthrene, (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene and indeno(1,2,3-cd)pyrene).

other, the more precise the measurement process. Precision error may affect data usefulness. Good precision is indicative of relative consistency and comparability between different samples. Precision will be expressed as the relative percent difference (RPD) for spike sample and field duplicate comparisons of various matrices. The RPD is calculated as:

$$RPD\,(\%) = \frac{|D_1 - D_2|}{(D_1 + D_2)/2} \; X \; 100,$$

Where:

D_1 = Concentration of analyte in primary sample.

D_2 = Concentration of analyte in duplicate sample.

The RPD will be calculated for samples and compared to the project RPD QC limits. Project RPD QC limits are listed in Tables B-3 and B-4. The RPD QC limits listed in Tables B-3 and B-4 are only applicable if the primary and duplicate sample concentrations are greater than five times the PQL. For results less than five times the PQL, the difference between the primary and duplicate samples should be less than two times the PQL for sediment samples and one times the PQL for water samples.

2.4. Accuracy

Accuracy is a measure of bias in the analytical process. The closer the measurement value is to the true value, the greater the accuracy. Accuracy is typically evaluated by adding a known spike concentration of a target or surrogate compound to a sample prior to analysis. The detected concentration or percent recovery (%R) of the spiked compound reported in the sample provides a quantitative measure of analytical accuracy. Since most environmental data collected represent single points spatially and temporally rather than an average of values, accuracy is generally more important than precision in assessing the data. In general, if %R values are low, non-detect results may be reported for compounds of interest when in fact these compounds are present (i.e., false negative results), and results for detected compounds may be biased low. The reverse is true when %R values are high. In this case, non-detect values are considered accurate, whereas detected values may be higher than true values.

For this project, accuracy will be expressed as the %R of a known surrogate spike, matrix spike, or laboratory control sample (blank spike), concentration:

$$Recovery\,(\%R) = \frac{Spiked\ Result - Unspiked\ Result}{Known\ Spike\ Concentration} \; X \; 100$$

Accuracy (%R) criteria for surrogate spikes, matrix spikes, and laboratory control samples (blank spikes) are presented in Tables B-3 and B-4 .

2.5. Representativeness, Completeness, and Comparability

Representativeness expresses the degree to which data accurately and precisely represent the actual site conditions. Representativeness of the data will be evaluated by:

- Comparing actual sampling procedures to those specified in this QAPP.
- Reviewing analytical results for field duplicates to determine the variability in the analytical results.

- Invalidating non-representative data or identifying data to be classified as questionable or qualitative in nature. Only representative data will be used in subsequent data reduction, validation, and reporting activities.

Completeness establishes whether a sufficient amount of valid measurements were obtained to meet project objectives. The number of samples and results expected establishes the comparative basis for completeness. The completeness goal is 90 percent useable data for the samples/analyses planned. If the completeness goal is not achieved, an evaluation will be performed to determine if the data are adequate to meet study objectives.

Comparability expresses the confidence with which one set of data can be compared to another. Although numeric goals do not exist for comparability, a statement on comparability will be prepared to assess overall usefulness of data sets generated during the project, following the evaluation of precision and accuracy.

2.6. Holding Times

Holding times are defined as the time between sample collection and extraction, sample collection and analysis, or sample extraction and analysis. Some analytical methods specify a recommended holding time for analysis only. For many methods, recommended holding times may be extended by sample preservation techniques in the field. If a sample exceeds a recommended holding time, then the results may be biased low. For example, if the extraction holding time for volatile analysis of soil samples is exceeded, then the possibility exists that some of the organic constituents may have volatilized from the sample or degraded. Results for that analysis would be qualified as estimated to indicate that the reported results may be lower than actual site conditions. Recommended holding times are presented in Table B-5.

2.7. QC Blank Samples

According to the *National Functional Guidelines for Organic Data Review* (EPA 2008), "The purpose of laboratory or field blank analysis is to assess the existence and magnitude of contamination resulting from laboratory or field activities. The criteria for evaluation of blanks apply to any blank associated with the samples (e.g., method blanks, instrument blanks, trip blanks, and equipment blanks)." Trip blanks are placed with samples during shipment; method blanks are created during sample preparation and follow samples throughout the analysis process.

QC blanks are discussed further in Section 6.0. Analytical results for QC blanks will be interpreted in general accordance with EPA's *National Functional Guidelines for Organic and Inorganic Data Review* and professional judgment.

3.0 SAMPLE COLLECTION, HANDLING, AND CUSTODY

The sampling and analysis plan (SAP) (Appendix A) discusses sample collection, handling, and custody procedures. Topics addressed in the SAP include, but are not limited to, sampling equipment to be used; equipment decontamination procedures; field screening procedures; sample labeling; sample storage; sample delivery to the analytical laboratory; chain-of-custody procedures; and field documentation.

4.0 CALIBRATION PROCEDURES

4.1. Field Instrumentation

Field instrument calibration and calibration checks facilitate accurate and reliable field measurements. The calibration of the instruments will be checked and adjusted as necessary in general accordance with manufacturers' recommendations. Methods and frequency of calibration checks and instrument maintenance will be based on the type of instrument, stability characteristics, required accuracy, intended use, and environmental conditions. The basic calibration check frequencies are described below.

If a photoionization detector (PID) is used for headspace vapor screening or air quality monitoring, its calibration will be checked at the start of each day it is used. If necessary (based on the calibration check results), the instrument will be calibrated in general accordance with the manufacturer's specifications. Calibration check and calibration results will be recorded in the field report.

4.2. Laboratory Instrumentation

For chemical analytical testing, calibration procedures will be performed in general accordance with the analytical methods used and the laboratory's Standard Operating Procedures (SOPs). Calibration documentation will be retained at the laboratory for a period of 6 months.

5.0 LABORATORY DATA REPORTING AND DELIVERABLES

Laboratories will report data in formatted hardcopy and electronic form to the Project Manager and QA Leader. Upon completion of analyses, the laboratory will prepare electronic deliverables for data packages in accordance with the specifications in the agreed-upon *Special Conditions for Lab Analysis* document. The laboratory will provide electronic data deliverables (EDDs) within 2 business days after GeoEngineers' receipt of printed-copy analytical results, including the appropriate QC documentation. Analytical laboratory measurements will be recorded in standard formats that display, at a minimum, the client/field sample identification, the laboratory sample identification, reporting units, analytical methods, analytes tested, analytical results, extraction and analysis dates, quantitation limits, and data qualifiers. Each sample delivery group will be accompanied by sample receipt forms and a case narrative identifying data quality issues.

GeoEngineers will establish EDD requirements with the contract laboratory.

Chromatograms will be provided for samples analyzed using Ecology Method NWTPH-Dx. The laboratory will assure that the full height of all peaks appear on the chromatograms and that the same horizontal time scale is used for all chromatograms to allow for comparisons between chromatograms.

6.0 QUALITY CONTROL SAMPLES AND PROCEDURES

QC samples will be analyzed to ensure the precision, accuracy, representativeness, comparability, and completeness of the data. Table B-6 summarizes the types and frequency of QC samples to be analyzed during the investigation, including both field QC and laboratory QC samples.

6.1. Field Quality Control Samples

Field QC samples serve as a control and check mechanism to monitor the consistency of sampling methods as shown in Table B-6. The samples are collected in the field as described below.

6.1.1. Field Duplicates

Field duplicates serve as measures for precision. They are created by placing aliquots of the collected sample in separate containers, and identifying one of the aliquots as the primary sample and the other as the duplicate sample. Field duplicates measure the precision and consistency of laboratory analytical procedures and methods, as well as the consistency of the sampling techniques used by field personnel and/or the relative homogeneity of sample matrices. The duplicate sample is submitted to gain precision information on sample homogeneity, handling, shipping, storage and preparation and analysis. Field duplicates will be analyzed for the same parameters as the associated primary samples.

For this investigation, one field duplicate will be collected for every twenty primary sediment and porewater samples (i.e., a frequency of 5% for each matrix). The duplicate samples will be collected at the same locations and as close as possible to the same times as the associated primary samples.

6.1.2. Other QC Samples

Discretionary QC samples include field blanks. Field blanks will be used at the discretion of the QA Leader if there is a reason to suspect contamination introduced by ambient conditions in the field. Field blanks are samples of distilled water poured directly into sample containers in the field. Field blanks are analyzed for the same parameters as the associated project samples.

6.2. Laboratory Quality Control

The analytical laboratory will follow standard analytical method procedures that include specified QC monitoring requirements. These requirements will vary by method, but generally include:

- Method blanks;
- Internal standards;
- Instrument calibrations;
- Matrix spikes/matrix spike duplicates (MS/MSDs);
- Laboratory control samples/laboratory control sample duplicates (LCS/LCSDs);
- Laboratory replicates or duplicates; and
- Surrogate spikes.

6.2.1. Laboratory Blanks

Laboratory procedures employ the use of several types of blanks but the most commonly used blanks for QA/QC assessments are method blanks. Method blanks are laboratory QC samples that consist of either a soil-like material that has undergone a contaminant destruction process, or a sample of reagent water. Method blanks are extracted and analyzed with each batch of environmental samples undergoing analysis. Method blanks are particularly useful during volatiles analysis since VOCs can be transported in

the laboratory through the vapor phase. If a substance is found in the method blank, it indicates that one (or more) of the following occurred:

- Measurement apparatus or containers were not properly cleaned and contained contaminants.
- Reagents used in the analytical process were contaminated with a substance(s) of interest.
- Contaminated analytical equipment was not properly cleaned.
- Volatile substances in the air with high solubility or affinities toward the sample matrix contaminated the samples during preparation or analysis.

It is difficult to determine which of the above scenarios took place if method blank contamination occurs. However, it is assumed that the conditions that affected the blanks also likely affected the project samples. If method blank contamination occurs, validation guidelines assist in determining which substances detected in associated project samples are likely truly present in the samples and which ones are likely attributable to the analytical process.

6.2.2. Matrix Spikes/Matrix Spike Duplicates

MS/MSDs are used to assess influences or interferences caused by the physical or chemical properties of the sample itself. For example, extreme pH can affect the results of SVOC analyses. Or, the presence of a particular analyte in a sample may interfere with accurate quantitation of another analyte. MS/MSD data is reviewed in combination with other QC monitoring data to evaluate matrix effects. In some cases, matrix effects cannot be determined due to dilution and/or high levels of related substances in the sample. An MS is created by spiking a known amount of one or more of the target analytes into a project sample, ideally at a concentration at least 5 to 10 times higher than the concentration in the un-spiked sample. A %R value is calculated by subtracting the un-spiked sample result from the spiked sample result, dividing by the spike amount, and multiplying by 100.

The samples designated for MS/MSD analysis should be obtained from a boring or sampling location that is suspected to not be highly contaminated. A sample from an area of low-level contamination is needed because the objective of MS/MSD analyses is to assess possible matrix interferences, which can best be achieved with low levels of contaminants. For this investigation, additional sample volume will be collected for MS/MSD analysis for every twenty primary sediment samples and every twenty primary porewater samples (i.e., a frequency of 5 percent for each matrix), or as determined as necessary by the analytical laboratory.

6.2.3. Laboratory Control Spikes/ Laboratory Control Spike Duplicates

Also known as blank spikes, laboratory control spikes (LCS) and laboratory control spike duplicates (LCSDs) are similar to MS/MSD samples in that a known amount of one or more of the target analytes is spiked into a prepared medium and a %R value is calculated for the spiked substance(s). The primary difference between an MS and LCS is that the LCS spike medium is considered "clean" or contaminant-free. For example, reagent water is typically used for LCS water analyses. The purpose of an LCS is to help assess the overall accuracy and precision of the analytical process including sample preparation, instrument performance, and analyst performance. LCS data must be reviewed in context with other laboratory QC data to determine if corrective action is necessary for laboratory control limit exceedances.

6.2.4. Laboratory Replicates/Duplicates

Laboratories often utilize MS/MSDs, LCS/LCSDs, and/or replicates to assess precision. Replicates are a second analysis of a field-collected environmental sample. Replicates can be split at varying stages of the sample preparation and analysis process, but most commonly consist of a second analysis on the extracted media.

6.2.5. Surrogate Spikes

Surrogate spikes are used to verify the accuracy of the analytical instrument and extraction procedures used. Surrogates are substances similar to the target analytes. A known concentration of surrogate is added to project samples and passed through the instrument, noting the surrogate recovery. Each surrogate used has an acceptable range of %R. If a surrogate recovery is low, sample results may be biased low, and, depending on the %R value, a possibility of false negatives may exist. Conversely, when surrogate recoveries are above the specified range of acceptance, a possibility of false positives exists, although non-detected results are considered accurate.

6.2.6. Instrument Calibrations

Several types of instrument calibrations are used, depending on the method, to determine whether the methodology is 'in control' by verifying the linearity of the calibration curve and to assure that the sample results reflect accurate and precise measurements. This is done by verifying that the percent relative standard deviations (%RSD) and/or the correlation coefficients are within the control limits specified in the validation documents. The main calibrations used are initial calibrations, daily calibrations, and continuing calibration verification.

7.0 DATA REDUCTION AND ASSESSMENT PROCEDURES

This section describes the process for generating and checking data, as well as the process for producing reports for field and analytical laboratory data.

7.1. Data Reduction

Data reduction involves the conversion or transcription of field and analytical data to a useable format. The laboratory personnel will reduce the analytical data for review by the QA Leader and Project Manager. This will involve both hard-copy forms and EDDs. Both forms of data will be compared with each other to verify that the data are reliable and error-free.

7.2. Review of Field Documentation and Laboratory Receipt Information

Documentation of field sampling data will be reviewed periodically for conformance with project QC requirements described in this QAPP. At a minimum, field documentation will be checked for proper documentation of the following:

- Sample collection information (date, time, location, matrices, etc.);
- Field instruments used and calibration data;
- Sample collection protocol;
- Sample containers, preservation, and volume;

- Field QC samples collected at the frequency specified; and
- Chain-of-custody protocols.

Sample receipt forms provided by the laboratory will be reviewed for QC exceptions. The final laboratory data package will describe (in the case narrative) the effects that any identified QC exceptions have on data quality. The laboratory will review transcribed sample collection and receipt information for correctness prior to delivering the final data package.

7.3. Data Verification/Validation

Project decisions, conclusions, and recommendations will be based upon verified (validated) data. The purpose of data verification is to ensure that data used for subsequent evaluations and calculations are scientifically valid, of known and documented quality, and legally defensible. Field data verification will be used to eliminate data not collected or documented in accordance with the protocols specified in the SAP. Laboratory data verification will be used to eliminate data not obtained using prescribed laboratory procedures.

The QA Leader will validate data collected during the investigation to ensure that the data are valid and usable. Data will be validated in general conformance with EPA functional guidelines for data validation (EPA 2004, 2005, and 2008). At a minimum, the following items will be reviewed to verify the data as applicable:

- Documentation that a final review of the data was completed by the Laboratory QA Coordinator;
- Documentation of analytical and QC methodology;
- Documentation of sample preservation and transport;
- Sample receipt forms and case narratives; and
- The following QC parameters:
  - Holding times and sample preservation
  - Method blanks
  - MS/MSDs
  - LCS/LCSDs
  - Surrogate spikes
  - Duplicates/replicates
  - Laboratory calibrations and continuing calibrations

When sample analytical data are received from the analytical laboratory, they will undergo a QC review by the QA Leader. The accuracy and precision achieved will be compared to the laboratory's analytical control limits. Control limits are presented in Tables B-3 and B-4. Calculations of RPDs will follow standard statistical conventions and formulas as presented in Section 2.0. Additional specifications and professional judgment by the QA Leader may be incorporated when appropriate data from specific matrices and field samples are available.

A data quality assessment will be prepared to document the overall quality of the data relative to the DQOs. The major components of the data quality assessment are as follows:

- **Data Validation Summary.** Summarizes the data validation results for all sample delivery groups by analytical method. The summary identifies any systematic problems, data generation trends, general conditions of the data, and reasons for any data qualification.
- **QC Sample Evaluation.** Evaluates the results of QC sample analyses, and presents conclusions based on these results regarding the validity of the project data.
- **Assessment of DQOs.** An assessment of the quality of data measured and generated in terms of accuracy, precision, and completeness relative to objectives established for the project.
- **Summary of Data Usability.** Summarizes the usability of data, based on the assessment performed in the three preceding steps.

The data quality assessment will help to achieve an acceptable level of confidence in the decisions that are to be made based upon the project data. The project analytical data will be submitted to Ecology's Environmental Information Management (EIM) system after the data quality assessment is completed.

8.0 REFERENCES

Environmental Protection Agency. Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, OSWER 9240.1-45, EPA 540-R-04-004. October 2004.

Environmental Protection Agency. Contract Laboratory Program National Functional Guidelines for Chlorinated Dioxin/Furan Data Review. EPA 540-R-05-01. September 2005.

Environmental Protection Agency. Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review, EPA-540-R-08-01. June 2008.

Washington State Department of Ecology (Ecology), "Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies," July 2004.

Washington State Department of Ecology (Ecology), "Sediment Sampling and Analysis Appendix: Guidance on the Development of Sediment Sampling and Analysis Plans Meeting the Requirements of the Sediment Management Standards." Chapter 173-204 WAC. Ecology Publication Number 03-09-043. February 2008.

Washington Administrative Code (WAC) 173, Chapter 173-340-820.

Table B-1

Target Practical Quantitation Limits For Sediment Samples

Preliminary Remedial Design Investigation QAPP, R.G. Haley Site

Bellingham, Washington

Analytes (Analytical Method)	Sediment Cleanup Level[1]		Target PQL/RL[2]
	Organic Carbon (0.5% to 3.5%)	Organic Carbon (<0.5% or >3.5%)	
Petroleum Hydrocarbons (NWTPH-Dx)			
Diesel-range Hydrocarbons	NE	NE	50 mg/kg
Heavy Oil-Range Hydrocarbons	NE	NE	100 mg/kg
Total TPH	260 [3] mg/kg	NE	100 mg/kg
PAHs (EPA 8270E)			
1-Methylnaphthalene	--	--	20 µg/kg dw
2-Methylnaphthalene	38 mg/kg OC	670 µg/kg dw	20 µg/kg dw
Naphthalene	99 mg/kg OC	2,100 µg/kg dw	20 µg/kg dw
Acenaphthene	16 mg/kg OC	500 µg/kg dw	20 µg/kg dw
Phenanthrene	100 mg/kg OC	1,500 µg/kg dw	20 µg/kg dw
cPAHs (EPA 8270E)			
Benzo(a)anthracene	110 mg/kg OC	1,300 µg/kg dw	20 µg/kg dw
Benzo(a)pyrene	NE	NE	20 µg/kg dw
Benzo(b)fluoranthene	NE	NE	20 µg/kg dw
Benzo(k)fluoranthene	NE	NE	20 µg/kg dw
Chrysene	NE	NE	20 µg/kg dw
Dibenzo(a,h)anthracene	NE	NE	20 µg/kg dw
Inden(1,2,3-cd)pyrene	NE	NE	20 µg/kg dw
Total cPAHs - TEQ	NE	229 µg/kg dw	--
SVOCs (EPA 8270E)			
Pentachlorophenol	100 µg/kg dw	100 µg/kg dw	100 µg/kg dw

Notes:

[1] Cleanup levels identified for sediment at the R.G. Haley Site.

[2] Target PQLs/RLs obtained from Analytical Resources, Inc. of Tukwila, Washington.

[3] TPH cleanup level is for the sum of total petroleum hydrocarbons.

TPH = total petroleum hydrocarbons

PAHs = polycyclic aromatic hydrocarbons

cPAHs = carcinogenic polycyclic aromatic hydrocarbons

SVOCs = semivolatile organic compounds

TEQ = toxic equivalent

NE = cleanup level not established for the Site

EPA = United States Environmental Protection Agency

OC = organic carbon normalized concentration

dw = dry weight concentration

PQL = practical quantitation limit

RL = reporting limit

µg/kg = microgram per kilogram

mg/kg = milligram per kilogram

Table B-2

Target Practical Quantitation Limits For Porewater Samples

Preliminary Remedial Design Investigation QAPP, R.G. Haley Site

Bellingham, Washington

Analytes (Analytical Method)	Groundwater Cleanup Level[1]	Target PQL/RL[2]
Petroleum Hydrocarbons (NWTPH-Dx) (µg/L)		
Diesel-range Hydrocarbons	NE	NE
Heavy Oil-Range Hydrocarbons	NE	NE
Total TPH	NE	NE
PAHs (EPA 8270E) (µg/L)		
1-Methylnaphthalene	15	1.0
2-Methylnaphthalene	15	1.0
Naphthalene	NE	1.0
Acenaphthene	5.3	1.0
Phenanthrene	NE	1.0
cPAHs (EPA 8270E) (µg/L)		
Benzo(a)anthracene	0.01	1.0
Benzo(a)pyrene	NE	NE
Benzo(b)flouranthene	NE	NE
Benzo(k)flouranthene	NE	NE
Chrysene	NE	NE
Dibenzo(a,h)anthracene	NE	NE
Indeno(1,2,3-cd)pyrene	NE	1.0
Total cPAHs - TEQ	0.02	–
SVOCs (EPA 8041A) (µg/L)		
Pentachlorophenol	0.04	0.025

Notes:

[1] Cleanup levels for groundwater at the R.G. Haley Site.

[2] Target PQLs/RLs obtained from Analytical Resources, Inc. of Tukwila, Washington.

PQL = practical quantitation limit

RL = reporting limit

TPH = total petroleum hydrocarbons

PAHs = polycyclic aromatic hydrocarbons

cPAHs = carcinogenic polycyclic aromatic hydrocarbons

SVOCs = semivolatile organic compounds

TEQ = toxic equivalent

NE = cleanup level not established for the Site

µg/L = microgram per liter

Table B-3

Sediment Laboratory Quality Assurance/Quality Control Requirements

Preliminary Remedial Design Investigation QAPP, R.G. Haley Site

Bellingham, Washington

Analyte Group		Laboratory Control Sample (LCS) %R Limits (%)	Matrix Spike (MS) %R Limits (%)	MS Duplicate (MSD) Samples or Lab Duplicate %RPD Limits[1] (%)	Surrogate Standard (SS) or Labeled Compounds %R Limits (%)
Conventionals		80 - 120	75 - 125	≤20	NA
Diesel- and Heavy Oil-Range Hydrocarbons (NWTPH-Dx)		30-160	NA	≤30	50-150
PAHs (EPA 8270E)	1-Methylnaphthalene	42-120	same as LCS	≤30	2-Fluorophenol (27 -120) Phenol-d5 (29 - 120) 2-Chlorophenol-d4 (31 - 120) 1,2-Dichlorobenzene-d4 (32 - 120) Nitrobenzene-d5 (30 - 120) 2-Fluorobiphenyl (35 - 120) 2,4,6-Tribromophenol (24 - 134) p-Terphenyl-d14 (37 - 120)
	2-Methylnaphthalene	43-120	same as LCS	≤30	
	Acenapthene	45-120	same as LCS	≤30	
	Fluoranthene	53-145	same as LCS	≤30	
	Naphthalene	43-120	same as LCS	≤30	
	Phenanthrene	49-120	NE	NE	
cPAHs (EPA 8270E)	Benzo(a)anthracene	49-120	same as LCS	NE	
	Benzo(a)pyrene	42-120	same as LCS	≤30	
	Benzo(b)fluoranthene	42-132	same as LCS	≤30	
	Benzo(k)fluoranthene	39-129	same as LCS	≤30	
	Chrysene	47-120	same as LCS	≤30	
	Dibenzo(a,h)anthracene	30-133	same as LCS	≤30	
	Indeno(1,2,3-cd)pyrene	42-163	same as LCS	≤30	
SVOCs (EPA 8270E)	Pentachlorophenol	16-120	NE	NE	

Notes:

1 RPD control limits are only applicable if the primary and duplicate sample concentrations are greater than 5 times the method reporting limit (MRL). For results less than 5 times the MRL, the difference between the primary and duplicate samples must be less than 2 times the MRL for sediment.

MS = matrix spike

MSD = matrix spike duplicate

LCS = laboratory control sample

SS = surrogate standard

NA = not applicable

EPA = United States Environmental Protection Agency

cPAHs = carcinogenic polycyclic aromatic hydrocarbons

SVOCs = semivolatile organic compounds

%R = percent recovery

RPD = relative percent difference

Table B-4

Porewater Laboratory Quality Assurance/Quality Control Requirements

Preliminary Remedial Design Investigation QAPP, R.G. Haley Site

Bellingham, Washington

Analyte Group		Laboratory Control Sample (LCS) %R Limits (%)	Matrix Spike (MS) %R Limits (%)	MS Duplicate (MSD) Samples or Lab Duplicate %RPD Limits[1] (%)	Surrogate Standard (SS) or Labeled Compounds %R Limits (%)
Conventionals		90-110	75-125	≤20	NA
Diesel- and Heavy Oil-Range Hydrocarbons (NWTPH-Dx)		30-160	30-160	≤30	50-150
PAHs (EPA 8270E)	1-Methylnaphthalene	46.9-120	same as LCS	≤30	1,4-Dioxan-d8 (39 - 120) 2-Fluorophenol (33 - 120) Phenol-d5 (38 - 120) 2-Chlorophenol-d4 (41 - 120) 1,2-Dichlorobenzene-d4 (20 - 120) Nitrobenzene-d5 (27 - 120) 2-Fluorobiphenyl (33 - 120) 2,4,6-Tribromophenol (52 - 134) p-Terphenyl-d14 (28 - 120)
	2-Methylnaphthalene	47,3-120	same as LCS	≤30	
	Acenapthene	50.4-120	same as LCS	≤30	
	Fluoranthene	66.7-120	same as LCS	≤30	
	Naphthalene	40.5-120	same as LCS	≤30	
	Phenanthrene	58.8-120	NE	NE	
cPAHs (EPA 8270E)	Benzo(a)anthracene	58.3-128	same as LCS	≤31	
	Benzo(a)pyrene	70.6-120	same as LCS	≤30	
	Benzo(b)fluoranthene	64.9-120	same as LCS	≤30	
	Benzo(k)fluoranthene	63.9-120	same as LCS	≤30	
	Chrysene	58.9-120	same as LCS	≤30	
	Dibenzo(a,h)anthracene	46.9-120	same as LCS	≤30	
	Indeno(1,2,3-cd)pyrene	46.5-120	same as LCS	≤30	
SVOCs (EPA 8041A)	Pentachlorophenol	48-120	NE	NE	2,4,6-Tribromophenol (26-120)

Notes:

MS = matrix spike

MSD = matrix spike duplicate

LCS = laboratory control sample

SS = surrogate standard

%R = percent recovery

SVOCs = semivolatile organic compounds

PAHs = polycyclic aromatic hydrocarbons

NE = cleanup level not established for the Site

EPA = United States Environmental Protection Agency

RPD = relative percent difference

Table B-5

Sediment And Porewater Test Methods, Sample Containers, Preservation And Holding Times

Preliminary Remedial Design Investigation QAPP, R.G. Haley Site

Bellingham, Washington

Media	Analysis	Method	Minimum Sample Size	Sample Containers	Sample Preservation	Holding Times
Sediment	Diesel- and Heavy Oil-Range Hydrocarbons (NWTPH-Dx)	Ecology NWTPH-Dx without acid/silica gel cleanup[1]	25 g	8 oz widemouth with Teflon-lined lid	Cool ≤6°C	14 days to extraction (1 year if frozen), 40 days from extraction to analysis
		Ecology NWTPH-Dx with acid/silica gel cleanup[1]	26 g	8 oz widemouth with Teflon-lined lid	Cool ≤6°C	14 days to extraction (1 year if frozen), 40 days from extraction to analysis
	PAHs and Pentachlorophenol	EPA 8270	100 g	8 oz glass widemouth with Teflon-lined lid	Cool ≤6°C	14 days to extraction (1 year if frozen), 40 days from extraction to analysis
	Total Organic Carbon	EPA 9060A	25 g	4 oz glass widemouth with Teflon-lined lid	Cool ≤6°C	14 days to sample prep, 180 days to analysis
Porewater	Diesel- and Heavy Oil-Range Hydrocarbons (NWTPH-Dx)	Ecology NWTPH-Dx without acid/silica gel cleanup	500 mL	Two 500 mL amber glass with Teflon-lined lid	Cool ≤6°C	7 days to extraction 40 days from extraction to analysis
	PAHs	EPA 8270	500 mL	Two 500 mL amber glass with Teflon-lined lid	Cool ≤6°C	7 days to extraction 40 days from extraction to analysis
	Pentachlorophenol	EPA 8041	500 mL	Two 500 mL amber glass with Teflon-lined lid	Cool ≤6°C	7 days to extraction 40 days from extraction to analysis
	Total Organic Carbon	EPA 9060A	250 mL	250 mL amber glass (narrow mouth) with Teflon-lined lid	Cool ≤6°C with H_2SO_4	28 days

Notes:

[1] Sediment samples for diesel- and heavy oil-range hydrocarbons with and without acid/silica gel cleanup. Samples should be placed into same container.

cPAHs = carcinogenic polycyclic aromatic hydrocarbons
SVOCs = semivolatile organic compounds
PSEP = Puget Sound Estuary Program
H_2SO_4 = sulfuric acid
EPA = United States Environmental Protection Agency
NA = not applicable
HDPE = high density polyethylene
oz = ounce
mL = milliliter
L = liter
g = gram

Table B-6

Quality Control Samples Type and Minimum Frequency

Preliminary Remedial Design Investigation QAPP, R.G. Haley Site
Bellingham, Washington

Parameter	Field QC Samples	Laboratory QC Samples	
	Field Duplicates	Method Blanks	LCS or OPR
Conventionals	1 per round of investigation	NA	NA
Diesel- and Heavy Oil-Range Hydrocarbons (NWTPH-Dx)	1 per 20 primary sediment/porewater samples	1 per batch[1]	1 per batch[1]
SVOCs and PAHs (SW8270)	1 per 20 primary sediment/porewater samples	1 per batch[1]	1 per batch[1]
SVOCs (SW8041)	1 per 20 primary porewater samples	1 per batch[1]	1 per batch[1]

Notes:

[1] An analytical batch is defined as a group of samples taken through a preparation procedure and sharing a method blank, LCS, and MS/MSD (or MS and lab duplicate). No more than 20 field samples are contained in one batch.

LCS = laboratory control sample

OPR = ongoing precision and recovery

MS = matrix spike

MSD = matrix spike duplicate

PAHs = polycyclic aromatic hydrocarbons

NA = Not applicable

SVOCs = semivolatile organic compounds

APPENDIX C
Health and Safety Plan

Site Health and Safety Plan

R.G. Haley International Site
Bellingham, Washington

for
City of Bellingham

March 18, 2022

GeoEngineers

2101 4th Avenue, Suite 950
Seattle, Washington 98121
206.728.2674

Table of Contents

GEOENGINEERS, INC.
SITE HEALTH AND SAFETY PLAN
SUPPLEMENTAL DATA COLLECTION FIELD INVESTIGATION
R.G. HALEY INTERNATIONAL CORPORATION
FILE NO. 0356-114-08

This HASP is to be used in conjunction with the GeoEngineers Safety Program Manual. Together, the written safety programs and this HASP constitute the site safety plan for this site. This plan is to be used by GeoEngineers personnel on this site and must be available on-site. If the work entails potential exposures to other substances or unusual situations, additional safety and health information will be included, and the plan will need to be approved by the GeoEngineers Health and Safety Manager. All plans are to be used in conjunction with current standards and policies outlined in the GeoEngineers Health and Safety Program Manual.

Liability Clause: If requested by subcontractors, this site safety plan may be provided for informational purposes only. In this case, Form 3 shall be signed by the subcontractor. Please be advised that this Site Safety Plan is intended for use by GeoEngineers Employees only. Nothing herein shall be construed as granting rights to GeoEngineers' subcontractors or any other contractors working on this site to use or legally rely on this Site Safety Plan. GeoEngineers specifically disclaims any responsibility for the health and safety of any person not employed by them.

1.0 GENERAL PROJECT INFORMATION

Project Name:	R. G. Haley Supplemental Data Collection Field Investigation
Project Number:	00356-114-08
Type of Project:	Subsurface investigation for sediment and porewater sampling
Site Address	500 Cornwall Avenue, Bellingham, WA
Start/Completion:	Summer 2022
Subcontractors:	Utility Locate Contractor Drilling Contractor Crane Contractor

2.0 WORK PLAN

GeoEngineers will complete additional characterization to support design of the remedial action to be completed in the Marine Unit of the R.G. Haley International Site (Site). Additional site characterization will include collection of data to evaluate:

- Intertidal sediment and porewater at the base of the planned excavation in Zone 1a to identify the depth of excavation to remove Non-Aqeuos Phase Liquid (NAPL)-impacted sediment and provide input for design of the amended sand cap within the sediment excavation area.

- Intertidal sediment and porewater at the base of the planned amended cap in Zone 1b to provide information to support design of the amended sand cap outside of the sediment excavation and capping area.
- Conditions within the existing organoclay (OC) cap placed during the 2013 interim action and estimate the organoclay usage rate within the existing cap to inform the design of the amended sand caps to be placed in Zones 1a and 1b.

Field activities for the additional sediment and porewater sampling will include:

- Sampling subsurface sediment including sonic drilling and subsurface soil sampling using hand tools. Soil samples will be obtained, field screened, and submitted to a laboratory.
- Use of a crane to place and remove limited access sonic drilling rig on the beach during low tide, dry conditions.

2.1 Site Description

The approximately 7-acre site, located at the foot of Cornwall Avenue in Bellingham, Washington, is relatively flat. The Site is vacant and most of it is surrounded by a chain link fence. Inside the fence is an ecology block wall area that designates where recovered fluids are stored. The intertidal area where explorations will be completed are located outside the fenced area. Vehicle access to the site is limited to authorized vehicles by a gate across the access road. The shoreline is accessible to the public.

2.2 Site History

Wood treatment activities were conducted at the site from about 1951 to 1985. The wood was treated using pentachlorophenol (PCP) in a P-9 carrier oil (diesel-range petroleum) and this liquid was released to soil and groundwater at the Site.

Chemicals released at the Site include pentachlorophenol (PCP) in a diesel oil carrier (P9 oil), dioxins/furans (associated with the PCP), and polycyclic aromatic hydrocarbons.

2.3 List of Field Activities

Check the activities to be completed during the project:

	Site reconnaissance	X	Field Screening of Soil Samples
X	Exploratory Borings	X	Vapor Measurements
	Construction Monitoring	X	Groundwater Sampling
X	Surveying	X	Groundwater Depth and Free Product Measurement
	Test Pit Exploration	X	Product Sample Collection
X	Monitoring Well Installation		Soil Stockpile Testing
X	Monitoring Well Development		Remedial Excavation
X	Soil Sample Collection		Underground Storage Tank (UST) Removal Monitoring
	Remediation System Monitoring	X	Sediment Sampling

Check the activities to be completed during the project:

3.0 LIST OF FIELD PERSONNEL AND TRAINING

Name of Employee on Site	Level of HAZWOPER Training (24-/40-hr)	Date of 8-Hr Refresher Training	First Aid/ CPR	Date of Other Trainings	Date of Respirator Fit Test
Nathan Solomon	40	June 27, 2019	June 10, 2013	--	June 4, 2020
Katy Atakturk	40	April 22, 2020	April 20, 2020	--	September 21, 2020
Brian Tracy	40	December 17, 2019	May 10, 2011	--	--

Chain of Command	Title	Name	Telephone Numbers
1	Project Manager	Brian Tracy	206-679-1643 (c)
2	HAZWOPER Supervisor	Katy Atakturk	206-419-4290 (c)
3	Field Engineer/Geologist	Katy Atakturk	425-861-6045 (o) 206-419-4290 (c)
		Nate Solomon	206-437-6819 (c)
4	Site Safety and Health Supervisor*	Katy Atakturk	206-419-4290 (c)
		Nathan Solomon	206-437-6819 (c)
5	Client Assigned Site Supervisor	Craig Mueller	360-778-7922 (o)
6	Health and Safety Program Manager	Mary Lou Sullivan	253-722-2425 (o) 360-633-9821 (c)
7	Current Owner	City of Bellingham:	
		Sam D. Shipp	W 360-778-7900
8	Subcontractors	Cascade Drilling:	
		Kasey Goble	425-466-8588 (c)

*** Site Safety and Health Supervisor –** The individual present at a hazardous waste site responsible to the employer and who has the authority and knowledge necessary to establish the site-specific health and safety plan and verify compliance with applicable safety and health requirements.

4.0 EMERGENCY INFORMATION

Hospital Name and Address:

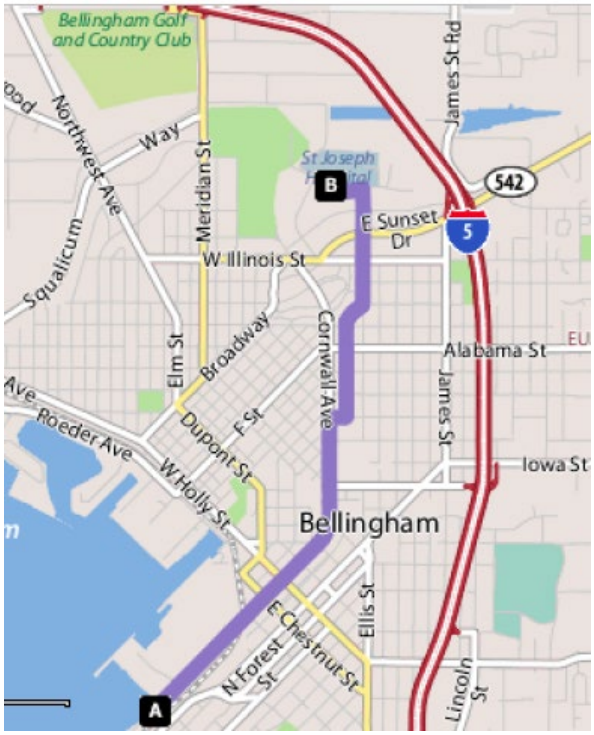
St. Joseph Hospital
2901 Squalicum Parkway
Bellingham, WA 98225-1898
Phone: (360) 734-5400

Phone Numbers (Hospital ER):

ER: 206.731.3000

Route to Hospital:
Distance: 2.58 miles
Time: 12 minutes

1. Start at 500 CORNWALL AVE, BELLINGHAM going toward E PINE ST - go 1.4 mi/
2. Turn Right on VIRGINIA ST
3. Turn Left on DEAN AVE - go 0.4 mi/
4. Continue on HAMPTON PL - go 0.1 mi/
5. Bear Left on ELLIS ST - go 0.5 mi/
6. Turn Left on SQUALICUM PKY - go 0.1 mi/
7. Arrive at 2901 SQUALICUM PKY, BELLINGHAM, on the Right



Ambulance: 9-1-1
Poison Control: (800) 732-6985
Police: 9-1-1
Fire: 9-1-1
Location of Nearest Telephone: Cell phones are carried by field personnel.
Nearest Fire Extinguisher: Located in the GeoEngineers vehicle on-site.
Nearest First-Aid Kit: Located in the GeoEngineers vehicle on-site.

4.1 Standard Emergency Procedures

Get help

- Send another worker to phone 9-1-1 (if necessary)

- As soon as feasible, notify GeoEngineers' Project Manager

Reduce risk to injured person

- Turn off equipment
- Move person from injury location (if in life-threatening situation only)
- Keep person warm
- Perform CPR (if necessary)

Transport injured person to medical treatment facility (if necessary)

- By ambulance (if necessary) or GeoEngineers vehicle
- Stay with person at medical facility
- Keep GeoEngineers manager apprised of situation and notify Human Resources Manager of situation

5.0 HAZARD ANALYSIS

- Note: A hazard assessment will be completed at every site prior to beginning field activities. Updates will be included in the daily log. This list is a summary of hazards listed on the form.

5.1 Physical Hazards

X	Drill rigs and Concrete Coring, including working inside a warehouse
	Backhoe
	Trackhoe
X	Crane
	Front End Loader
	Excavations/trenching (1:1 slopes for Type B soil)
	Shored/braced excavation if greater than 4 feet of depth
	Overhead hazards/power lines
X	Tripping/puncture hazards: working on beach with various rock and debris hazards. Care should be taken to ensure sure footing.
	Unusual traffic hazard – Street traffic: Transients frequent the site and GeoEngineers personnel should leave the Site and call police at any indication of a threat.
X	Heat/Cold, Humidity
X	Utilities/ utility locate
X	Tide fluctuations in portion of Site affected by tides

- High-visibility vests will be worn by on-site personnel to ensure they can be seen by vehicle and equipment operators.
- Field personnel will be aware at all times of the location and motion of heavy equipment in the area of work to ensure a safe distance between personnel and the equipment. Personnel will be visible to the operator at all times and will remain out of the swing and/or direction of the equipment

apparatus. Personnel will approach operating heavy equipment only when they are certain the operator has indicated that it is safe to do so through hand signal or other acceptable means.

- Safety glasses will be worn during sampling to protect against splashing or other potential eye injuries.
- Caution will be taken near the drill rig to avoid moving parts of the drill rig, as well as falling or flying objects.
- Field personnel will minimize time spent near drill rig; will not wear loose clothing; will use safety glasses, hard hat, and steel-toed boots.
- Personnel will avoid tripping hazards, steep slopes, pits and other hazardous encumbrances.
- Personnel shall understand the times and magnitude of tides when working in the intertidal areas.
- Cold stress control measures will be implemented according to the GeoEngineers Health and Safety Program to prevent frost nip (superficial freezing of the skin), frost bite (deep tissue freezing), or hypothermia (lowering of the core body temperature). Heated break areas and warm beverages shall be available during periods of cold weather.
- Heat stress control measures required for this site will be implemented according to GeoEngineers Health and Safety Program with water provided on-site.

5.2 Engineering Controls

_____	Trench shoring (1:1 slope for Type B Soils)
X	Location work spaces upwind/wind direction monitoring
X	Other soil covers (as needed)
X	Dust Control (as needed)

5.3 Chemical Hazards

CHEMICAL HAZARDS (POTENTIALLY PRESENT AT SITE)

Substance	Pathways
Pentachlorophenol	Free product/Water/Soil
Dioxins and Furans (PCDD's, TCDD's, related congeners and other organics)	Free product /Water/Soil
Diesel fuel	Free product/ Water/Soil
Polycyclic aromatic hydrocarbons (PAHs)	Free product /Water/Soil

SPECIFIC CHEMICAL HAZARDS AND EXPOSURES (POTENTIALLY PRESENT AT SITE)

Compound/ Description	Exposure Limits/LDLH	Exposure Routes	Symptoms/Health Effects
Diesel Fuel — liquid with a characteristic odor	None established by OSHA, but ACGIH has adopted 100 mg/m^3 for a TWA (as total hydrocarbons)	Ingestion, inhalation, skin absorption, skin and eye contact	Irritated eyes, skin, and mucous membrane; fatigue; blurred vision; dizziness; slurred speech; confusion; convulsions; headache; dermatitis
Polycyclic aromatic hydrocarbons (PAH) as coal tar pitch volatiles	PEL 0.2 mg/m^3 TLV 0.2 mg/m^3 REL 0.1 mg/m^3 IDLH 80 mg/m^3	Inhalation, ingestion, skin and/or eye contact	Dermatitis, bronchitis, potential carcinogen
Pentachlorophenol	PEL 0.5 mg/m^3 TLV 0.5 mg/m^3 ACGIH STEL 1 mg/m^3 REL 0.5 mg/m^3 IDLH 2.5 mg/m^3	Inhalation, ingestion, skin and/or eye contact	Irritating to the eyes, nose, throat; sneezing, cough; lassitude (weakness, exhaustion), anorexia, weight loss; sweating; headache, dizziness; nausea, vomiting; dyspnea (breathing difficulty), chest pain; high fever; dermatitis.
Dioxins and Furans (PCDD's, TCDD's, related congeners and other organics)	Threshold limits not prescribed, see description below	Ingestion, skin and/or eye contact	Increased risk of severe skin lesions such as chloracne and hyperpigmentation, altered liver function and lipid metabolism, general weakness associated with drastic weight loss, changes in activities of various liver enzymes, depression of the immune system, and endocrine- and nervous-system abnormalities

Compound/ Description	Exposure Limits/LDLH	Exposure Routes	Symptoms/Health Effects
Copper	PEL 1 mg/m^3 IDLH 100 mg/m^3	Inhalation, ingestion, skin and eye contact	Irritated eyes, nose, pharynx; nasal septum perforation; metallic taste; dermatitis

Notes:

IDLH = immediately dangerous to life or health
OSHA = Occupational Safety and Health Administration
ACGIH = American Conference of Governmental Industrial Hygienists
mg/m^3 = milligrams per cubic meter
TWA = time-weighted average (Over 8 hrs.)
PEL = permissible exposure limit
TLV = threshold limit value (over 10 hrs.)
STEL = short-term exposure limit (15 min)
ppm = parts per million

5.3.1 Diesel Oil

Diesel fuels are similar to fuel oils used for heating (fuel oils no. 1, no. 2 and no. 4). All fuel oils consist of complex mixtures of aliphatic and aromatic hydrocarbons. Diesel fuels predominantly contain a mixture of C10 through C19 hydrocarbons, which include approximately 64 percent aliphatic hydrocarbons, I to 2 percent olefinic hydrocarbons and 35 percent aromatic hydrocarbons. Workers may be exposed to fuel oils through their skin without adequate protection, such as gloves, boots, coveralls or other protective clothing. Breathing diesel fuel vapors for a long time may damage your kidneys, increase your blood pressure, or lower your blood's ability to clot. Constant skin contact (for example, washing) with diesel fuel may also damage your kidneys. The International Agency for Research on Cancer (IARC) has determined that residual (heavy) fuel oils and marine diesel fuel are possibly carcinogenic to humans (Group 2B classification).

5.3.2 Polycyclic Aromatic Hydrocarbons (PHAs), Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)

Exposure to cPAHs can occur via inhalation of vapors, ingestion, and skin and eye contact. Skin contact can result in reddening or corrosion. Ingestion can cause nausea, vomiting, blood pressure fall, abdominal pain, convulsions and coma. Damage to the central nervous system can also occur. The U.S. Department of Health and Human Services (1989) has classified 15 PAHs compounds as having sufficient evidence for carcinogenicity, while the U.S. EPA (1990) has classified at least 5 of the identified PAHs as human carcinogens. There is no currently assigned PEL-TWA for cPAHs, but the closely related material coal tar is listed as coal tar pitch volatiles with a PEL-TWA of 0.2 mg/m3. PAHs and cPAHs as soil contaminants can be irritating to eyes and mucous membranes. PAHs are also formed during combustion and are linked to lung cancers with exposure to combustion byproducts. Lymphatic cancers are reported in the literature with PAHs in the presence of carbon black.

5.3.3 PCP

Pentachlorophenol (penta or PCP), like other chlorinated phenolics, n-nitrosodiphenylamine, and dibenzofuran are absorbed through the skin. They are irritating to eyes, nose, and mucous membranes. They are potential carcinogens or listed as animal carcinogens. When inhaled they may cause cough, dizziness, headache, drowsiness, difficulty breathing, and sore throat. They are also hazardous by

ingestion (soil particles, etc.) causing abdominal cramps, diarrhea, nausea, vomiting, and weakness. Penta has low volatility (VP @ 77 degrees F is 0.0001 mmHg) like the others, but often the combination of chemical odors in oils or heavily contaminated soils can cause transient nausea and headache. Penta (liquid) has a NIOSH IDLH limit of 2.5 mg/m^3 and ACGIH STEL of 1.0 mg/m^3 based on acute toxicity data in humans. This may be a conservative value due to the lack of relevant acute toxicity data for workers exposed to concentrations above 2.4 mg/m^3.

5.3.4 Dioxins/Furans

Very little human toxicity data from exposure to TCDD's and/or PCDDs are available. Health-effect data obtained from occupational settings in humans are based on exposure to chemicals contaminated with dioxins. It produces a variety of toxic effects in animals and is considered one of the most toxic chemicals known. Most of the toxicity data available are from high-dose oral exposures to animals (including tumor production, immunological dysfunction, and teratogenesis). Very little dermal and inhalation exposure data are available in the literature. It is important for field personnel to remember that while dioxins are toxic and carcinogenic (see next paragraph), most of the information is based on high doses to liquid product. These products are not very volatile, so the major concern is on skin protection and inhalation/ingestion of soil particles. The American Conference of Governmental Industrial Hygienists (ACGIH) recommends a 20 ppm TLV for 1,4 dioxane (an example of numerous dioxin compounds), lists it as being absorbed through the skin, as potentially carcinogenic as well as toxic to liver and kidneys. This is typical of health effects for dioxin/furan compounds. Care should be taken especially in sampling product from drums and wells known to contain detectable levels of dioxins. Emphasis will be on working outside in well-ventilated areas using proper PPE (as discussed later in this plan). There is a wide range of difference in sensitivity to regarding lethality in animals. The signs and symptoms of poisoning with chemicals contaminated with dioxins in humans, however are analogous to those observed in animals.

Generally, dioxin exposures to humans are associated with increased risk of severe skin lesions such as chloracne and hyperpigmentation, altered liver function and lipid metabolism, general weakness associated with drastic weight loss, changes in activities of various liver enzymes, depression of the immune system, and endocrine- and nervous-system abnormalities. It is a potent teratogenic and fetotoxic chemical in animals. A very potent promoter in rat liver cancers, TCDD also causes cancers of the liver and other organs in animals. Populations occupationally or accidentally exposed to chemicals contaminated with dioxin have increased incidences of soft-tissue sarcoma and non-Hodgkin's lymphoma.

Dioxin-contaminated soil may result in dioxins occurring in a food chain. This is especially important for the general population. It has been estimated that about 98% of exposure to dioxins is through the oral route. Exposure as a vapor is normally negligible because of the low vapor pressure typical of these compounds. In the 1980s, a concentration level of 1 ppb 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) in soil was specified as "a level of concern," based on cancer effects. However, recent studies indicate that end points other than cancer (such as those listed above) are also of concern based on a projected intake from 1 ppb TCDD in soil. TL-MW-3-P01, HS-SSP-S01, and other samples taken on this site indicate levels in the well and soils exceeding 1 ppb.

5.4 Biological Hazards and Procedures

Y/N	Hazard	Procedures
N	Poison Ivy or other vegetation	
Y	Insects or snakes	Work gloves and long sleeve shirt
Y	Used hypodermic needs or other infectious hazards	Do not pick up or contact
Y	Others: Blackberry bushes, COVID-19	Hard hat, gloves and long sleeve shirt, see supplemental COVID-19 JHA

5.5 Additional Hazards

Update in Daily Report. Include evaluation of:

- *Physical Hazards* (equipment hazards, tripping hazards and others)
- *Chemical Hazards* (odors, spills, free product, airborne particulates and others present)
- *Biological Hazards* (stray dogs, discarded needles, pollen, bees/wasps and others present)

6.0 AIR MONITORING PLAN

Work upwind if at all possible.

Check instrumentation to be used:-None

X Photoionization Detector (PID)

____ Other (i.e., detector tubes): _____

6.1 Action Levels

- The workspace will be monitored using a photoionization detector (PID) and lower-explosive-limit meter (LEL). These instruments must be properly maintained, calibrated and charged (refer to the instrument manuals for details). Zero this meter in the same relative humidity as the area in which it will be used and allow at least a 10-minute warm-up prior to zeroing. Do not zero in a contaminated area. The PID can be tuned to read chemicals specifically if there are not multiple contaminants on-site. It can be tuned to detect one chemical with the response factor entered into the equipment, but the PID picks up all volatile organic compounds (VOCs) present. The ionization potential (IP) of the chemical has to be less than the PID lamp (11.7 / 10.6eV), and the PID does not detect methane. The LEL meter will detect if explosive gasses such as methane are present at concentrations approaching the lower explosive limit (LEL).
- An initial vapor measurement survey of the site should be conducted to detect “hot spots” every 15 minutes during initial excavation and boring of the soil. If ppm is below 0.1 ppm during this time the vapor measurement survey of the workspace can be conducted at least hourly or more often if persistent petroleum-related odors are detected. If vapor concentrations exceed 1 ppm above background continuously for a 5-minute period as measured in the breathing zone, upgrade to Level C personal protective equipment (PPE) or move to a non-contaminated area.

- Note: Standard industrial hygiene/safety procedure is to require that action be taken to reduce worker exposure to organic vapors when vapor concentrations exceed one-half the TLV. Because of the variety of chemicals, the PID will not indicate exposure to a specific PEL and is therefore not a preferred tool for determining worker exposure to chemicals. If odors are detected, then employees shall upgrade to respirators with Organic Vapor cartridges, evacuate the site, and will contact the Health and Safety Program Manager for other sampling options and further guidance.

ACTION LEVEL TABLE FOR CHEMICAL MONITORING

CHEMICAL (OR CLASS)	MONITORING EQUIPMENT	ACTIVITY	MONITORING FREQUENCY AND LOCATION	ACTION LEVEL	ACTIONS TAKEN
Organic Vapors	Photo Ionization Detector (PID)	Drill boring/Sample Collection	Four times per hour (15 min) in breathing zone during the start of the job. Afterwards in work zone, start of shift; prior to boring; every 30 to 60 minutes and in event of odors	0.05 TO 0.1 ppm	Normal operations, Level D PPE.
Organic Vapors	Photo Ionization Detector (PID)	Drill boring/Sample Collection		0.1 TO 1 ppm	Upgrade to Level C PPE, change to continuous monitoring
Organic Vapors	Photo Ionization Detector (PID)	Drill boring/Sample Collection		>1 ppm for over 5 minutes	Leave work site and contact Health and Safety Manager for guidance.

7.0 SITE CONTROL PLAN

Work zones will be considered within 10 feet of the well being monitored and the area within the ecology block enclosure. Employee should work upwind to the extent practical. The decontamination area and contaminant reduction zone are located in the ecology block enclosure. Employees must not leave the site without following decontamination procedures, such as washing hands, if they were handling fluids from the wells.

7.1 Traffic or Vehicle Access Control Plans

Traffic is restricted to authorized vehicles on the one road that goes through the Site. No work activities are within this road.

7.2 Site Work Zones

Hot zone (exclusion zone): *Within a minimum of 10 feet of drilling being completed.*

Method of delineation / excluding non-site personnel

	Fence
X	Survey Tape
X	Traffic Cones-when traffic is present
X	Other. Oil storage area has exclusion signs posted.

7.3 Buddy System

Personnel on-site should use the buddy system (pairs), particularly whenever communication is restricted. If only one GeoEngineers employee is on-site, a buddy system can be arranged with subcontractor/ contractor personnel or by establishing call in/out times during the project to the Project Manager.

7.4 Site Communication Plan

Positive communications (within sight and hearing distance or via radio) should be maintained between pairs on-site, with the pair remaining in proximity to assist each other in case of emergencies. The team should prearrange hand signals or other emergency signals for communication when voice communication becomes impaired (including cases of lack of radios or radio breakdown). In these instances, you should consider suspending work until communication can be restored; if not, the following are some examples for communication:

1. Hand gripping throat: Out of air, can't breathe.
2. Gripping partner's wrist or placing both hands around waist: Leave area immediately, no debate.
3. Hands on top of head: Need assistance.
4. Thumbs up: Okay, I'm all right: or I understand.
5. Thumbs down: No, negative.

7.5 Decontamination Procedures

Decontamination consists of removing and discarding disposable gloves. Soiled boots (if boot covers not worn) should be cleaned using bucket and brush provided on-site in the decontamination area. Employees will perform decontamination procedures and wash prior to eating, drinking or leaving the site.

All decontamination equipment and PPE must be left on Site and managed in accordance with the Fluid Recovery Management Plan.

7.6 Waste Disposal or Storage

PPE disposal: Used disposable PPE (gloves, Tyvek®) will be placed in plastic trash bags and disposed as solid waste.

Drill cutting/excavated sediment disposal or storage:

_____ On-site, pending analysis and further action
__X__ Secured (list method) __On-site in 55-gallon drum_____
_____ Other (describe destination, responsible parties): _____

8.0 PERSONAL PROTECTIVE EQUIPMENT

- Half-face combination organic vapor/high efficiency particulate air (HEPA) or P100 cartridge respirators will be available on-site to be used as necessary. P100 cartridges are to be used only if PID measurements are below the site action limit. P100 cartridges are used for protection against

dust, metals and asbestos, while the combination organic vapor/HEPA cartridges are protective against both dust and vapor. Ensure that the PID or TLV will detect the chemicals of concern on-site.

- Level D PPE unless a higher level of protection is required will be worn at all times on the site. Potentially exposed personnel will wash gloves, hands, face and other pertinent items to prevent hand-to-mouth contact. This will be done prior to hand-to-mouth activities including eating, smoking, etc.
- Adequate personnel and equipment decontamination will be used to decrease potential ingestion and inhalation.

Check applicable personal protection gear to be used:

X	Hardhat (if overhead hazards, or client requests)
X	Steel-toed boots (if crushing hazards are a potential or if client requests)
X	Safety glasses (if dust, particles, or other hazards are present or client requests)
X	Hearing protection (if it is difficult to carry on a conversation 3 feet away)
X	Chemical resistant boots or boot covers

Gloves (specify):

X	Nitrile
	Latex
	Liners
	Leather
X	Other (specify) -Leather gloves or similar may be used if covered with outer glove or not worn when chance of coming into contact with fluids from wells.

Protective clothing:

	Tyvek (if dry conditions are encountered, Tyvek is sufficient)
	Saranex (personnel shall use Saranex if liquids are handled or splash may be an issue)
	Cotton
X	Rain gear (as needed)
X	Layered warm clothing (as needed)

Inhalation hazard protection:

X	Level D
X	Level C (respirators with organic vapor/HEPA or P100 filters) – only if needed as indicated by air monitoring)

8.1 Personal Protective Equipment Inspections

PPE clothing ensembles designated for use during site activities shall be selected to provide protection against known or anticipated hazards. However, no protective garment, glove or boot is entirely chemical-resistant, nor does any PPE provide protection against all types of hazards. To obtain optimum performance from PPE, site personnel shall be trained in the proper use and inspection of PPE. This training shall include the following:

- Inspect PPE before and during use for imperfect seams, non-uniform coatings, tears, poorly functioning closures or other defects. If the integrity of the PPE is compromised in any manner, proceed to the contamination reduction zone and replace the PPE.
- Inspect PPE during use for visible signs of chemical permeation such as swelling, discoloration, stiffness, brittleness, cracks, tears or other signs of punctures. If the integrity of the PPE is compromised in any manner, proceed to the contamination reduction zone and replace the PPE.
- Disposable PPE should not be reused after breaks unless it has been properly decontaminated.

8.2 Respirator Selection, Use and Maintenance

If respirators are required, site personnel shall be trained before use on the proper use, maintenance and limitations of respirators. Additionally, they must be medically qualified to wear a respiratory protection in accordance with 29 CFR 1910.134. Site personnel who will use a tight-fitting respirator must have passed a qualitative or quantitative fit test conducted in accordance with an OSHA-accepted fit test protocol. Fit testing must be repeated annually or whenever a new type of respirator is used. Respirators will be stored in a protective container.

8.3 Respirator Cartridges

If site personnel are required to wear air-purifying respirators, the appropriate cartridges shall be selected to protect personnel from known or anticipated site contaminants. The respirator/cartridge combination shall be certified and approved by the National Institute for Occupational Safety and Health (NIOSH). A cartridge change-out schedule shall be developed based on known site contaminants, anticipated contaminant concentrations and data supplied by the cartridge manufacturer related to the absorption capacity of the cartridge for specific contaminants. Site personnel shall be made aware of the cartridge change-out schedule prior to the initiation of site activities. Site personnel shall also be instructed to change respirator cartridges if they detect increased resistance during inhalation or detect vapor breakthrough by smell, taste or feel, although breakthrough is not an acceptable method of determining the change-out schedule.

8.4 Respirator Inspection and Cleaning

The Site Safety and Health Supervisor shall periodically (weekly) inspect respirators at the project site. Site personnel shall inspect respirators prior to each use in accordance with the manufacturer's instructions. In addition, site personnel wearing a tight-fitting respirator shall perform a positive and negative pressure user seal check each time the respirator is donned, to ensure proper fit and function. User seal checks shall be performed in accordance with the GeoEngineers respiratory protection program or the respirator manufacturer's instructions.

9.0 ADDITIONAL ELEMENTS

9.1 Cold Stress Prevention

Working in cold environments presents many hazards to site personnel and can result in frost nip (superficial freezing of the skin), frost bite (deep tissue freezing), or hypothermia (lowering of the core body temperature).

The combination of wind and cold temperatures increases the degree of cold stress experienced by site personnel. Site personnel shall be trained on the signs and symptoms of cold-related illnesses, how the human body adapts to cold environments, and how to prevent the onset of cold-related illnesses. Heated break areas and warm beverages shall be provided during periods of cold weather. Employees should review GeoEngineers Heat Stress program.

9.2 Heat Stress Prevention

State and federal OSHA regulations provide specific requirements for handling employee exposure to heat stress. GeoEngineers' program complies with these requirements and will be implemented in all areas where heat stress is identified as a potential health issue.

9.2.1 Minimize Exposure to Extreme Temperatures

Where acceptable temperature cannot be maintained, all outdoor work should be scheduled so as to minimize exposure to extreme temperatures.

9.2.2 Monitoring

Temperature, Heat Index, and conditions in the work area should be monitored by supervisory personnel.

9.2.3 Appropriate Dress

Employees are required to dress appropriately for the relevant working conditions, including normal weather extremes. Limiting the time of exposure and wearing protective clothing will reduce the dangers of exposure to heat. Clothing should:

- Be constructed of an absorbent, close-weave material that doesn't allow penetration of sunlight; and
- Be worn in light layers that can be adjusted for comfort.

9.2.4 Preventive Measures for Working Outdoors

The following measures are to be implemented to protect employees working outdoors:

- Use of a range of sunscreens (with high protection factor) that are persistent on the skin irrespective of humidity and perspiration.
- Encouragement of the application of a sunscreen 15 minutes prior to exposure.
- Encouragement of regular re-application of sunscreen throughout the day.
- Use of safety sunglasses (where lighting is not an issue).

9.2.5 Appropriate Dress

Employees shall retire to shaded or cooled areas for rest breaks when possible.

9.2.6 Rest Breaks

When cool down is required, employees shall take rest breaks in a shaded or cooled area.

9.2.7 Drinking Water

Ensure an adequate supply of cool drinking water for the employees to replace water lost through perspiration. It is essential that water intake be approximately equal to the amount of sweat produced to avoid dehydration. Most workers exposed to hot conditions drink fewer fluids than needed because of an insufficient thirst drive. A worker, therefore, should not depend on thirst to signal when and how much to drink.

- Fluids shall be replaced approximately every 20 minutes in amounts of at least one gallon per day.
- Water shall be kept cool throughout the operation.
- Electrolyte replacement shall be in the form of a commercial electrolyte replacement drink (that is, Gatorade or equivalent).
- Avoid alcohol and caffeine (including coffee and tea), which contribute to dehydration.

9.2.8 Air Conditioning

Minimize humidity in the work environment to improve sweat evaporation from the surface of the skin. This can be accomplished by air conditioning or dehumidification. Cooling by the evaporation of sweat lets the body reduce its temperature; evaporation proceeds more quickly and the cooling effect is more pronounced within increasing air speed and low relative humidity. When possible, vehicle and work areas should be equipped with air conditioning.

9.2.9 Reduce Physical Demands

Increase work during high temperatures can add stress to the body. Reduce physical demands of work task when possible through mechanical means such as hoists, hand trucks, lift-tables etc.

9.2.10 Steps to Prevent Heat Stress

Steps to help prevent heat stress include:

- Consider a worker's physical condition when determining fitness to work in hot environments. Obesity, lack of conditioning, pregnancy and inadequate rest can increase susceptibility to heat stress.
- Certain medical conditions (such as heart conditions) or treatments (such as low-sodium diets and some medications) increase the risk from heat exposure.
- Seek medical advice when symptoms of heat stress appear.
- Schedule strenuous physical activity at the beginning and end of the day, when external temperatures may be cooler.
- Provide portable water sprayers so that employees can cool down skin surfaces.
- Provide whole-body cooling devices such as ice vests with frozen packs or recirculation systems.

10.0 MISCELLANEOUS

10.1 Emergency Response

Indicate what site-specific procedures you will implement.

- Personnel on-site will be working with other GeoEngineers staff and subcontractors. Field personnel should carry a cell phone programmed with the GEI office number should it be necessary to communicate to others regarding emergencies.
- If any member of the field crew experiences any adverse exposure symptoms while on-site, the entire field crew should immediately halt work and act according to the instructions provided by the Site Safety and Health Supervisor.
- The discovery of any condition that would suggest the existence of a situation more hazardous than anticipated should result in the evacuation of the field team, contact of the PM, and reevaluation of the hazard and the level of protection required.
- If an accident occurs, the Site Safety and Health Supervisor and the injured person are to complete, within 24 hours, an Incident Report via Safety Hub for submittal to the PM, the Health and Safety Program Manager and Human Resources. The PM should ensure that follow-up action is taken to correct the situation that caused the accident or exposure.

10.2 Personnel Medical Surveillance

GeoEngineers employees are not in a medical surveillance program because they do not fall into the category of "Employees Covered" in OSHA 1910.120(f)(2), which states a medical surveillance program is required for the following employees:

1. All employees who are or may be exposed to hazardous substances or health hazards at or above the permissible exposure limits or, if there is no permissible exposure limit, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more a year;
2. All employees who wear a respirator for 30 days or more a year or as required by state and federal regulations;
3. All employees who 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 operation; and
4. Members of HAZMAT teams.

10.3 Spill Containment Plans (Drum and Container Handling)

If fluid from the wells is spelled onto the ground the area should be identified and noted in the field report, If significant volume of fluid is spilled absorbent (such as cat litter) should be applied to the spill area and the project manager contacted. Spent absorbent material will need to be stored within the ecology block wall enclosure.

10.4 Sampling, Managing and Handling Drums and Containers

Drums and containers used during the cleanup shall meet the appropriate Department of Transportation (DOT), OSHA and U.S. Environmental Protection Agency (EPA) regulations for the waste that they contain. Site operations shall be organized to minimize the amount of drum or container movement. When practicable, drums and containers shall be inspected and their integrity shall be ensured before they are moved. Unlabeled drums and containers shall be considered to contain hazardous substances and handled accordingly until the contents are positively identified and labeled. Before drums or containers are moved, all employees involved in the transfer operation shall be warned of the potential hazards associated with the contents.

Drums or containers and suitable quantities of proper absorbent shall be kept available and used where spills, leaks or rupture may occur. Where major spills may occur, a spill containment program shall be implemented to contain and isolate the entire volume of the hazardous substance being transferred. Fire extinguishing equipment shall be on hand and ready for use to control incipient fires.

10.6 Sanitation

Water should be available in the decontamination area for washing. Water will be brought to the Site and the decontamination area will be setup near the field vehicle(s).

11.0 DOCUMENTATION TO BE COMPLETED FOR HAZWOPER PROJECTS

The following forms are required for Hazardous Waste Operations and Emergency Response (HAZWOPER) projects:

- Field Log
- Health and Safety Plan acknowledgment by GeoEngineers employees (Form 2)
- Contractors Health and Safety Plan Disclaimer (Form 3)
- Conditional forms available at GeoEngineers office: Accident Report

NOTE: The Field Report is to contain the following information:

- Updates on hazard assessments, field decisions, conversations with subcontractors, client or other parties, etc.;
- Air monitoring/calibration results, including: personnel, locations monitored, activity at the time of monitoring, etc.;
- Actions taken;
- Action level for upgrading PPE and rationale; and
- Meteorological conditions (temperature, wind direction, wind speed, humidity, rain, snow, etc.).

12.0 DOCUMENTATION EXPECTED TO BE COMPLETED

NOTE: The Field Log is to contain the following information:

- Updates on hazard assessments, field decisions, and conversations with subs, client or other parties.
- Actions taken
- Meteorological conditions (temperature, wind direction, wind speed, humidity, rain, snow, etc.).
- Required forms:
    - Field Log
    - FORM 1. Health & Safety Meeting
    - FORM 2. Site Safety Plan – Geoengineers' Employee Acknowledgment
    - FORM 3. Subcontractor And Site Visitor Site Safety Form

13.0 APPROVALS

1.	Plan Prepared	Signature	March 18, 2022 Date
2.	Plan Approval	Project Manager	March 18, 2022 Date
3.	Health & Safety Officer	Connor Jordan on behalf of Mary Lou Sullivan Connor Jordan on behalf of Mary Lou Sullivan (Mar 18, 2022 14:56 PDT) Health & Safety Program Manager	March 18, 2022 Date

HASP FORM 1
HEALTH AND SAFETY BRIEFING
SUPPLEMENTAL DATA COLLECTION FIELD INVESTIGATION
FORMER R.G. HALEY WOOD TREATMENT SITE
FILE NO. 0356-114-08

Inform employees, contractors and subcontractors or their representatives about:

- The nature, level, and degree of exposure to hazardous substances they're likely to encounter;
- Emergency response procedures; and
- Any identified potential fire, explosion, or other health or safety hazards, and associated safe work practices.

Date	Topics	Attendee	Company Name	Employee Initials

HASP FORM 2
SITE SAFETY PLAN – GEOENGINEERS' EMPLOYEE ACKNOWLEDGMENT
FORMER R.G. HALEY WOOD TREATMENT SITE
FILE NO. 0356-114-08

(All GeoEngineers' Site workers shall complete this form, which should remain attached to the Safety Plan and filed with other project documentation).

I hereby verify that a copy of the current Safety Plan has been provided by GeoEngineers, Inc., for my review and personal use. I have read the document completely and acknowledge an understanding of the safety procedures and protocol for my responsibilities on Site. I agree to comply with all required, specified safety regulations and procedures.

Print Name	**Signature**	**Date**

HASP FORM 3
SUBCONTRACTOR AND SITE VISITOR SITE SAFETY FORM
FORMER R.G. HALEY WOOD TREATMENT SITE
FILE NO. 0356-114-08

I verify that a copy of the current Site Safety Plan has been provided by GeoEngineers, Inc. to inform me of the hazardous substances on Site and to provide safety procedures and protocols that will be used by GeoEngineers' staff at the Site. By signing below, I agree that the safety of my employees is the responsibility of the undersigned company.

Print Name	Signature	Firm	Date

APPENDIX D
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): R.G. Haley/Cornwall Landfill

Location: Bellingham, Washington

Project Lead/Organization: City of Bellingham

County: Whatcom

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

2. CULTURAL RESOURCE DISCOVERIES

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

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

toys, food containers, and other items associated with homes or farming sites.

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

3. 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:	Craig Mueller, PE	Name:	Chad Schulhauser, PE
Organization:	City of Bellingham	Organization:	City of Bellingham
Office:	360-778-7922	Office:	360-778-7910
Mobile:	615-238-0336	Mobile:	360-306-0158
Email:	camueller@cob.org	Email:	cmschulhauser@cob.org

Ecology Contacts (completed by Ecology Project Manager)

Ecology Project Manager

Name: Lucy McInerney
Program: Toxics Cleanup Program
Desk: 206-594-0123
Cell: 425-410-1400
Email: lucy.mcinerney@ecy.wa.gov

Alternate or Cultural Resource Contact

Name: Lucy McInerney
Program: Toxics Cleanup Program
Phone: 206-594-0123
Cell: 425-410-1400
Email: lucy.mcinerney@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: Lummi Nation
Name: Lena Tso
Title: Tribal Historic Preservation Officer
Phone: 360-312-2257
Email: lenat@lummi-nsn.gov

Tribe: Samish Indian Nation
Name: Jackie Ferry
Title: Tribal Historic Preservation Officer
Phone: 360-293-6404, Ext.126
Email: jferry@samishtribe-nsn.gov

Tribe: Nooksack Tribe
Name: Trevor Delgado.
Title: Tribal Historic Preservation Officer
Phone: 360-592-5140, Ext 3234
Email: tdelgado@nooksack-nsn.gov

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:

Agency:
Name:
Title:
Phone:
Email:

State Agency:

Agency:
Name:
Title:
Phone:
Email:

6. SPECIAL PROCEDURES FOR THE DISCOVERY OF HUMAN SKELETAL REMAINS

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

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

Guy Tasa, PhD State Physical Anthropologist
Guy.Tasa@dahp.wa.gov
(360) 790-1633 (Cell/Office)

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

1. Notify law enforcement and the Medical Examiner/Coroner using the contacts 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:
     Whatcom County Medical Examiner; 360-738-4557
   - Local Law Enforcement main name and phone:
     City of Bellingham Police Department; 360-778-8800
   - Local Non-Emergency phone number (911 if without a non-emergency number):
     See City of Bellingham Police Department phone number

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

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

Cultural features, horizons, and artifacts detected in buried sediments may require the archaeologist to conduct further evaluation using hand-dug test units. They will excavate units in a controlled fashion to expose features, collect samples from

undisturbed contexts, or to interpret complex stratigraphy. They may also use a test unit or trench excavation to determine if an intact occupation surface is present. They will only use test units when necessary to gather information on the nature, extent, and integrity of subsurface cultural deposits to evaluate the site's significance. They will conduct excavations using standard archaeological techniques to precisely document the location of cultural deposits, artifacts, and features.

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

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

The archaeologist will analyze, catalogue, and temporarily curate all prehistoric and historic artifacts collected from the surface and from probes and excavation units. The ultimate disposition of cultural materials will be determined in consultation with the federal agencies (if any), DAHP, 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 site and available by request to any party.
- This IDP is implemented to address any discovery at the site.

- That all field staff, contractors, and volunteers are instructed on how to implement this IDP.

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

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

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

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). These are examples of above ground cultural resources.*

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

Implement the IDP if you see…

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

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

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

Shell Midden pocket in modern fill discovered in sewer trench.

Underground oven. Courtesy of DAHP.

Shell Midden with fire cracked rock.

Hearth excavated near Hamilton, WA.

Implement the IDP if you see…

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

Examples are:

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

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

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

Implement the IDP if you see…

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

Examples are:

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

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

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

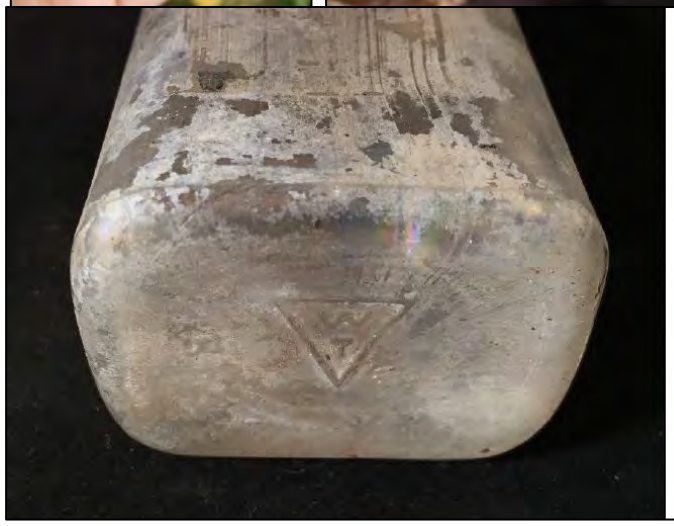
Implement the IDP if you see…

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

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

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

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



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

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

Implement the IDP if you see…

Historic foundations or buried structures.

Examples are:

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

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

Implement the IDP if you see…

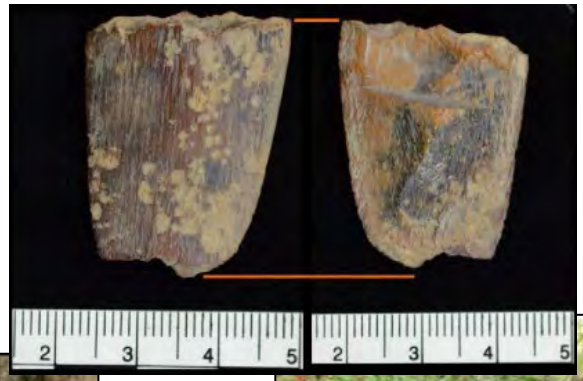
Potential human remains.

Examples are:

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

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!*

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