Appendix C

Memo

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To: Sandy Smith, PE, LG, LHG (Washington Department of Ecology [Ecology])

From: Troy Bussey, PE, LG, LHG and Joel Hecker, LG, LHG (PIONEER Technologies Corporation [PIONEER])

CC: Melisa Bod, Rob Healy, and Dave Meyers (Port of Tacoma [Port])

Date: March 13, 2025

Subject: Site-Wide Plans: SL Calculations, QAPP, HASP, IDP
Earley Business Center (EBC) Site
Agreed Order No. DE 9553, Facility/Site No. 9762715, Cleanup Site No. 2395
401 Alexander Avenue, Tacoma, Washington 98421

The following planning documents are included as a package to support remedial investigation (RI) and interim action (IA) activities at the EBC site (Site):

1. Screening Level (SL) Calculations Memo
2. Quality Assurance Project Plan (QAPP)
3. PIONEER Health and Safety Plan (HASP)
4. Inadvertent Discovery Plan (IDP)

These four Site-wide plans are living "evergreen" documents that will be revised/updated as necessary as RI and IA activities progress, conditions change, and new information is obtained. Revisions are summarized in the table below.

Rev. No.	Date	Revision Summary
N/A	11/12/24	Original version of this document.
1.	3/13/25	SL Calculations: Updated SLs based on January 2025 CLARC update. Updated Puget Sound-specific free cyanide SLs. Updated tributyltin oxide CAS number. QAPP: Updated text referencing WAC 173-340-830 requirements. Updated information for cyanide and cPAH analyses. Updated sensitivity analysis based on the updated SLs. IDP: Updated Ecology Alternate Contact and Section 11 (Additional Information).
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6.		

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From: Troy Bussey, PE, LG, LHG and Joel Hecker, LG, LHG (PIONEER Technologies Corporation)

CC: Melisa Bod, Dave Myers, and Rob Healy (Port of Tacoma [Port])

Date: March 13, 2025

Subject: Screening Level Calculations
Earley Business Center (EBC) Site
Agreed Order No. DE 9553, Facility/Site No. 9762715, Cleanup Site No. 2395
401 Alexander Avenue, Tacoma, Washington 98421

The purpose of this memo is to present the calculations of groundwater, surface water, soil, indoor air, and sub-slab soil gas screening levels (SLs) to support forthcoming remedial investigation (RI) and interim action (IA) activities at the EBC site (Site). The constituents of interest (COIs) and associated SLs in this memo were developed with the intent to provide a comprehensive list of likely and reasonably possible analytes that will or may be analyzed during future RI and IA activities at the Site.[1] As the RI and IA activities become better defined and/or new Site information is obtained, this memo will be updated as necessary. For instance, it is anticipated this memo would be updated (1) when Ecology's Cleanup Levels and Risk Calculation (CLARC) database updates affect SLs included in this memo, (2) if new Site COIs are identified, (3) if additional media will be sampled (e.g., sediment), or (4) if site-specific data is collected to calculate site-specific SLs (e.g., site-specific distribution coefficient data per WAC 173-340-747(5)(b), synthetic precipitation leaching procedure leaching tests for metals per WAC 173-340-747(7)(a) through (c), empirical demonstration of the soil-to-groundwater transport pathway per WAC 173-340-747(9), or empirical demonstration of the soil-to-groundwater residual saturation criteria per WAC 173-340-747(10)(c)). Although SLs for some potential key COIs are substantially lower than practical quantitation limits (PQLs) that certified laboratories can achieve with approved analytical methods, PQL adjustments to SLs were not made at this time.[2] However, pursuant to Model Toxics Control Act (MTCA) regulations, the required PQL adjustments will be made as necessary when constituents of concern and cleanup levels are defined in the future.[3]

Constituents of Interest

The COIs were identified based on (1) constituents associated with former or current on-site operations (e.g., shipbuilding,[4] usage of various petroleum products, general industrial operations), (2) constituents associated with off-

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[1] For a given Sampling and Analysis Plan, the applicable COIs will be determined based on the objectives and nature of the investigation activities.

[2] For instance, the groundwater SL for total polychlorinated biphenyls (PCBs) and the groundwater and soil SLs for total carcinogenic polycyclic aromatic hydrocarbons (cPAHs) are several orders of magnitude lower than the corresponding target PQLs presented in the Quality Assurance Project Plan.

[3] For example, Ecology's Southwest Region approved a PQL-adjusted groundwater SL of 0.01 ug/L for total PCBs for an IA at the Rayonier Mill site (GeoEngineers 2021).

[4] According to an United States Environmental Protection Agency (USEPA) review of the shipbuilding and repair industry, key shipbuilding and repair industry COIs based on typical operations and waste streams are volatile organic compounds (VOCs), metals, cyanide, total petroleum hydrocarbons (TPH), and tributyltin (USEPA 1997). The constituents most released to the environment by the shipbuilding and repair industry in

site releases from the Occidental Chemical Corporation that have impacted the Site (e.g., VOCs), (3) COIs identified by the Ecology Site Manager in draft 2020 comments on the 2016 Site Remedial Investigation/Feasibility Study Report (Ecology 2020),[5] and (4) laboratory analyses conducting during previous Site investigation activities. The Site COIs included in this memo for each medium are summarized below and listed in Tables 1 through 4:

- The COIs for groundwater, surface water, and soil are VOCs, TPH, metals (i.e., antimony, arsenic, barium, cadmium, trivalent chromium, hexavalent chromium, total chromium, copper, lead, manganese, mercury, nickel, selenium, silver, and zinc), cyanide, PCBs, SVOCs (which include PAHs), dioxins/furans, organotins, and pesticides (see Tables 1 and 2).
- The COIs Indoor air and sub-slab soil gas COIs are VOCs, TPH, and 1-methylnaphthalene (see Tables 3 and 4).

Screening Levels

Preliminary screening levels (SLs) were calculated for COIs at this industrial property in accordance with MTCA regulations by conservatively assuming the following transport and exposure pathways are complete and significant:

- The groundwater-to-surface water transport and surface water-related exposure pathways;
- The groundwater-to-indoor air transport pathway for volatile VOIs and vapor intrusion (VI) exposure pathways;
- The soil-to-groundwater transport and aforementioned groundwater-related exposure pathways; and
- The soil direct contact exposure pathways.

The groundwater SLs are presented in Table 1 and are the most stringent of the following:

- Surface water SLs for marine waters calculated in accordance with Washington Administrative Code (WAC) 173-340-730(3)(b)(i) through (iii) and current CLARC values (Ecology 2025), subject to any necessary adjustments in WAC 173-340-730(5)(b) and (c) (see Table 1a).
- The most stringent of the carcinogenic and non-carcinogenic values in the CLARC database (Ecology 2025) for the Standard Method C groundwater VI SLs (see Table 1b).

The surface water SLs were calculated as mentioned above (see Table 1a).

The soil SLs are presented in Table 2 and are the most stringent of the following:

- The soil-to-groundwater SLs calculated using (1) the MTCA fixed parameter three-phase partitioning model in WAC 173-340-747(4), (2) the target groundwater SLs presented in Table 1, and (3) current physiochemical properties in CLARC (Ecology 2025), subject to (1) any necessary residual saturation adjustments required by WAC 173-340-747(10), and/or (2) any necessary adjustments in WAC 173-340-740(5)(b) and (c) (see Table 2a).
- Standard Method C soil cleanup levels calculated in accordance with WAC 173-340-745(5)(b)(iii)(B) and current CLARC values (Ecology 2025), subject to any necessary adjustments in WAC 173-340-745(6)(b) and (c) (see Table 2b).

1995 (based upon USEPA toxic release inventory data) were xylenes, n-butyl alcohol, toluene, methyl ethyl ketone (2-butanone), methyl isobutyl ketone (4-methyl-2-pentanone), zinc, copper, and styrene (USEPA 1997). All COIs mentioned in this footnote are included In the Site COI list.

[5] COIs identified by the Ecology Site Manager were TPH and associated analyses in Table 830-1 of MTCA regulations, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), specific metals (i.e., arsenic, barium, cadmium, chromium, copper, lead, manganese, mercury, selenium, silver, zinc), semi-volatile organic compounds (SVOCs), cyanide, hexavalent chromium, and chlorinated dibenzo-p-dioxins and chlorinated dibenzofurans (dioxins/furans). All COIs mentioned in this footnote are included In the Site COI list.

The indoor air SLs (see Table 3) and sub-slab soil gas SLs (see Table 4) are the most stringent of the carcinogenic and non-carcinogenic values in the CLARC database (Ecology 2025) for the Standard Method C indoor air VI cleanup levels and Standard Method C soil gas VI SLs, respectively.

References

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Enclosures

Table 1	Calculation of Preliminary Groundwater Screening Levels
Table 1a	Calculation of Surface Water Screening Levels
Table 1b	Calculation of Groundwater Vapor Intrusion Screening Levels
Table 2	Calculation of Preliminary Soil Screening Levels
Table 2a	Calculation of Preliminary Soil-to-Groundwater Screening Levels
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Table 2c	Calculation of Saturated Zone Soil-to-Groundwater Screening Levels
Table 3	Calculation of Preliminary Indoor Air Screening Levels
Table 4	Calculation of Preliminary Sub-Slab Soil Gas Screening Levels

Table 1: Calculation of Preliminary Groundwater Screening Levels

Constituent Category	CAS No.	Constituent	Surface Water SL [1] (ug/L)	Groundwater VI SL for Industrial Properties [2] (ug/L)	Preliminary Groundwater SL [3] (ug/L)	Adjustment Note [4]
VOCs	630-20-6	1,1,1,2-Tetrachloroethane	--	71	71	
	71-55-6	1,1,1-Trichloroethane	50,000	12,000	12,000	
	79-34-5	1,1,2,2-Tetrachloroethane	0.30	59	0.30	
	76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	--	360	360	
	79-00-5	1,1,2-Trichloroethane	0.90	11	0.90	
	75-34-3	1,1-Dichloroethane	--	110	110	
	75-35-4	1,1-Dichloroethene	4,000	280	280	
	563-58-6	1,1-Dichloropropene	--	--	No Value	
	87-61-6	1,2,3-Trichlorobenzene	--	--	No Value	
	96-18-4	1,2,3-Trichloropropane	--	44	44	
	120-82-1	1,2,4-Trichlorobenzene	0.037	84	0.037	(4)
	95-63-6	1,2,4-Trimethylbenzene	--	520	520	
	96-12-8	1,2-Dibromo-3-Chloropropane	--	1.6	1.6	
	106-93-4	1,2-Dibromoethane	--	3.0	3.0	
	95-50-1	1,2-Dichlorobenzene	800	5,500	800	
	107-06-2	1,2-Dichloroethane	73	35	35	
	78-87-5	1,2-Dichloropropane	3.1	61	3.1	
	108-67-8	1,3,5-Trimethylbenzene	--	370	370	
	541-73-1	1,3-Dichlorobenzene	2.0	--	2.0	
	142-28-9	1,3-Dichloropropane	--	--	No Value	
	106-46-7	1,4-Dichlorobenzene	200	50	50	
	540-36-3	1,4-Difluorobenzene	--	--	No Value	
	594-20-7	2,2-Dichloropropane	--	--	No Value	
	78-93-3	2-Butanone	--	3,700,000	3,700,000	
	110-75-8	2-Chloroethyl vinyl ether	--	--	No Value	
	95-49-8	2-Chlorotoluene	--	--	No Value	
	591-78-6	2-Hexanone	--	16,000	16,000	
	107-87-9	2-Pentanone	--	--	No Value	
	460-00-4	4-Bromofluorobenzene	--	--	No Value	
	106-43-4	4-Chlorotoluene	--	--	No Value	
	108-10-1	4-Methyl-2-Pentanone	--	1,000,000	1,000,000	
	67-64-1	Acetone	--	--	No Value	
	107-02-8	Acrolein	1.1	6.4	1.1	(4)
	107-13-1	Acrylonitrile	0.028	120	0.028	(4)
	71-43-2	Benzene	1.6	24	1.6	
	108-86-1	Bromobenzene	--	1,400	1,400	
	74-97-5	Bromochloromethane	--	--	No Value	
	75-27-4	Bromodichloromethane	2.8	14	2.8	
	75-25-2	Bromoform	12	2,200	12	
	74-83-9	Bromomethane	970	24	24	
	75-15-0	Carbon Disulfide	--	1,800	1,800	
	56-23-5	Carbon tetrachloride	0.35	6.2	0.35	
	108-90-7	Chlorobenzene	200	750	200	
	75-00-3	Chloroethane	--	32,000	32,000	
	67-66-3	Chloroform	560	12	12	
	74-87-3	Chloromethane	--	330	330	
	156-59-2	cis-1,2-Dichloroethene	--	400	400	
	542-75-6	cis-1,3-Dichloropropene	1.2	80	1.2	
	108-94-1	Cyclohexanone	--	4,500,000	4,500,000	
	124-48-1	Dibromochloromethane	2.2	--	2.2	
	74-95-3	Dibromomethane	--	210	210	
	75-71-8	Dichlorodifluoromethane	--	9.2	9.2	
	100-41-4	Ethylbenzene	21	6,100	21	
	87-68-3	Hexachloro-1,3-butadiene	0.010	6.4	0.010	(4)
	74-88-4	Iodomethane	--	--	No Value	
	98-82-8	Isopropylbenzene	--	2,000	2,000	
	99-87-6	Isopropyltoluene	--	190	190	
	108-38-3	m,p-Xylene	--	--	No Value	
	1634-04-4	Methyl tert-Butyl Ether	--	8,600	8,600	
	75-09-2	Methylene chloride	100	7,100	100	
	91-20-3	Naphthalene [5]	4,900	88	88	
	104-51-8	n-Butylbenzene	--	--	No Value	
	110-54-3	n-Hexane	--	16	16	
	103-65-1	n-Propylbenzene	--	4,900	4,900	
	95-47-6	o-Xylene	--	--	No Value	
	363-72-4	Pentafluorobenzene	--	--	No Value	
	135-98-8	sec-Butylbenzene	--	--	No Value	
	100-42-5	Styrene	--	19,000	19,000	
	98-06-6	tert-Butylbenzene	--	--	No Value	
	127-18-4	Tetrachloroethene	2.9	100	2.9	
	108-88-3	Toluene	102	34,000	102	
	1330-20-7	Total Xylenes [6]	106	710	106	
	156-60-5	trans-1,2-Dichloroethene	1,000	170	170	
	542-75-6	trans-1,3-Dichloropropene	1.2	80	1.2	
	110-57-6	trans-1,4-Dichloro 2-Butene	--	--	No Value	
	79-01-6	Trichloroethene	0.70	8.6	0.70	
	75-69-4	Trichlorofluoromethane	--	260	260	
	108-05-4	Vinyl Acetate	--	18,000	18,000	
	75-01-4	Vinyl Chloride	0.18	3.3	0.18	(4)
	71-36-3	n-Butyl Alcohol	--	--	No Value	
TPH	unavailable25	TPH-G (benzene present)	1,700	--	1,700	
	unavailable08	TPH-G (no detectable benzene)	1,700	--	1,700	
	unavailable09	TPH-D (weathered) [7]	2,100	--	2,100	
	unavailable09UW	TPH-D (unweathered) [7]	50	--	50	
	unavailable10	TPH-HO [7]	--	--	No Value	

Table 1: Calculation of Preliminary Groundwater Screening Levels

Constituent Category	CAS No.	Constituent	Surface Water SL [1] (ug/L)	Groundwater VI SL for Industrial Properties [2] (ug/L)	Preliminary Groundwater SL [3] (ug/L)	Adjustment Note [4]
Metals	7440-36-0	Antimony	90	--	90	
	7440-38-2	Arsenic	8.0	--	8.0	
	7440-39-3	Barium	--	--	No Value	
	7440-43-9NP	Cadmium	7.9	--	7.9	
	16065-83-1	Chromium (III) [8]	240,000	--	240,000	
	18540-29-9	Chromium (VI) [8]	4.1	--	4.1	(4)
	7440-47-3	Total Chromium [8]	--	--	No Value	
	7440-50-8	Copper	3.1	--	3.1	
	7439-92-1	Lead	8.1	--	8.1	
	7439-96-5	Manganese	100	--	100	
	7439-97-6	Mercury	0.025	--	0.025	(4)
	7440-02-0	Nickel	8.2	--	8.2	
	7782-49-2	Selenium	71	--	71	
	7440-22-4	Silver	0.91	--	0.91	
	7440-66-6	Zinc	81	--	81	
Cyanide	57-12-5	Free Cyanide [9]	2.8	--	2.8	(4)
PCBs	1336-36-3	Total PCBs [6]	0.0000070	--	0.0000070	(4)
SVOCs	120-82-1	1,2,4-Trichlorobenzene	0.037	84	0.037	(4)
	95-50-1	1,2-Dichlorobenzene	800	5,500	800	
	541-73-1	1,3-Dichlorobenzene	2.0	--	2.0	
	106-46-7	1,4-Dichlorobenzene	200	50	50	
	90-12-0	1-Methylnaphthalene	--	0.37	0.37	
	108-60-1	2,2'-Oxybis(1-chloropropane)	370	--	370	
	95-95-4	2,4,5-Trichlorophenol	600	--	600	
	88-06-2	2,4,6-Trichlorophenol	0.28	--	0.28	(4)
	120-83-2	2,4-Dichlorophenol	10.0	--	10.0	
	105-67-9	2,4-Dimethylphenol	97	--	97	
	51-28-5	2,4-Dinitrophenol	100	--	100	
	121-14-2	2,4-Dinitrotoluene	0.18	--	0.18	(4)
	606-20-2	2,6-Dinitrotoluene	--	--	No Value	
	91-58-7	2-Chloronaphthalene	100	--	100	
	95-57-8	2-Chlorophenol	17	--	17	
	91-57-6	2-Methylnaphthalene	--	--	No Value	
	95-48-7	2-Methylphenol	--	--	No Value	
	88-74-4	2-Nitroaniline	--	--	No Value	
	88-75-5	2-Nitrophenol	--	--	No Value	
	91-94-1	3,3'-Dichlorobenzidine	0.0033	--	0.0033	(4)
	99-09-2	3-Nitroaniline	--	--	No Value	
	534-52-1	4,6-Dinitro-2-methylphenol	7.0	--	7.0	
	101-55-3	4-Bromophenyl phenyl ether	--	--	No Value	
	59-50-7	4-Chloro-3-Methylphenol	36	--	36	
	106-47-8	4-Chloroaniline	--	--	No Value	
	7005-72-3	4-Chlorophenylphenyl ether	--	--	No Value	
	106-44-5	3&4-Methylphenol	--	--	No Value	
	100-01-6	4-Nitroaniline	--	--	No Value	
	100-02-7	4-Nitrophenol	--	--	No Value	
	83-32-9	Acenaphthene	30	--	30	
	208-96-8	Acenaphthylene	--	--	No Value	
	120-12-7	Anthracene	100	--	100	
	191-24-2	Benzo(g,h,i)perylene	--	--	No Value	
	65-85-0	Benzoic acid	--	--	No Value	
	100-51-6	Benzyl Alcohol	--	--	No Value	
	111-91-1	Bis(2-Chloroethoxy)methane	--	--	No Value	
	111-44-4	bis(2-chloroethyl) ether	0.060	--	0.060	(4)
	117-81-7	bis(2-Ethylhexyl)phthalate	0.046	--	0.046	(4)
	85-68-7	Butylbenzylphthalate	0.013	--	0.013	(4)
	86-74-8	Carbazole	--	--	No Value	
	132-64-9	Dibenzofuran	--	--	No Value	
	84-66-2	Diethyl phthalate	200	--	200	
	131-11-3	Dimethylphthalate	600	--	600	
	84-74-2	Di-n-Butylphthalate	8.0	--	8.0	
	117-84-0	Di-n-Octylphthalate	--	--	No Value	
	206-44-0	Fluoranthene	6.0	--	6.0	
	86-73-7	Fluorene	10.0	--	10.0	
	118-74-1	Hexachlorobenzene	0.0000050	--	0.0000050	(4)
	87-68-3	Hexachlorobutadiene	0.010	6.4	0.010	(4)
	77-47-4	Hexachlorocyclopentadiene	1.0	--	1.0	
	67-72-1	Hexachloroethane	0.020	--	0.020	(4)
	78-59-1	Isophorone	110	--	110	
	91-20-3	Naphthalene [5]	4,900	88	88	
	98-95-3	Nitrobenzene	100	--	100	
	62-75-9	N-Nitrosodimethylamine	0.34	--	0.34	(4)
	621-64-7	N-Nitroso-di-n-Propylamine	0.058	--	0.058	(4)
	86-30-6	N-Nitrosodiphenylamine	0.69	--	0.69	
	87-86-5	Pentachlorophenol	0.0020	--	0.0020	(4)
	85-01-8	Phenanthrene	--	--	No Value	
	108-95-2	Phenol	70,000	--	70,000	
	129-00-0	Pyrene	8.0	--	8.0	
	50-32-8	Total cPAHs [10]	0.000016	--	0.000016	(4)
Dioxins/ Furans	1746-01-6	Total Dioxins/Furans [10]	5.1E-09	--	5.1E-09	(4)
Organotins	56-35-9	Tributyltin oxide [11]	0.050	--	0.050	(4)

Table 1: Calculation of Preliminary Groundwater Screening Levels

Constituent Category	CAS No.	Constituent	Surface Water SL [1] (ug/L)	Groundwater VI SL for Industrial Properties [2] (ug/L)	Preliminary Groundwater SL [3] (ug/L)	Adjustment Note [4]
Pesticides	72-54-8	4,4´-DDD	0.0000079	--	0.0000079	(4)
	72-55-9	4,4´-DDE	0.00000088	--	0.00000088	(4)
	50-29-3	4,4´-DDT	0.0000012	--	0.0000012	(4)
	309-00-2	Aldrin	0.000000041	--	0.000000041	(4)
	319-84-6	alpha-BHC	0.000048	--	0.000048	(4)
	5103-71-9	alpha-Chlordane	--	--	No Value	
	319-85-7	beta-BHC	0.0014	--	0.0014	(4)
	319-86-8	delta-BHC	--	--	No Value	
	60-57-1	Dieldrin	0.000000070	--	0.000000070	(4)
	959-98-8	Endosulfan I	0.0087	--	0.0087	(4)
	33213-65-9	Endosulfan II	0.0087	--	0.0087	(4)
	1031-07-8	Endosulfan sulfate	10.0	--	10.0	
	72-20-8	Endrin	0.0020	--	0.0020	(4)
	7421-93-4	Endrin aldehyde	0.035	--	0.035	(4)
	53494-70-5	Endrin ketone	--	--	No Value	
	58-89-9	gamma-BHC	0.43	--	0.43	
	5103-74-2	gamma-Chlordane	--	--	No Value	
	76-44-8	Heptachlor	0.00000034	--	0.00000034	(4)
	1024-57-3	Heptachlor epoxide	0.0000024	--	0.0000024	(4)
	72-43-5	Methoxychlor	0.020	--	0.020	(4)
	8001-35-2	Toxaphene	0.000032	--	0.000032	(4)

Notes:

--: No value exists for this constituent in the Cleanup Levels and Risk Calculation (CLARC) database (Ecology 2025). No Value: A screening level cannot be calculated because no values exist in CLARC.

All values are presented as two significant figures in standard notation, except numbers greater than 100 are rounded to a whole number.

[1] See Table 1a for calculation of these screening levels.

[2] See Table 1b for calculation of these screening levels.

[3] The screening level is the most stringent of the screening levels in the two previous columns, unless otherwise noted.

[4] Actual and appropriate PQLs for some constituents will exceed screening levels (e.g., some screening levels are lower than achievable PQLs for approved analytical methods, some PQLs were or will be elevated due to necessary lab dilutions to satisfy lab quality control standards). Constituents expected to have a screening level less than an achievable PQL are preliminarily identified in this table. For current screening purposes, PQL adjustments to screening levels were not made for these constituents or any other constituents. However, pursuant to WAC 173-340-720(7)(c), PQL adjustments will be made as necessary when constituents of concern and cleanup levels are defined in the future.

[5] The data reduction rules for naphthalene results from different analytical methods on the same sample (i.e., USEPA Methods SW846-8260 and SW846-8270) will be: (a) if naphthalene is detected by one or both methods, then the highest detection will be used, and (b) if naphthalene is not detected by either method, then the lower reporting limit will be used.

[6] Xylenes and PCBs will be evaluated on a total basis by summing the individual constituents. Total PCBs are the sum of Aroclors 1016, 1221, 1232, 1242, 1248, 1254, and 1260. The following data reduction rules will be used for compound totaling of non-detect constituents: (a) if one or more individual constituent was detected in a sample, the non-detect constituents will be assumed to equal one-half of the reporting limit, and (b) if no individual constituents were detected in a sample, the sum of the reporting limits for the individual constituents will be used.

[7] In accordance with Ecology guidance (Ecology 2004), if TPH-D and TPH-HO are both detected in a given sample, results will be evaluated as the sum of TPH-D and TPH-HO unless NWTPH-HCID results and/or the chromatogram demonstrate that both petroleum products are present. If TPH-D and TPH-HO are both non-detect in a given sample, the reporting limits will be summed. If one constituent is detected and one constituent is non-detect, the non-detect result will be assigned half the reporting limit in the summation.

[8] Per CLARC notes, sampling for chromium (VI) is recommended "when chromium is likely to be an important contaminant at a site" (e.g., total chromium soil concentrations are greater than Puget Sound natural background concentration of 48 mg/kg). If chromium (VI) is present, then the chromium (III) concentration is determined by subtracting the chromium (VI) concentration from the total chromium concentration. If chromium (VI) is not present, then the total chromium concentration is assumed to be the chromium (III) concentration.

[9] Cyanide values in CLARC are based on free cyanide (i.e., sum of hydrogen cyanide and cyanide ion). Analyses for free cyanide, weak acid dissociable cyanide, or total cyanide are acceptable, although weak acid dissociable cyanide and total cyanide concentrations can overestimate free cyanide concentrations, and therefore could overestimate the potential hazard (Ecology 2025).

[10] Total cPAHs and total dioxins/furans cleanup levels were based on the toxicity of benzo(a)pyrene and 2,3,7,8-tetrachlorodibenzo-p-dioxin, respectively, in accordance with WAC 173-340-708(8). Total cPAHs and total dioxins/furans concentrations will be calculated using MTCA toxicity equivalence factors (TEFs). Non-detect results will be evaluated per the 2001 MTCA Concise Explanatory Statement (Ecology 2001c). If a constituent/congener was detected in any sample in any media, non-detect results for that constituent/congener in other samples will be assumed to equal half of the reporting limit in the TEF calculation. If a constituent/congener was non-detect in all samples from all sampled media, non-detect results for that constituent/congener will be assumed to equal zero in the TEF calculation.

Table 1a: Calculation of Surface Water Screening Levels

Constituent Category	CAS No.	Constituent	Standard Method B Surface Water Value for Carcinogens [1] (ug/L)	Standard Method B Surface Water Value for Non-Carcinogens [1] (ug/L)	Surface Water Value for Acute Marine Aquatic Life 173-201A WAC [1] (ug/L)	Surface Water Value for Acute Marine Aquatic Life CWA §304 [1] (ug/L)	Surface Water Value for Chronic Marine Aquatic Life 173-201A WAC [1] (ug/L)	Surface Water Value for Chronic Marine Aquatic Life CWA §304 [1] (ug/L)	Surface Water Value for Human Health in Marine Waters 173-201A WAC [1] (ug/L)	Surface Water Value for Human Health in Marine Waters 40 CFR 131.45 [1] (ug/L)	Surface Water Value for Human Health in Marine Waters CWA §304 [1] (ug/L)	Surface Water SL [2] (ug/L)	Adjustment Note
	630-20-6	1,1,1,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	No Value	
	71-55-6	1,1,1-Trichloroethane	--	930,000	--	--	--	--	50,000	50,000	200,000	50,000	
	79-34-5	1,1,2,2-Tetrachloroethane	6.5	10,000	--	--	--	--	0.30	0.30	3.0	0.30	
	76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	--	--	--	--	--	--	No Value	
	79-00-5	1,1,2-Trichloroethane	25	2,300	--	--	--	--	0.90	0.90	8.9	0.90	
	75-34-3	1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	No Value	
	75-35-4	1,1-Dichloroethene	--	23,000	--	--	--	--	4,000	4,000	20,000	4,000	
	563-58-6	1,1-Dichloropropene	--	--	--	--	--	--	--	--	--	No Value	
	87-61-6	1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	No Value	
	96-18-4	1,2,3-Trichloropropane	--	--	--	--	--	--	--	--	--	No Value	
	120-82-1	1,2,4-Trichlorobenzene	2.0	230	--	--	--	--	0.037	0.037	0.076	0.037	
	95-63-6	1,2,4-Trimethylbenzene	--	--	--	--	--	--	--	--	--	No Value	
	96-12-8	1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	No Value	
	106-93-4	1,2-Dibromoethane	--	--	--	--	--	--	--	--	--	No Value	
	95-50-1	1,2-Dichlorobenzene	--	4,200	--	--	--	--	800	800	3,000	800	
	107-06-2	1,2-Dichloroethane	59	13,000	--	--	--	--	73	73	650	73	(3)
	78-87-5	1,2-Dichloropropane	43	25,000	--	--	--	--	3.1	--	31	3.1	
	108-67-8	1,3,5-Trimethylbenzene	--	--	--	--	--	--	--	--	--	No Value	
	541-73-1	1,3-Dichlorobenzene	--	--	--	--	--	--	2.0	2.0	10.0	2.0	
	142-28-9	1,3-Dichloropropane	--	--	--	--	--	--	--	--	--	No Value	
	106-46-7	1,4-Dichlorobenzene	22	3,300	--	--	--	--	200	200	900	200	(3)
	540-36-3	1,4-Difluorobenzene	--	--	--	--	--	--	--	--	--	No Value	
	594-20-7	2,2-Dichloropropane	--	--	--	--	--	--	--	--	--	No Value	
	78-93-3	2-Butanone	--	--	--	--	--	--	--	--	--	No Value	
	110-75-8	2-Chloroethyl vinyl ether	--	--	--	--	--	--	--	--	--	No Value	
VOCs	95-49-8	2-Chlorotoluene	--	--	--	--	--	--	--	--	--	No Value	
	591-78-6	2-Hexanone	--	--	--	--	--	--	--	--	--	No Value	
	107-87-9	2-Pentanone	--	--	--	--	--	--	--	--	--	No Value	
	460-00-4	4-Bromofluorobenzene	--	--	--	--	--	--	--	--	--	No Value	
	106-43-4	4-Chlorotoluene	--	--	--	--	--	--	--	--	--	No Value	
	108-10-1	4-Methyl-2-Pentanone	--	--	--	--	--	--	--	--	--	No Value	
	67-64-1	Acetone	--	--	--	--	--	--	--	--	--	No Value	
	107-02-8	Acrolein	--	--	--	--	--	--	1.1	--	400	1.1	
	107-13-1	Acrylonitrile	0.40	86	--	--	--	--	0.028	--	7.0	0.028	
	71-43-2	Benzene	23	2,000	--	--	23	--	1.6	--	16	1.6	
	108-86-1	Bromobenzene	--	--	--	--	--	--	--	--	--	No Value	
	74-97-5	Bromochloromethane	--	--	--	--	--	--	--	--	--	No Value	
	75-27-4	Bromodichloromethane	28	14,000	--	--	--	--	2.8	2.8	27	2.8	
	75-25-2	Bromoform	220	14,000	--	--	--	--	12	12	120	12	
	74-83-9	Bromomethane	--	970	--	--	--	--	2,400	--	10,000	970	
	75-15-0	Carbon Disulfide	--	--	--	--	--	--	--	--	--	No Value	
	56-23-5	Carbon tetrachloride	4.9	550	--	--	--	--	0.35	--	5.0	0.35	
	108-90-7	Chlorobenzene	--	5,000	--	--	--	--	200	200	800	200	
	75-00-3	Chloroethane	--	--	--	--	--	--	--	--	--	No Value	
	67-66-3	Chloroform	56	6,900	--	--	--	--	600	600	2,000	560	(3)
	74-87-3	Chloromethane	--	--	--	--	--	--	--	--	--	No Value	
	156-59-2	cis-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	No Value	
	542-75-6	cis-1,3-Dichloropropene	34	41,000	--	--	--	--	1.2	1.2	12	1.2	
	108-94-1	Cyclohexanone	--	--	--	--	--	--	--	--	--	No Value	
	124-48-1	Dibromochloromethane	21	14,000	--	--	--	--	2.2	2.2	21	2.2	
	74-95-3	Dibromomethane	--	--	--	--	--	--	--	--	--	No Value	

Table 1a: Calculation of Surface Water Screening Levels

Constituent Category	CAS No.	Constituent	Standard Method B Surface Water Value for Carcinogens [1] (ug/L)	Standard Method B Surface Water Value for Non-Carcinogens [1] (ug/L)	Surface Water Value for Acute Marine Aquatic Life 173-201A WAC [1] (ug/L)	Surface Water Value for Acute Marine Aquatic Life CWA §304 [1] (ug/L)	Surface Water Value for Chronic Marine Aquatic Life 173-201A WAC [1] (ug/L)	Surface Water Value for Chronic Marine Aquatic Life CWA §304 [1] (ug/L)	Surface Water Value for Human Health in Marine Waters 173-201A WAC [1] (ug/L)	Surface Water Value for Human Health in Marine Waters 40 CFR 131.45 [1] (ug/L)	Surface Water Value for Human Health in Marine Waters CWA §304 [1] (ug/L)	Surface Water SL [2] (ug/L)	Adjustment Note
VOCs	75-71-8	Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	No Value	
	100-41-4	Ethylbenzene	--	6,900	--	--	21	--	31	31	130	21	
	87-68-3	Hexachloro-1,3-butadiene	30	930	--	--	--	--	0.010	0.010	0.010	0.010	
	74-88-4	Iodomethane	--	--	--	--	--	--	--	--	--	No Value	
	98-82-8	Isopropylbenzene	--	--	--	--	--	--	--	--	--	No Value	
	99-87-6	Isopropyltoluene	--	--	--	--	--	--	--	--	--	No Value	
	108-38-3	m,p-Xylene	--	--	--	--	--	--	--	--	--	No Value	
	1634-04-4	Methyl tert-Butyl Ether	--	--	--	--	--	--	--	--	--	No Value	
	75-09-2	Methylene chloride	590	17,000	--	--	--	--	100	100	1,000	100	
	91-20-3	Naphthalene	--	4,900	--	--	--	--	--	--	--	4,900	
	104-51-8	n-Butylbenzene	--	--	--	--	--	--	--	--	--	No Value	
	110-54-3	n-Hexane	--	--	--	--	--	--	--	--	--	No Value	
	103-65-1	n-Propylbenzene	--	--	--	--	--	--	--	--	--	No Value	
	95-47-6	o-Xylene	--	--	--	--	--	--	--	--	--	No Value	
	363-72-4	Pentafluorobenzene	--	--	--	--	--	--	--	--	--	No Value	
	135-98-8	sec-Butylbenzene	--	--	--	--	--	--	--	--	--	No Value	
	100-42-5	Styrene	--	--	--	--	--	--	--	--	--	No Value	
	98-06-6	tert-Butylbenzene	--	--	--	--	--	--	--	--	--	No Value	
	127-18-4	Tetrachloroethene	100	500	--	--	--	--	2.9	2.9	29	2.9	
	108-88-3	Toluene	--	19,000	--	--	102	--	130	130	520	102	
	1330-20-7	Total Xylenes	--	--	--	--	106	--	--	--	--	106	
	156-60-5	trans-1,2-Dichloroethene	--	33,000	--	--	--	--	1,000	1,000	4,000	1,000	
	542-75-6	trans-1,3-Dichloropropene	34	41,000	--	--	--	--	1.2	1.2	12	1.2	
	110-57-6	trans-1,4-Dichloro 2-Butene	--	--	--	--	--	--	--	--	--	No Value	
	79-01-6	Trichloroethene	4.9	120	--	--	--	--	0.70	0.70	7.0	0.70	
	75-69-4	Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	No Value	
	108-05-4	Vinyl Acetate	--	--	--	--	--	--	--	--	--	No Value	
	75-01-4	Vinyl Chloride	3.7	6,600	--	--	--	--	0.18	0.18	1.6	0.18	
	71-36-3	n-Butyl Alcohol	--	--	--	--	--	--	--	--	--	No Value	
TPH	unavailable25	TPH-G (benzene present)	--	--	--	--	1,700	--	--	--	--	1,700	
	unavailable08	TPH-G (no detectable benzene)	--	--	--	--	1,700	--	--	--	--	1,700	
	unavailable09	TPH-D (weathered)	--	--	--	--	2,100	--	--	--	--	2,100	
	unavailable09U	TPH-D (unweathered)	--	--	--	--	50	--	--	--	--	50	
	unavailable10	TPH-HO	--	--	--	--	--	--	--	--	--	No Value	
Metals	7440-36-0	Antimony	--	1,000	--	--	--	--	90	90	640	90	
	7440-38-2	Arsenic	0.0046	3.5	69	69	36	36	0.14	0.14	0.14	8.0	(4)
	7440-39-3	Barium	--	--	--	--	--	--	--	--	--	No Value	
	7440-43-9NP	Cadmium	--	41	33	33	7.9	7.9	--	--	--	7.9	
	16065-83-1	Chromium (III)	--	240,000	--	--	--	--	--	--	--	240,000	
	18540-29-9	Chromium (VI)	0.41	150	1,100	1,100	50	50	--	--	--	4.1	(3)
	7440-47-3	Total Chromium	--	--	--	--	--	--	--	--	--	No Value	
	7440-50-8	Copper	--	2,900	4.8	4.8	3.1	3.1	--	--	--	3.1	
	7439-92-1	Lead	--	--	210	210	8.1	8.1	--	--	--	8.1	
	7439-96-5	Manganese	--	--	--	--	--	--	--	--	100	100	
	7439-97-6	Mercury	--	--	1.8	1.8	0.025	0.94	--	--	--	0.025	
	7440-02-0	Nickel	--	1,100	74	74	8.2	8.2	100	100	4,600	8.2	
	7782-49-2	Selenium	--	2,700	290	290	71	71	200	200	4,200	71	
	7440-22-4	Silver	--	26,000	2.3	1.9	0.91	--	--	--	--	0.91	
	7440-66-6	Zinc	--	17,000	90	90	81	81	1,000	1,000	26,000	81	
Cyanide	57-12-5	Free Cyanide	--	1,600	9.1	1.0	2.8	1.0	100	100	400	2.8	(5)
PCBs	1336-36-3	Total PCBs	0.00010	--	10.0	--	0.030	0.030	0.0000070	0.0000070	0.000064	0.0000070	

Table 1a: Calculation of Surface Water Screening Levels

Constituent Category	CAS No.	Constituent	Standard Method B Surface Water Value for Carcinogens [1] (ug/L)	Standard Method B Surface Water Value for Non-Carcinogens [1] (ug/L)	Surface Water Value for Acute Marine Aquatic Life 173-201A WAC [1] (ug/L)	Surface Water Value for Acute Marine Aquatic Life CWA §304 [1] (ug/L)	Surface Water Value for Chronic Marine Aquatic Life 173-201A WAC [1] (ug/L)	Surface Water Value for Chronic Marine Aquatic Life CWA §304 [1] (ug/L)	Surface Water Value for Human Health in Marine Waters 173-201A WAC [1] (ug/L)	Surface Water Value for Human Health in Marine Waters 40 CFR 131.45 [1] (ug/L)	Surface Water Value for Human Health in Marine Waters CWA §304 [1] (ug/L)	Surface Water SL [2] (ug/L)	Adjustment Note
SVOCs	120-82-1	1,2,4-Trichlorobenzene	2.0	230	--	--	--	--	0.037	0.037	0.076	0.037	
	95-50-1	1,2-Dichlorobenzene	--	4,200	--	--	--	--	800	800	3,000	800	
	541-73-1	1,3-Dichlorobenzene	--	--	--	--	--	--	2.0	2.0	10.0	2.0	
	106-46-7	1,4-Dichlorobenzene	22	3,300	--	--	--	--	200	200	900	200	(3)
	90-12-0	1-Methylnaphthalene	--	--	--	--	--	--	--	--	--	No Value	
	108-60-1	2,2'-Oxybis(1-chloropropane)	37	42,000	--	--	--	--	900	900	4,000	370	(3)
	95-95-4	2,4,5-Trichlorophenol	--	--	--	--	--	--	--	--	600	600	
	88-06-2	2,4,6-Trichlorophenol	3.9	17	--	--	--	--	0.28	--	2.8	0.28	
	120-83-2	2,4-Dichlorophenol	--	190	--	--	--	--	10	10.0	60	10.0	
	105-67-9	2,4-Dimethylphenol	--	550	--	--	--	--	97	--	3,000	97	
	51-28-5	2,4-Dinitrophenol	--	3,500	--	--	--	--	100	100	300	100	
	121-14-2	2,4-Dinitrotoluene	5.5	1,400	--	--	--	--	0.18	--	1.7	0.18	
	606-20-2	2,6-Dinitrotoluene	--	--	--	--	--	--	--	--	--	No Value	
	91-58-7	2-Chloronaphthalene	--	1,000	--	--	--	--	100	100	1,000	100	
	95-57-8	2-Chlorophenol	--	97	--	--	--	--	17	--	800	17	
	91-57-6	2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	No Value	
	95-48-7	2-Methylphenol	--	--	--	--	--	--	--	--	--	No Value	
	88-74-4	2-Nitroaniline	--	--	--	--	--	--	--	--	--	No Value	
	88-75-5	2-Nitrophenol	--	--	--	--	--	--	--	--	--	No Value	
	91-94-1	3,3'-Dichlorobenzidine	0.046	--	--	--	--	--	0.0033	--	0.15	0.0033	
	99-09-2	3-Nitroaniline	--	--	--	--	--	--	--	--	--	No Value	
	534-52-1	4,6-Dinitro-2-methylphenol	--	--	--	--	--	--	7.0	7.0	30	7.0	
	101-55-3	4-Bromophenyl phenyl ether	--	--	--	--	--	--	--	--	--	No Value	
	59-50-7	4-Chloro-3-Methylphenol	--	--	--	--	--	--	36	--	2,000	36	
	106-47-8	4-Chloroaniline	--	--	--	--	--	--	--	--	--	No Value	
	7005-72-3	4-Chlorophenylphenyl ether	--	--	--	--	--	--	--	--	--	No Value	
	106-44-5	3&4-Methylphenol	--	--	--	--	--	--	--	--	--	No Value	
	100-01-6	4-Nitroaniline	--	--	--	--	--	--	--	--	--	No Value	
	100-02-7	4-Nitrophenol	--	--	--	--	--	--	--	--	--	No Value	
	83-32-9	Acenaphthene	--	640	--	--	--	--	30	30	90	30	
	208-96-8	Acenaphthylene	--	--	--	--	--	--	--	--	--	No Value	
	120-12-7	Anthracene	--	26,000	--	--	--	--	100	100	400	100	
	191-24-2	Benzo(g,h,i)perylene	--	--	--	--	--	--	--	--	--	No Value	
	65-85-0	Benzoic acid	--	--	--	--	--	--	--	--	--	No Value	
	100-51-6	Benzyl Alcohol	--	--	--	--	--	--	--	--	--	No Value	
	111-91-1	Bis(2-Chloroethoxy)methane	--	--	--	--	--	--	--	--	--	No Value	
	111-44-4	bis(2-chloroethyl) ether	0.85	--	--	--	--	--	0.060	--	2.2	0.060	
	117-81-7	bis(2-Ethylhexyl)phthalate	3.6	400	--	--	--	--	0.046	0.046	0.37	0.046	
	85-68-7	Butylbenzylphthalate	8.2	1,300	--	--	--	--	0.013	0.013	0.10	0.013	
	86-74-8	Carbazole	--	--	--	--	--	--	--	--	--	No Value	
	132-64-9	Dibenzofuran	--	--	--	--	--	--	--	--	--	No Value	
	84-66-2	Diethyl phthalate	--	28,000	--	--	--	--	200	200	600	200	
	131-11-3	Dimethylphthalate	--	--	--	--	--	--	600	600	2,000	600	
	84-74-2	Di-n-Butylphthalate	--	2,900	--	--	--	--	8.0	8.0	30	8.0	
	117-84-0	Di-n-Octylphthalate	--	--	--	--	--	--	--	--	--	No Value	
	206-44-0	Fluoranthene	--	90	--	--	--	--	6.0	6.0	20	6.0	
	86-73-7	Fluorene	--	3,500	--	--	--	--	10.0	10.0	70	10.0	
	118-74-1	Hexachlorobenzene	0.00047	0.24	--	--	--	--	0.0000050	0.0000050	0.000079	0.0000050	
	87-68-3	Hexachlorobutadiene	30	930	--	--	--	--	0.010	0.010	0.010	0.010	
	77-47-4	Hexachlorocyclopentadiene	--	3,600	--	--	--	--	1.0	1.0	4.0	1.0	
	67-72-1	Hexachloroethane	1.9	21	--	--	--	--	0.020	0.020	0.10	0.020	

Table 1a: Calculation of Surface Water Screening Levels

Constituent Category	CAS No.	Constituent	Standard Method B Surface Water Value for Carcinogens [1] (ug/L)	Standard Method B Surface Water Value for Non-Carcinogens [1] (ug/L)	Surface Water Value for Acute Marine Aquatic Life 173-201A WAC [1] (ug/L)	Surface Water Value for Acute Marine Aquatic Life CWA §304 [1] (ug/L)	Surface Water Value for Chronic Marine Aquatic Life 173-201A WAC [1] (ug/L)	Surface Water Value for Chronic Marine Aquatic Life CWA §304 [1] (ug/L)	Surface Water Value for Human Health in Marine Waters 173-201A WAC [1] (ug/L)	Surface Water Value for Human Health in Marine Waters 40 CFR 131.45 [1] (ug/L)	Surface Water Value for Human Health in Marine Waters CWA §304 [1] (ug/L)	Surface Water SL [2] (ug/L)	Adjustment Note
SVOCs	78-59-1	Isophorone	1,600	120,000	--	--	--	--	110	--	1,800	110	
	91-20-3	Naphthalene	--	4,900	--	--	--	--	--	--	--	4,900	
	98-95-3	Nitrobenzene	--	1,800	--	--	--	--	100	100	600	100	
	62-75-9	N-Nitrosodimethylamine	0.80	800	--	--	--	--	0.34	--	3.0	0.34	
	621-64-7	N-Nitroso-di-n-Propylamine	0.82	--	--	--	--	--	0.058	--	0.51	0.058	
	86-30-6	N-Nitrosodiphenylamine	9.7	--	--	--	--	--	0.69	--	6.0	0.69	
	87-86-5	Pentachlorophenol	1.5	1,200	13	13	6.7	7.9	0.0020	0.0020	0.040	0.0020	
	85-01-8	Phenanthrene	--	--	--	--	--	--	--	--	--	No Value	
	108-95-2	Phenol	--	560,000	--	--	--	--	70,000	70,000	300,000	70,000	
	129-00-0	Pyrene	--	2,600	--	--	--	--	8.0	8.0	30	8.0	
	50-32-8	Total cPAHs	0.035	26	--	--	--	--	0.000016	0.000016	0.00013	0.000016	
Dioxins/ Furans	1746-01-6	Total Dioxins/Furans	1.0E-08	3.6E-07	--	--	--	--	6.4E-08	--	5.1E-09	5.1E-09	
Organotins	56-35-9	Tributyltin oxide	--	--	--	--	--	--	--	--	--	0.050	(6)
Pesticides	72-54-8	4,4´-DDD	0.00050	0.0240	--	--	--	--	0.0000079	0.0000079	0.00012	0.0000079	
	72-55-9	4,4´-DDE	0.00036	0.024	--	--	--	--	0.00000088	0.00000088	0.000018	0.00000088	
	50-29-3	4,4´-DDT	0.00036	0.024	0.13	0.13	0.0010	0.0010	0.0000012	0.0000012	0.000030	0.0000012	
	309-00-2	Aldrin	0.000082	0.017	1.3	1.3	0.0019	--	0.000000041	0.000000041	0.00000077	0.000000041	
	319-84-6	alpha-BHC	0.0079	18	--	--	--	--	0.000048	0.000048	0.00039	0.000048	
	5103-71-9	alpha-Chlordane	--	--	--	--	--	--	--	--	--	No Value	
	319-85-7	beta-BHC	0.028	--	--	--	--	--	0.0014	0.0014	0.014	0.0014	
	319-86-8	delta-BHC	--	--	--	--	--	--	--	--	--	No Value	
	60-57-1	Dieldrin	0.000087	0.028	0.71	0.71	0.0019	0.0019	0.000000070	0.000000070	0.0000012	0.000000070	
	959-98-8	Endosulfan I	--	--	0.034	0.034	0.0087	0.0087	7.0	7.0	30	0.0087	
	33213-65-9	Endosulfan II	--	--	0.034	0.034	0.0087	0.0087	10.0	--	40	0.0087	
	1031-07-8	Endosulfan sulfate	--	--	--	--	--	--	10.0	--	40	10.0	
	72-20-8	Endrin	--	0.20	0.037	0.037	0.0023	0.0023	0.0020	0.0020	0.030	0.0020	
	7421-93-4	Endrin aldehyde	--	--	--	--	--	--	0.035	--	1.0	0.035	
	53494-70-5	Endrin ketone	--	--	--	--	--	--	--	--	--	No Value	
	58-89-9	gamma-BHC	0.045	6.0	0.16	0.16	--	--		0.43	4.4	0.43	(3)
	5103-74-2	gamma-Chlordane	--	--	--	--	--	--	--	--	--	No Value	
	76-44-8	Heptachlor	0.00013	0.12	0.053	0.053	0.0036	0.0036	0.00000034	0.00000034	0.0000059	0.00000034	
	1024-57-3	Heptachlor epoxide	0.000064	0.0030	--	0.053	--	0.0036	0.0000024	0.0000024	0.000032	0.0000024	
	72-43-5	Methoxychlor	--	8.4	--	--	0.030	0.030	--	--	0.020	0.020	
	8001-35-2	Toxaphene	0.00045	0.018	0.21	0.21	0.00020	0.00020	0.000032	--	0.00071	0.000032	

Notes:

--: No value exists for this constituent in the Cleanup Levels and Risk Calculation (CLARC) database (Ecology 2025). No Value: A screening level cannot be calculated because no values exist in CLARC.

All values are presented as two significant figures in standard notation, except numbers greater than 100 are rounded to a whole number.

[1] Values from CLARC (Ecology 2025), unless otherwise noted.

[2] The screening level is the most stringent of the standard Method B surface water value for carcinogens, the standard Method B surface water value for non-carcinogens, the 173-210A WAC and CWA §304 acute marine aquatic life values, the 173-210A WAC and CWA §304 chronic marine aquatic life values, and the 173-210A WAC, CWA §304, and 40 CFR 131.45 human health marine water values, unless otherwise noted.

[3] In accordance with WAC 173-340-730(5)(b), the standard Method B value for carcinogens was adjusted upward towards concentrations established under applicable state and federal laws by a maximum factor of ten (not to exceed concentrations established under applicable state and federal laws).

[4] Adjusted to the Puget Sound Basin groundwater background concentration of 8 ug/L (Ecology 2022) in accordance with WAC 173-340-720(7)(c).

Table 1b: Calculation of Groundwater Vapor Intrusion Screening Levels

Constituent Category	CAS No.	Constituent	Standard Method C Groundwater VI SL for Carcinogens [1] (ug/L)	Standard Method C VI Groundwater SL for Non-carcinogens [1] (ug/L)	Groundwater VI SL for Industrial Properties [2] (ug/L)
VOCs	630-20-6	1,1,1,2-Tetrachloroethane	71	--	71
	71-55-6	1,1,1-Trichloroethane	--	12,000	12,000
	79-34-5	1,1,2,2-Tetrachloroethane	59	--	59
	76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	--	360	360
	79-00-5	1,1,2-Trichloroethane	88	11	11
	75-34-3	1,1-Dichloroethane	110	--	110
	75-35-4	1,1-Dichloroethene	--	280	280
	563-58-6	1,1-Dichloropropene	--	--	No Value
	87-61-6	1,2,3-Trichlorobenzene	--	--	No Value
	96-18-4	1,2,3-Trichloropropane	--	44	44
	120-82-1	1,2,4-Trichlorobenzene	--	84	84
	95-63-6	1,2,4-Trimethylbenzene	--	520	520
	96-12-8	1,2-Dibromo-3-Chloropropane	1.6	77	1.6
	106-93-4	1,2-Dibromoethane	3.0	640	3.0
	95-50-1	1,2-Dichlorobenzene	--	5,500	5,500
	107-06-2	1,2-Dichloroethane	35	250	35
	78-87-5	1,2-Dichloropropane	100	61	61
	108-67-8	1,3,5-Trimethylbenzene	--	370	370
	541-73-1	1,3-Dichlorobenzene	--	--	No Value
	142-28-9	1,3-Dichloropropane	--	--	No Value
	106-46-7	1,4-Dichlorobenzene	50	17,000	50
	540-36-3	1,4-Difluorobenzene	--	--	No Value
	594-20-7	2,2-Dichloropropane	--	--	No Value
	78-93-3	2-Butanone	--	3,700,000	3,700,000
	110-75-8	2-Chloroethyl vinyl ether	--	--	No Value
	95-49-8	2-Chlorotoluene	--	--	No Value
	591-78-6	2-Hexanone	--	16,000	16,000
	107-87-9	2-Pentanone	--	--	No Value
	460-00-4	4-Bromofluorobenzene	--	--	No Value
	106-43-4	4-Chlorotoluene	--	--	No Value
	108-10-1	4-Methyl-2-Pentanone	--	1,000,000	1,000,000
	67-64-1	Acetone	--	--	No Value
	107-02-8	Acrolein	--	6.4	6.4
	107-13-1	Acrylonitrile	120	630	120
	71-43-2	Benzene	24	220	24
	108-86-1	Bromobenzene	--	1,400	1,400
	74-97-5	Bromochloromethane	--	--	No Value
	75-27-4	Bromodichloromethane	14	--	14
	75-25-2	Bromoform	2,200	--	2,200
	74-83-9	Bromomethane	--	24	24
	75-15-0	Carbon Disulfide	--	1,800	1,800
	56-23-5	Carbon tetrachloride	6.2	150	6.2
	108-90-7	Chlorobenzene	--	750	750
	75-00-3	Chloroethane	--	32,000	32,000
	67-66-3	Chloroform	12	22	12
	74-87-3	Chloromethane	--	330	330
	156-59-2	cis-1,2-Dichloroethene	--	400	400
	542-75-6	cis-1,3-Dichloropropene	80	250	80
	108-94-1	Cyclohexanone	--	4,500,000	4,500,000
	124-48-1	Dibromochloromethane	--	--	No Value
	74-95-3	Dibromomethane	--	210	210
	75-71-8	Dichlorodifluoromethane	--	9.2	9.2
	100-41-4	Ethylbenzene	--	6,100	6,100
	87-68-3	Hexachloro-1,3-butadiene	6.4	--	6.4
	74-88-4	Iodomethane	--	--	No Value
	98-82-8	Isopropylbenzene	--	2,000	2,000
	99-87-6	Isopropyltoluene	--	190	190
	108-38-3	m,p-Xylene	--	--	No Value
	1634-04-4	Methyl tert-Butyl Ether	8,600	270,000	8,600
	75-09-2	Methylene chloride	30,000	7,100	7,100
	91-20-3	Naphthalene	88	360	88
	104-51-8	n-Butylbenzene	--	--	No Value
	110-54-3	n-Hexane	--	16	16
	103-65-1	n-Propylbenzene	--	4,900	4,900
	95-47-6	o-Xylene	--	--	No Value
	363-72-4	Pentafluorobenzene	--	--	No Value
	135-98-8	sec-Butylbenzene	--	--	No Value
	100-42-5	Styrene	--	19,000	19,000
	98-06-6	tert-Butylbenzene	--	--	No Value
	127-18-4	Tetrachloroethene	250	100	100
	108-88-3	Toluene	--	34,000	34,000
	1330-20-7	Total Xylenes	--	710	710
	156-60-5	trans-1,2-Dichloroethene	--	170	170
	542-75-6	trans-1,3-Dichloropropene	80	250	80
	110-57-6	trans-1,4-Dichloro 2-Butene	--	--	No Value
	79-01-6	Trichloroethene	26	8.6	8.6
	75-69-4	Trichlorofluoromethane	--	260	260
	108-05-4	Vinyl Acetate	--	18,000	18,000
	75-01-4	Vinyl Chloride	3.3	120	3.3
	71-36-3	n-Butyl Alcohol	--	--	No Value
TPH	unavailable25	TPH-G (benzene present)	--	--	No Value
	unavailable08	TPH-G (no detectable benzene)	--	--	No Value
	unavailable09	TPH-D (weathered)	--	--	No Value
	unavailable09	TPH-D (unweathered)	--	--	No Value
SVOCs	90-12-0	1-Methylnaphthalene	--	0.37	0.37

Notes:

--: No value exists for this constituent in the Cleanup Levels and Risk Calculation (CLARC) database (Ecology 2025). No Value: A screening level cannot be calculated because no values exist in CLARC.

Non-volatile constituents (e.g., metals, PCBs, SVOCs, TPH-HO) are not included in this table.

All values are presented as two significant figures in standard notation, except numbers greater than 100 are rounded to a whole number.

[1] Values from CLARC (Ecology 2025), unless otherwise noted.

[2] The screening level is the most stringent of the carcinogenic and non-carcinogenic values.

Table 2: Calculation of Preliminary Soil Screening Levels

Constituent Category	CAS No.	Constituent	Preliminary Soil-to-Groundwater SL [1] (mg/kg)	Soil Direct Contact SL for Industrial Properties [2] (mg/kg)	Preliminary Soil SL [3] (mg/kg)	Adjustment Note [4]
	630-20-6	1,1,1,2-Tetrachloroethane	0.41	5,000	0.41	
	71-55-6	1,1,1-Trichloroethane	89	7,000,000	89	
	79-34-5	1,1,2,2-Tetrachloroethane	0.0017	660	0.0017	
	76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	11	110,000,000	11	
	79-00-5	1,1,2-Trichloroethane	0.0050	2,300	0.0050	
	75-34-3	1,1-Dichloroethane	0.58	23,000	0.58	
	75-35-4	1,1-Dichloroethene	1.8	180,000	1.8	
	563-58-6	1,1-Dichloropropene	--	--	No Value	
	87-61-6	1,2,3-Trichlorobenzene	29	2,800	29	
	96-18-4	1,2,3-Trichloropropane	0.28	4.4	0.28	
	120-82-1	1,2,4-Trichlorobenzene	0.0014	4,500	0.0014	(4)
	95-63-6	1,2,4-Trimethylbenzene	8.6	35,000	8.6	
	96-12-8	1,2-Dibromo-3-Chloropropane	0.010	160	0.010	
	106-93-4	1,2-Dibromoethane	0.016	66	0.016	
	95-50-1	1,2-Dichlorobenzene	9.3	320,000	9.3	
	107-06-2	1,2-Dichloroethane	0.17	1,400	0.17	
	78-87-5	1,2-Dichloropropane	0.016	3,500	0.016	
	108-67-8	1,3,5-Trimethylbenzene	6.0	35,000	6.0	
	541-73-1	1,3-Dichlorobenzene	0.023	--	0.023	
	142-28-9	1,3-Dichloropropane	753	70,000	753	
	106-46-7	1,4-Dichlorobenzene	0.82	24,000	0.82	
	540-36-3	1,4-Difluorobenzene	--	--	No Value	
	594-20-7	2,2-Dichloropropane	--	--	No Value	
	78-93-3	2-Butanone	15,142	2,100,000	15,142	
	110-75-8	2-Chloroethyl vinyl ether	--	--	No Value	
	95-49-8	2-Chlorotoluene	220	70,000	220	
	591-78-6	2-Hexanone	69	18,000	69	
	107-87-9	2-Pentanone	--	--	No Value	
	460-00-4	4-Bromofluorobenzene	--	--	No Value	
	106-43-4	4-Chlorotoluene	62	70,000	62	
	108-10-1	4-Methyl-2-Pentanone	4,044	280,000	4,044	
	67-64-1	Acetone	202,440	3,200,000	202,440	
	107-02-8	Acrolein	0.0044	1,800	0.0044	(4)
	107-13-1	Acrylonitrile	0.00012	240	0.00012	(4)
	71-43-2	Benzene	0.0088	2,400	0.0088	
	108-86-1	Bromobenzene	12	28,000	12	
	74-97-5	Bromochloromethane	3,755	--	3,755	
	75-27-4	Bromodichloromethane	0.013	2,100	0.013	
	75-25-2	Bromoform	0.078	17,000	0.078	
VOCs	74-83-9	Bromomethane	0.11	4,900	0.11	
	75-15-0	Carbon Disulfide	9.2	350,000	9.2	
	56-23-5	Carbon tetrachloride	0.0029	1,900	0.0029	
	108-90-7	Chlorobenzene	1.7	70,000	1.7	
	75-00-3	Chloroethane	159	--	159	
	67-66-3	Chloroform	0.063	4,200	0.063	
	74-87-3	Chloromethane	1.5	--	1.5	
	156-59-2	cis-1,2-Dichloroethene	2.0	7,000	2.0	
	542-75-6	cis-1,3-Dichloropropene	0.0056	1,300	0.0056	
	108-94-1	Cyclohexanone	5,435	18,000,000	5,435	
	124-48-1	Dibromochloromethane	0.010	1,600	0.010	
	74-95-3	Dibromomethane	0.94	35,000	0.94	
	75-71-8	Dichlorodifluoromethane	0.22	700,000	0.22	
	100-41-4	Ethylbenzene	0.18	350,000	0.18	
	87-68-3	Hexachloro-1,3-butadiene	0.00021	1,700	0.00021	(4)
	74-88-4	Iodomethane	--	--	No Value	
	98-82-8	Isopropylbenzene	37	350,000	37	
	99-87-6	Isopropyltoluene	5.1	14,000	5.1	
	108-38-3	m,p-Xylene	66	700,000	66	
	1634-04-4	Methyl tert-Butyl Ether	36	73,000	36	
	75-09-2	Methylene chloride	0.43	21,000	0.43	
	91-20-3	Naphthalene [5]	2.4	70,000	2.4	
	104-51-8	n-Butylbenzene	20	180,000	20	
	110-54-3	n-Hexane	2.4	210,000	2.4	
	103-65-1	n-Propylbenzene	54	350,000	54	
	95-47-6	o-Xylene	80	700,000	80	
	363-72-4	Pentafluorobenzene	--	--	No Value	
	135-98-8	sec-Butylbenzene	27	350,000	27	
	100-42-5	Styrene	346	700,000	346	
	98-06-6	tert-Butylbenzene	36	350,000	36	
	127-18-4	Tetrachloroethene	0.029	21,000	0.029	
	108-88-3	Toluene	0.72	280,000	0.72	
	1330-20-7	Total Xylenes [6]	0.94	700,000	0.94	
	156-60-5	trans-1,2-Dichloroethene	0.88	70,000	0.88	
	542-75-6	trans-1,3-Dichloropropene	0.0056	1,300	0.0056	
	110-57-6	trans-1,4-Dichloro 2-Butene	283	--	283	
	79-01-6	Trichloroethene	0.0044	1,800	0.0044	
	75-69-4	Trichlorofluoromethane	2.5	1,100,000	2.5	
	108-05-4	Vinyl Acetate	74	3,500,000	74	
	75-01-4	Vinyl Chloride	0.0011	88	0.0011	
	71-36-3	n-Butyl Alcohol	12,860	350,000	12,860	
TPH	unavailable08	TPH-G	30	1,500	30	
	unavailable09	TPH-D [7]	2,000	2,000	2,000	
	unavailable10	TPH-HO [7]	2,000	2,000	2,000	

Table 2: Calculation of Preliminary Soil Screening Levels

Constituent Category	CAS No.	Constituent	Preliminary Soil-to-Groundwater SL [1] (mg/kg)	Soil Direct Contact SL for Industrial Properties [2] (mg/kg)	Preliminary Soil SL [3] (mg/kg)	Adjustment Note [4]
Metals	7440-36-0	Antimony	81	1,400	81	
	7440-38-2	Arsenic	20	20	20	
	7440-39-3	Barium	--	700,000	700,000	
	7440-43-9NP	Cadmium	1.1	3,500	1.1	
	16065-83-1	Chromium (III) [8]	4,800,960	5,300,000	4,800,960	
	18540-29-9	Chromium (VI) [8]	1.6	820	1.6	
	7440-47-3	Total Chromium [8]	--	--	No Value	
	7440-50-8	Copper	36	140,000	36	
	7439-92-1	Lead	1,620	1,000	1,000	
	7439-96-5	Manganese	1,146	--	1,146	
	7439-97-6	Mercury	0.070	1,100	0.070	
	7440-02-0	Nickel	38	70,000	38	
	7782-49-2	Selenium	7.4	18,000	7.4	
	7440-22-4	Silver	0.61	18,000	0.61	
	7440-66-6	Zinc	101	1,100,000	101	
Cyanide	57-12-5	Free Cyanide [9]	0.57	2,200	0.57	
PCBs	1336-36-3	Total PCBs [6]	1.0	10	1.0	
SVOCs	120-82-1	1,2,4-Trichlorobenzene	0.0014	4,500	0.0014	(4)
	95-50-1	1,2-Dichlorobenzene	9.3	320,000	9.3	
	541-73-1	1,3-Dichlorobenzene	0.023	--	0.023	
	106-46-7	1,4-Dichlorobenzene	0.82	24,000	0.82	
	90-12-0	1-Methylnaphthalene	0.020	2,600	0.020	
	108-60-1	2,2'-Oxybis(1-chloropropane)	2.1	1,900	2.1	
	95-95-4	2,4,5-Trichlorophenol	22	350,000	22	
	88-06-2	2,4,6-Trichlorophenol	0.0033	3,500	0.0033	(4)
	120-83-2	2,4-Dichlorophenol	0.069	11,000	0.069	(4)
	105-67-9	2,4-Dimethylphenol	1.3	70,000	1.3	
	51-28-5	2,4-Dinitrophenol	0.40	7,000	0.40	
	121-14-2	2,4-Dinitrotoluene	0.0028	420	0.0028	(4)
	606-20-2	2,6-Dinitrotoluene	143	88	88	
	91-58-7	2-Chloronaphthalene	5.4	280,000	5.4	
	95-57-8	2-Chlorophenol	0.20	18,000	0.20	
	91-57-6	2-Methylnaphthalene	66	14,000	66	
	95-48-7	2-Methylphenol	13,118	180,000	13,118	
	88-74-4	2-Nitroaniline	458	35,000	458	
	88-75-5	2-Nitrophenol	--	--	No Value	
	91-94-1	3,3'-Dichlorobenzidine	0.00022	290	0.00022	(4)
	99-09-2	3-Nitroaniline	--	--	No Value	
	534-52-1	4,6-Dinitro-2-methylphenol	0.13	280	0.13	(4)
	101-55-3	4-Bromophenyl phenyl ether	--	--	No Value	
	59-50-7	4-Chloro-3-Methylphenol	0.50	350,000	0.50	
	106-47-8	4-Chloroaniline	1,220	660	660	
	7005-72-3	4-Chlorophenylphenyl ether	--	--	No Value	
	106-44-5	3&4-Methylphenol	10,759	350,000	10,759	
	100-01-6	4-Nitroaniline	225	6,600	225	(4)
	100-02-7	4-Nitrophenol	--	--	No Value	
	83-32-9	Acenaphthene	3.1	210,000	3.1	
	208-96-8	Acenaphthylene	--	--	No Value	
	120-12-7	Anthracene	1.0	1,100,000	1.0	
	191-24-2	Benzo(g,h,i)perylene	--	--	No Value	
	65-85-0	Benzoic acid	682	14,000,000	682	
	100-51-6	Benzyl Alcohol	9,501	350,000	9,501	
	111-91-1	Bis(2-Chloroethoxy)methane	1,672	11,000	1,672	
	111-44-4	bis(2-chloroethyl) ether	0.00033	120	0.00033	(4)
	117-81-7	bis(2-Ethylhexyl)phthalate	0.10	9,400	0.10	
	85-68-7	Butylbenzylphthalate	0.0036	69,000	0.0036	(4)
	86-74-8	Carbazole	--	--	No Value	
	132-64-9	Dibenzofuran	29	3,500	29	
	84-66-2	Diethyl phthalate	1.1	2,800,000	1.1	
	131-11-3	Dimethylphthalate	2.8	--	2.8	
	84-74-2	Di-n-Butylphthalate	0.28	350,000	0.28	
	117-84-0	Di-n-Octylphthalate	3.1	35,000	3.1	
	206-44-0	Fluoranthene	5.9	140,000	5.9	
	86-73-7	Fluorene	1.6	140,000	1.6	
	118-74-1	Hexachlorobenzene	0.0000080	82	0.0000080	(4)
	87-68-3	Hexachlorobutadiene	0.00021	1,700	0.00021	(4)
	77-47-4	Hexachlorocyclopentadiene	0.032	21,000	0.032	(4)
	67-72-1	Hexachloroethane	0.00016	2,500	0.00016	(4)
	78-59-1	Isophorone	0.58	140,000	0.58	
	91-20-3	Naphthalene [5]	2.4	70,000	2.4	
	98-95-3	Nitrobenzene	0.64	7,000	0.64	
	62-75-9	N-Nitrosodimethylamine	0.0015	2.6	0.0015	(4)
	621-64-7	N-Nitroso-di-n-Propylamine	0.00055	19	0.00055	(4)
	86-30-6	N-Nitrosodiphenylamine	0.039	27,000	0.039	
	87-86-5	Pentachlorophenol	0.000032	330	0.000032	(4)
	85-01-8	Phenanthrene	--	--	No Value	
	108-95-2	Phenol	542	1,100,000	542	
	129-00-0	Pyrene	9.2	110,000	9.2	
	50-32-8	Total cPAHs [10]	0.084	130	0.084	
Dioxins/ Furans	1746-01-6	Total Dioxins/Furans [10]	5.2E-06	1.7E-03	5.2E-06	
Organotins	56-35-9	Tributyltin oxide	26	1,100	26	

Table 2: Calculation of Preliminary Soil Screening Levels

Constituent Category	CAS No.	Constituent	Preliminary Soil-to-Groundwater SL [1] (mg/kg)	Soil Direct Contact SL for Industrial Properties [2] (mg/kg)	Preliminary Soil SL [3] (mg/kg)	Adjustment Note [4]
Pesticides	72-54-8	4,4´-DDD	0.0000073	550	0.0000073	(4)
	72-55-9	4,4´-DDE	0.0000015	390	0.0000015	(4)
	50-29-3	4,4´-DDT	0.000016	390	0.000016	(4)
	309-00-2	Aldrin	0.000000040	7.7	0.000000040	(4)
	319-84-6	alpha-BHC	0.0000019	21	0.0000019	(4)
	5103-71-9	alpha-Chlordane	3.8	1,800	3.8	
	319-85-7	beta-BHC	0.000065	73	0.000065	(4)
	319-86-8	delta-BHC	--	0.21	0.21	
	60-57-1	Dieldrin	0.000000036	8.2	0.000000036	(4)
	959-98-8	Endosulfan I	0.0012	--	0.0012	(4)
	33213-65-9	Endosulfan II	0.0012	--	0.0012	(4)
	1031-07-8	Endosulfan sulfate	2.0	21,000	2.0	
	72-20-8	Endrin	0.00044	1,100	0.00044	(4)
	7421-93-4	Endrin aldehyde	0.0024	--	0.0024	(4)
	53494-70-5	Endrin ketone	--	--	No Value	
	58-89-9	gamma-BHC	0.013	120	0.013	
	5103-74-2	gamma-Chlordane	3.8	1,800	3.8	
	76-44-8	Heptachlor	0.000000066	29	0.000000066	(4)
	1024-57-3	Heptachlor epoxide	0.00000049	14	0.00000049	(4)
	72-43-5	Methoxychlor	0.032	18,000	0.032	
	8001-35-2	Toxaphene	0.000061	120	0.000061	(4)

Notes:

--: No value exists for this constituent in the Cleanup Levels and Risk Calculation (CLARC) database (Ecology 2025). No Value: A screening level cannot be calculated because no values exist in CLARC.

All values are presented as two significant figures in standard notation, except numbers greater than 100 are rounded to a whole number.

[1] See Table 2a for calculation of these screening levels.

[2] See Table 2b for calculation of these screening levels.

[3] The screening level is the most stringent of the screening levels in the two previous columns, unless otherwise noted.

[4] Actual and appropriate PQLs for some constituents will exceed screening levels (e.g., some screening levels are lower than achievable PQLs for approved analytical methods, some PQLs were or will be elevated due to necessary lab dilutions to satisfy lab quality control standards). Constituents expected to have a screening level less than an achievable PQL are preliminarily identified in this table. For current screening purposes, PQL adjustments to screening levels were not made for these constituents or any other constituents. However, pursuant to WAC 173-340-740(5)(c) and WAC 173-340-745(6)(c), PQL adjustments will be made as necessary when constituents of concern and cleanup levels are defined in the future.

[5] The data reduction rules for naphthalene results from different analytical methods on the same sample (i.e., USEPA Methods SW846-8260 and SW846-8270) will be: (a) if naphthalene is detected by one or both methods, then the highest detection will be used, and (b) if naphthalene is not detected by either method, then the lower reporting limit will be used.

[6] Xylenes and PCBs will be evaluated on a total basis by summing the individual constituents. Total PCBs are the sum of Aroclors 1016, 1221, 1232, 1242, 1248, 1254, and 1260. The following data reduction rules will be used for compound totaling of non-detect constituents: (a) if one or more individual constituent was detected in a sample, the non-detect constituents will be assumed to equal one-half of the reporting limit, and (b) if no individual constituents were detected in a sample, the sum of the reporting limits for the individual constituents will be used.

[7] In accordance with Ecology guidance (Ecology 2004), if TPH-D and TPH-HO are both detected in a given sample, results will be evaluated as the sum of TPH-D and TPH-HO unless NWTPH-HCID results and/or the chromatogram demonstrate that both petroleum products are present. If TPH-D and TPH-HO are both non-detect in a given sample, the reporting limits will be summed. If one constituent is detected and one constituent is non-detect, the non-detect result will be assigned half the reporting limit in the summation.

[8] Per CLARC notes, sampling for chromium (VI) is recommended "when chromium is likely to be an important contaminant at a site" (e.g., total chromium soil concentrations are greater than Puget Sound natural background concentration of 48 mg/kg). If chromium (VI) is present, then the chromium (III) concentration is determined by subtracting the chromium (VI) concentration from the total chromium concentration. If chromium (VI) is not present, then the total chromium concentration is assumed to be the chromium (III) concentration.

[9] Cyanide values in CLARC are based on free cyanide (i.e., sum of hydrogen cyanide and cyanide ion). Analyses for either free cyanide or total cyanide are acceptable, although total cyanide concentrations will be higher than free cyanide concentrations, which could overestimate the potential hazard (Ecology 2025).

[10] Total cPAHs and total dioxins/furans cleanup levels were based on the toxicity of benzo(a)pyrene and 2,3,7,8-tetrachlorodibenzo-p-dioxin, respectively, in accordance with WAC 173-340-708(8). Total cPAHs and total dioxins/furans concentrations will be calculated using MTCA toxicity equivalence factors (TEFs). Non-detect results will be evaluated per the 2001 MTCA Concise Explanatory Statement (Ecology 2001c). If a constituent/congener was detected in any sample in any media, non-detect results for that constituent/congener in other samples will be assumed to equal half of the reporting limit in the TEF calculation. If a constituent/congener was non-detect in all samples from all sampled media, non-detect results for that constituent/congener will be assumed to equal zero in the TEF calculation.

Table 2a: Calculation of Preliminary Soil-to-Groundwater Screening Levels

Constituent Category	CAS No.	Constituent	Preliminary Groundwater SL [1] (ug/L)	Physiochemical Properties [2]				Soil-to-Groundwater Calculations		Preliminary Soil-to-Groundwater SL [5] (mg/kg)	Adjustment Note
				Henry's Law Constant (Hcc) (unitless)	Organic Carbon Partitioning Coefficient (Koc) (L/kg)	Aqueous Solubility (mg/L)	Distribution Coefficient (Kd) for Metals (L/kg)	Soil Concentration Protective of Groundwater SL [3] (mg/kg)	Soil Saturation Concentration [4] (mg/kg)		
VOCs	630-20-6	1,1,1,2-Tetrachloroethane	71	0.047	86	1,070	--	0.41	310	0.41	
	71-55-6	1,1,1-Trichloroethane	12,000	0.42	135	1,290	--	89	479	89	
	79-34-5	1,1,2,2-Tetrachloroethane	0.30	0.0073	79	2,830	--	0.0017	791	0.0017	
	76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	360	14	197	170	--	11	269	11	
	79-00-5	1,1,2-Trichloroethane	0.90	0.018	75	4,590	--	0.0050	1,269	0.0050	
	75-34-3	1,1-Dichloroethane	110	0.14	53	5,040	--	0.58	1,337	0.58	
	75-35-4	1,1-Dichloroethene	280	0.70	65	2,420	--	1.8	789	1.8	
	563-58-6	1,1-Dichloropropene	No Value	--	--	--	--	--	--	No Value	
	87-61-6	1,2,3-Trichlorobenzene	No Value	0.017	1,383	18	--	--	29	29	
	96-18-4	1,2,3-Trichloropropane	44	0.0069	116	1,750	--	0.28	554	0.28	
	120-82-1	1,2,4-Trichlorobenzene	0.037	0.024	1,659	49	--	0.0014	91	0.0014	
	95-63-6	1,2,4-Trimethylbenzene	520	0.11	614	57	--	8.6	47	8.6	
	96-12-8	1,2-Dibromo-3-Chloropropane	1.6	0.0026	116	1,230	--	0.010	389	0.010	
	106-93-4	1,2-Dibromoethane	3.0	0.014	66	3,910	--	0.016	1,045	0.016	
	95-50-1	1,2-Dichlorobenzene	800	0.037	379	156	--	9.3	91	9.3	
	107-06-2	1,2-Dichloroethane	35	0.028	38	8,600	--	0.17	2,067	0.17	
	78-87-5	1,2-Dichloropropane	3.1	0.065	47	2,800	--	0.016	707	0.016	
	108-67-8	1,3,5-Trimethylbenzene	370	0.16	602	48	--	6.0	39	6.0	
	541-73-1	1,3-Dichlorobenzene	2.0	0.051	375	125	--	0.023	72	0.023	
	142-28-9	1,3-Dichloropropane	No Value	0.021	72	2,750	--	--	753	753	
	106-46-7	1,4-Dichlorobenzene	50	0.046	616	81	--	0.82	67	0.82	
	540-36-3	1,4-Difluorobenzene	No Value	--	--	--	--	--	--	No Value	
	594-20-7	2,2-Dichloropropane	No Value	--	--	--	--	--	--	No Value	
	78-93-3	2-Butanone	3,700,000	0.0013	4.5	223,000	--	15,142	45,632	15,142	
	110-75-8	2-Chloroethyl vinyl ether	No Value	--	--	--	--	--	--	No Value	
	95-49-8	2-Chlorotoluene	No Value	0.071	383	374	--	--	220	220	
	591-78-6	2-Hexanone	16,000	0.0019	15	17,200	--	69	3,700	69	
	107-87-9	2-Pentanone	No Value	--	--	--	--	--	--	No Value	
	460-00-4	4-Bromofluorobenzene	No Value	--	--	--	--	--	--	No Value	
	106-43-4	4-Chlorotoluene	No Value	0.081	375	106	--	--	62	62	
	108-10-1	4-Methyl-2-Pentanone	1,000,000	0.0029	13	19,000	--	4,257	4,044	4,044	
	67-64-1	Acetone	No Value	0.00088	2.4	1,000,000	--	--	202,440	202,440	
	107-02-8	Acrolein	1.1	0.0031	1.0	212,000	--	0.0044	42,669	0.0044	
	107-13-1	Acrylonitrile	0.028	0.0032	8.5	74,500	--	0.00012	15,555	0.00012	
	71-43-2	Benzene	1.6	0.13	62	1,750	--	0.0088	479	0.0088	
	108-86-1	Bromobenzene	1,400	0.043	234	446	--	12	195	12	
	74-97-5	Bromochloromethane	No Value	0.036	22	16,700	--	--	3,755	3,755	
	75-27-4	Bromodichloromethane	2.8	0.049	32	3,032	--	0.013	716	0.013	
	75-25-2	Bromoform	12	0.010	126	3,100	--	0.078	1,013	0.078	
	74-83-9	Bromomethane	24	0.21	9.0	15,200	--	0.11	3,453	0.11	
	75-15-0	Carbon Disulfide	1,800	0.38	22	2,160	--	9.2	551	9.2	
	56-23-5	Carbon tetrachloride	0.35	0.68	152	793	--	0.0029	326	0.0029	
	108-90-7	Chlorobenzene	200	0.066	224	498	--	1.7	214	1.7	
	75-00-3	Chloroethane	32,000	0.31	22	6,710	--	159	1,669	159	
	67-66-3	Chloroform	12	0.092	53	7,950	--	0.063	2,075	0.063	
	74-87-3	Chloromethane	330	0.27	6.0	5,320	--	1.5	1,220	1.5	
	156-59-2	cis-1,2-Dichloroethene	400	0.10	40	6,410	--	2.0	1,592	2.0	
	542-75-6	cis-1,3-Dichloropropene	1.2	0.079	27	2,800	--	0.0056	655	0.0056	
	108-94-1	Cyclohexanone	4,500,000	0.00016	17	25,000	--	19,565	5,435	5,435	
	124-48-1	Dibromochloromethane	2.2	0.021	32	2,700	--	0.010	631	0.010	
	74-95-3	Dibromomethane	210	0.019	22	11,900	--	0.94	2,658	0.94	

Table 2a: Calculation of Preliminary Soil-to-Groundwater Screening Levels

Constituent Category	CAS No.	Constituent	Preliminary Groundwater SL [1] (ug/L)	Physiochemical Properties [2]				Soil-to-Groundwater Calculations		Preliminary Soil-to-Groundwater SL [5] (mg/kg)	Adjustment Note
				Henry's Law Constant (Hcc) (unitless)	Organic Carbon Partitioning Coefficient (Koc) (L/kg)	Aqueous Solubility (mg/L)	Distribution Coefficient (Kd) for Metals (L/kg)	Soil Concentration Protective of Groundwater SL [3] (mg/kg)	Soil Saturation Concentration [4] (mg/kg)		
VOCs	75-71-8	Dichlorodifluoromethane	9.2	11	44	280	--	0.22	331	0.22	
	100-41-4	Ethylbenzene	21	0.16	204	169	--	0.18	71	0.18	
	87-68-3	Hexachloro-1,3-butadiene	0.010	0.18	845	3.2	--	0.00021	3.4	0.00021	
	74-88-4	Iodomethane	No Value	--	--	--	--	--	--	No Value	
	98-82-8	Isopropylbenzene	2,000	0.20	698	61	--	37	56	37	
	99-87-6	Isopropyltoluene	190	0.21	1,120	23	--	5.1	31	5.1	
	108-38-3	m,p-Xylene	No Value	0.15	196	161	--	--	66	66	
	1634-04-4	Methyl tert-Butyl Ether	8,600	0.011	11	50,000	--	36	10,594	36	
	75-09-2	Methylene chloride	100	0.084	10.0	13,000	--	0.43	2,825	0.43	
	91-20-3	Naphthalene	88	0.0083	1,191	31	--	2.4	43	2.4	
	104-51-8	n-Butylbenzene	No Value	0.29	1,482	12	--	--	20	20	
	110-54-3	n-Hexane	16	45	3,410	9.5	--	2.4	71	2.4	
	103-65-1	n-Propylbenzene	4,900	0.20	813	52	--	101	54	54	
	95-47-6	o-Xylene	No Value	0.11	241	178	--	--	80	80	
	363-72-4	Pentafluorobenzene	No Value	--	--	--	--	--	--	No Value	
	135-98-8	sec-Butylbenzene	No Value	0.28	1,331	18	--	--	27	27	
	100-42-5	Styrene	19,000	0.054	912	310	--	424	346	346	
	98-06-6	tert-Butylbenzene	No Value	0.21	1,001	30	--	--	36	36	
	127-18-4	Tetrachloroethene	2.9	0.38	265	206	--	0.029	103	0.029	
	108-88-3	Toluene	102	0.15	140	526	--	0.72	186	0.72	
	1330-20-7	Total Xylenes	106	0.14	233	171	--	0.94	76	0.94	
	156-60-5	trans-1,2-Dichloroethene	170	0.24	38	4,520	--	0.88	1,169	0.88	
	542-75-6	trans-1,3-Dichloropropene	1.2	0.079	27	2,800	--	0.0056	655	0.0056	
	110-57-6	trans-1,4-Dichloro 2-Butene	No Value	0.013	132	850	--	--	283	283	
	79-01-6	Trichloroethene	0.70	0.23	94	1,280	--	0.0044	402	0.0044	
	75-69-4	Trichlorofluoromethane	260	2.7	44	1,100	--	2.5	524	2.5	
	108-05-4	Vinyl Acetate	18,000	0.011	5.6	20,000	--	74	4,131	74	
	75-01-4	Vinyl Chloride	0.18	0.85	22	8,800	--	0.0011	2,599	0.0011	
	71-36-3	n-Butyl Alcohol	No Value	0.00015	3.5	63,200	--	--	12,860	12,860	
TPH	unavailable08	TPH-G	1,700	--	--	--	--	30 [6]	1,000 [6]	30	
	unavailable09	TPH-D	2,100	--	--	--	--	1,000,000 [6]	2,000 [6]	2,000	
	unavailable10	TPH-HO	No Value	--	--	--	--	1,000,000 [6]	2,000 [6]	2,000	
Metals	7440-36-0	Antimony	90	0.0	--	--	45	81	Not Applicable	81	
	7440-38-2	Arsenic	8.0	0.0	--	--	29	4.7	Not Applicable	20	(7)
	7440-39-3	Barium	No Value	0.0	--	--	41	--	Not Applicable	No Value	
	7440-43-9NP	Cadmium	7.9	0.0	--	--	6.7	1.1	Not Applicable	1.1	
	16065-83-1	Chromium (III)	240,000	0.0	--	--	1,000	4,800,960	Not Applicable	4,800,960	
	18540-29-9	Chromium (VI)	4.1	0.0	--	1,690,000	19	1.6	Not Applicable	1.6	
	7440-47-3	Total Chromium	No Value	0.0	--	--	1,000	--	Not Applicable	No Value	
	7440-50-8	Copper	3.1	0.0	--	--	22	1.4	Not Applicable	36	(8)
	7439-92-1	Lead	8.1	0.0	--	--	10,000	1,620	Not Applicable	1,620	
	7439-96-5	Manganese	100	0.0	--	--	65	130	Not Applicable	1,146	(8)
	7439-97-6	Mercury	0.025	0.17	--	0.060	52	0.026	Not Applicable	0.070	(8)
	7440-02-0	Nickel	8.2	0.0	--	--	65	11	Not Applicable	38	(8)
	7782-49-2	Selenium	71	0.0	--	--	5.0	7.4	Not Applicable	7.4	
	7440-22-4	Silver	0.91	0.0	--	--	8.3	0.15	Not Applicable	0.61	(8)
	7440-66-6	Zinc	81	0.0	--	--	62	101	Not Applicable	101	
Cyanide	57-12-5	Free Cyanide	2.8	*0.0042*	--	95,400	9.9	0.57	Not Applicable	0.57	
PCBs	1336-36-3	Total PCBs	0.0000070	*0.017*	78,100	0.70	--	0.000011	55	1.0	(9)

Table 2a: Calculation of Preliminary Soil-to-Groundwater Screening Levels

Constituent Category	CAS No.	Constituent	Preliminary Groundwater SL [1] (ug/L)	Physiochemical Properties [2]				Soil-to-Groundwater Calculations		Preliminary Soil-to-Groundwater SL [5] (mg/kg)	Adjustment Note
				Henry's Law Constant (Hcc) (unitless)	Organic Carbon Partitioning Coefficient (Koc) (L/kg)	Aqueous Solubility (mg/L)	Distribution Coefficient (Kd) for Metals (L/kg)	Soil Concentration Protective of Groundwater SL [3] (mg/kg)	Soil Saturation Concentration [4] (mg/kg)		
	120-82-1	1,2,4-Trichlorobenzene	0.037	0.024	1,659	49	--	0.0014	91	0.0014	
	95-50-1	1,2-Dichlorobenzene	800	0.037	379	156	--	9.3	91	9.3	
	541-73-1	1,3-Dichlorobenzene	2.0	0.051	375	125	--	0.023	72	0.023	
	106-46-7	1,4-Dichlorobenzene	50	0.046	616	81	--	0.82	67	0.82	
	90-12-0	1-Methylnaphthalene	0.37	0.0082	2,528	26	--	0.020	70	0.020	
	108-60-1	2,2'-Oxybis(1-chloropropane)	370	0.0014	83	1,700	--	2.1	481	2.1	
	95-95-4	2,4,5-Trichlorophenol	600	0.000026	1,597	1,200	--	22	2,156	22	
	88-06-2	2,4,6-Trichlorophenol	0.28	0.000041	381	800	--	0.0033	465	0.0033	
	120-83-2	2,4-Dichlorophenol	10.0	0.000075	147	5,550	--	0.069	1,926	0.069	
	105-67-9	2,4-Dimethylphenol	97	0.000014	492	7,870	--	1.3	5,444	1.3	
	51-28-5	2,4-Dinitrophenol	100	*0.0000035*	0.010	2,790	--	0.40	558	0.40	
	121-14-2	2,4-Dinitrotoluene	0.18	0.00000048	576	200	--	0.0028	155	0.0028	
	606-20-2	2,6-Dinitrotoluene	No Value	0.0000073	587	182	--	--	143	143	
	91-58-7	2-Chloronaphthalene	100	0.0048	2,478	12	--	5.4	31	5.4	
	95-57-8	2-Chlorophenol	17	0.00021	388	11,300	--	0.20	6,645	0.20	
	91-57-6	2-Methylnaphthalene	No Value	0.0070	2,478	25	--	--	66	66	
	95-48-7	2-Methylphenol	No Value	0.000020	307	25,900	--	--	13,118	13,118	
	88-74-4	2-Nitroaniline	No Value	0.00000061	111	1,470	--	--	458	458	
	88-75-5	2-Nitrophenol	No Value	--	--	--	--	--	--	No Value	
	91-94-1	3,3'-Dichlorobenzidine	0.0033	*1.2E-9*	3,190	3.1	--	0.00022	11	0.00022	
	99-09-2	3-Nitroaniline	No Value	--	--	--	--	--	--	No Value	
	534-52-1	4,6-Dinitro-2-methylphenol	7.0	*0.000057*	754	198	--	0.13	189	0.13	
	101-55-3	4-Bromophenyl phenyl ether	No Value	--	--	--	--	--	--	No Value	
	59-50-7	4-Chloro-3-Methylphenol	36	0.000040	492	3,834	--	0.50	2,652	0.50	
	106-47-8	4-Chloroaniline	No Value	0.000017	113	3,900	--	--	1,220	1,220	
SVOCs	7005-72-3	4-Chlorophenylphenyl ether	No Value	--	--	--	--	--	--	No Value	
	106-44-5	3&4-Methylphenol	No Value	0.000015	300	21,500	--	--	10,759	10,759	
	100-01-6	4-Nitroaniline	No Value	0.000000011	109	728	--	--	225	225	
	100-02-7	4-Nitrophenol	No Value	--	--	--	--	--	--	No Value	
	83-32-9	Acenaphthene	30	0.0025	4,898	3.9	--	3.1	20	3.1	
	208-96-8	Acenaphthylene	No Value	--	--	--	--	--	--	No Value	
	120-12-7	Anthracene	100	0.00065	23,493	0.043	--	47	1.0	1.0	
	191-24-2	Benzo(g,h,i)perylene	No Value	--	--	--	--	--	--	No Value	
	65-85-0	Benzoic acid	No Value	0.00000052	0.60	3,400	--	--	682	682	
	100-51-6	Benzyl Alcohol	No Value	0.0000049	21	42,900	--	--	9,501	9,501	
	111-91-1	Bis(2-Chloroethoxy)methane	No Value	0.000066	14	7,800	--	--	1,672	1,672	
	111-44-4	bis(2-chloroethyl) ether	0.060	0.00028	76	17,200	--	0.00033	4,748	0.00033	
	117-81-7	bis(2-Ethylhexyl)phthalate	0.046	0.0000023	111,123	0.27	--	0.10	30	0.10	
	85-68-7	Butylbenzylphthalate	0.013	0.000015	13,746	2.7	--	0.0036	38	0.0036	
	86-74-8	Carbazole	No Value	--	--	--	--	--	--	No Value	
	132-64-9	Dibenzofuran	No Value	0.000018	9,161	3.1	--	--	29	29	
	84-66-2	Diethyl phthalate	200	0.0000065	82	1,080	--	1.1	305	1.1	
	131-11-3	Dimethylphthalate	600	0.0000023	32	4,000	--	2.8	926	2.8	
	84-74-2	Di-n-Butylphthalate	8.0	0.000010	1,567	11	--	0.28	20	0.28	
	117-84-0	Di-n-Octylphthalate	No Value	0.000015	140,800	0.022	--	--	3.1	3.1	
	206-44-0	Fluoranthene	6.0	0.000091	49,096	0.26	--	5.9	13	5.9	
	86-73-7	Fluorene	10.0	0.0012	7,707	1.7	--	1.6	13	1.6	
	118-74-1	Hexachlorobenzene	0.0000050	0.022	80,000	0.0062	--	0.0000080	0.50	0.0000080	
	87-68-3	Hexachlorobutadiene	0.010	0.18	845	3.2	--	0.00021	3.4	0.00021	
	77-47-4	Hexachlorocyclopentadiene	1.0	0.022	1,404	1.8	--	0.032	2.9	0.032	
	67-72-1	Hexachloroethane	0.020	0.059	197	50	--	0.00016	20	0.00016	

Table 2a: Calculation of Preliminary Soil-to-Groundwater Screening Levels

Constituent Category	CAS No.	Constituent	Preliminary Groundwater SL [1] (ug/L)	Physiochemical Properties [2]				Soil-to-Groundwater Calculations		Preliminary Soil-to-Groundwater SL [5] (mg/kg)	Adjustment Note
				Henry's Law Constant (Hcc) (unitless)	Organic Carbon Partitioning Coefficient (Koc) (L/kg)	Aqueous Solubility (mg/L)	Distribution Coefficient (Kd) for Metals (L/kg)	Soil Concentration Protective of Groundwater SL [3] (mg/kg)	Soil Saturation Concentration [4] (mg/kg)		
SVOCs	78-59-1	Isophorone	110	0.00011	65	12,000	--	0.58	3,182	0.58	
	91-20-3	Naphthalene	88	0.0083	1,191	31	--	2.4	43	2.4	
	98-95-3	Nitrobenzene	100	0.00040	119	2,090	--	0.64	667	0.64	
	62-75-9	N-Nitrosodimethylamine	0.34	0.000037	23	1,000,000	--	0.0015	222,793	0.0015	
	621-64-7	N-Nitroso-di-n-Propylamine	0.058	*0.00022*	275	13,000	--	0.00055	6,180	0.00055	
	86-30-6	N-Nitrosodiphenylamine	0.69	*0.000049*	2,632	35	--	0.039	99	0.039	
	87-86-5	Pentachlorophenol	0.0020	*0.0000010*	592	14	--	0.000032	11	0.000032	
	85-01-8	Phenanthrene	No Value	--	--	--	--	--	--	No Value	
	108-95-2	Phenol	70,000	0.0000055	187	82,800	--	542	32,060	542	
	129-00-0	Pyrene	8.0	0.00011	67,992	0.14	--	11	9.2	9.2	
	50-32-8	Total cPAHs	0.000016	0.0000036	968,774	0.0016	--	0.00031	1.6	0.084	(10)
Dioxins/ Furans	1746-01-6	Total Dioxins/Furans	5.1E-09	*0.0020*	249,100	0.00020	--	2.5E-08	0.050	5.2E-06	(11)
Organotins	56-35-9	Tributyltin oxide	0.050	*0.000012*	25,930,000	20	--	26	505,639	26	
Pesticides	72-54-8	4,4´-DDD	0.0000079	*0.00027*	45,800	0.090	--	0.0000073	4.1	0.0000073	
	72-55-9	4,4´-DDE	0.00000088	0.00044	86,405	0.040	--	0.0000015	3.5	0.0000015	
	50-29-3	4,4´-DDT	0.0000012	0.00013	677,934	0.0055	--	0.000016	3.7	0.000016	
	309-00-2	Aldrin	0.000000041	0.000081	48,685	0.017	--	0.000000040	0.83	0.000000040	
	319-84-6	alpha-BHC	0.000048	*0.00027*	1,762	2.0	--	0.0000019	3.9	0.0000019	
	5103-71-9	alpha-Chlordane	No Value	*0.0020*	67,540	0.056	--	--	3.8	3.8	
	319-85-7	beta-BHC	0.0014	*0.000018*	2,139	0.24	--	0.000065	0.56	0.000065	
	319-86-8	delta-BHC	No Value	--	2,807	31.40	--	--	--	No Value	
	60-57-1	Dieldrin	0.000000070	0.000088	25,546	0.20	--	0.000000036	5.0	0.000000036	
	959-98-8	Endosulfan I	0.0087	*0.00029*	6,761	0.51	--	0.0012	3.6	0.0012	
	33213-65-9	Endosulfan II	0.0087	*0.000016*	6,761	0.45	--	0.0012	3.1	0.0012	
	1031-07-8	Endosulfan sulfate	10.0	*0.000013*	9,847	0.48	--	2.0	4.8	2.0	
	72-20-8	Endrin	0.0020	*0.00026*	10,811	0.25	--	0.00044	2.8	0.00044	
	7421-93-4	Endrin aldehyde	0.035	*0.00017*	3,271	0.024	--	0.0024	0.083	0.0024	
	53494-70-5	Endrin ketone	No Value	--	--	--	--	--	--	No Value	
	58-89-9	gamma-BHC	0.43	*0.00021*	1,352	7.3	--	0.013	11	0.013	
	5103-74-2	gamma-Chlordane	No Value	*0.0020*	67,540	0.056	--	--	3.8	3.8	
	76-44-8	Heptachlor	0.00000034	0.0038	9,528	0.18	--	0.000000066	1.8	0.000000066	
	1024-57-3	Heptachlor epoxide	0.0000024	0.00020	10,110	0.20	--	0.00000049	2.1	0.00000049	
	72-43-5	Methoxychlor	0.020	*0.0000083*	80,000	0.10	--	0.032	8.0	0.032	
	8001-35-2	Toxaphene	0.000032	*0.00025*	95,816	0.55	--	0.000061	53	0.000061	

Notes:

--: No value exists for this constituent in the Cleanup Levels and Risk Calculation (CLARC) database (Ecology 2025). No Value: A screening level cannot be calculated because no values exist in CLARC.

All values are presented as two significant figures in standard notation, except numbers greater than 100 are rounded to a whole number.

[1] See Table 1 for calculation of these screening levels.

[2] Values from CLARC (Ecology 2025), unless otherwise noted. Henry's Law Constant values are for 13 degrees Celsius, with the exception that values for the following constituents are for 25 degrees Celsius (due to a lack of data at 13 degrees Celsius): cyanide, total PCBs, 2,4-dinitrophenol, 3,3'-dichlorobenzidine, 4,6-dinitro-2-methylphenol, n-nitroso-di-n-propylamine, n-nitrosodiphenylamine, pentachlorophenol, total dioxins/furans, tributyltin oxide, 4,4´-DDD, alpha-BHC, alpha-chlordane, beta-BHC, endosulfan I, endosulfan II, endosulfan sulfate, endrin, endrin aldehyde, gamma-BHC, gamma-chlordane, methoxychlor, and toxaphene.

[3] Calculated with the MTCA three-phase partitioning model using standard MTCA default inputs in WAC 173-340-747(4).

[4] Calculated by substituting aqueous solubility value for target groundwater concentration * dilution factor in MTCA Equation 747-1 (Ecology 2001a), unless otherwise noted.

[5] Most stringent of soil concentration protective of target groundwater concentration and soil saturation concentration, unless a subsequent adjustment is necessary.

[6] These Soil Concentrations Protective of Groundwater Screening Level are the screening levels in Ecology 2001a. The Soil Saturation Concentrations are the default residual soil saturation concentrations in MTCA Table 745-5.

[7] Adjusted to Ecology's accepted soil background concentration of 20 mg/kg per WAC 173-340-740(5)(c) (see MTCA Table 740-1 footnote b).

[8] Adjusted to Puget Sound natural background concentration (Ecology 1994) in accordance with WAC 173-340-740(5)(c).

[9] In accordance with WAC 173-340-740(5)(b), the total PCBs cleanup level is 1 mg/kg since Toxics Substance Control Act regulations in 40 CFR 761.61 are the governing rules for PCB cleanup. Per 40 CFR 761.61(a)(4)(i)(A), "the cleanup level for bulk PCB remediation waste in high occupancy areas is ≤ 1 ppm without further conditions." This 1 mg/kg value is also the MTCA Method A soil cleanup level for unrestricted land uses (see MTCA Table 740-1 footnote p).

[10] In accordance with WAC 173-340-740(5)(c), adjusted to the median urban background concentration identified in the Toxics Cleanup Program's investigation of soil concentrations in six Seattle neighborhoods to determine typical urban area concentrations (Ecology 2011). Although the median background concentration (0.084 mg/kg) in Ecology's study was substantially lower than the 90th percentile concentration (0.39 mg/kg), which is the statistic typically used to establish background concenrations, the median concentration was conservatively used for initial RI screening purposes. Note that the MTCA Method A soil cleanup level for unrestrictred land uses is 0.1 mg/kg.

[11] Adjusted to natural background concentration for Washington soil (Ecology 2010) in accordance with WAC 173-340-740(5)(c).

Table 2b: Calculation of Soil Direct Contact Screening Levels

Constituent Category	CAS No.	Constituent	Standard Method C Soil Value for Carcinogens [1] (mg/kg)	Standard Method C Soil Value for Non-carcinogens [1] (mg/kg)	Soil Direct Contact SL for Industrial Properties [2] (mg/kg)	Adjustment Note
VOCs	630-20-6	1,1,1,2-Tetrachloroethane	5,000	110,000	5,000	
	71-55-6	1,1,1-Trichloroethane	--	7,000,000	7,000,000	
	79-34-5	1,1,2,2-Tetrachloroethane	660	70,000	660	
	76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	--	110,000,000	110,000,000	
	79-00-5	1,1,2-Trichloroethane	2,300	14,000	2,300	
	75-34-3	1,1-Dichloroethane	23,000	700,000	23,000	
	75-35-4	1,1-Dichloroethene	--	180,000	180,000	
	563-58-6	1,1-Dichloropropene	--	--	No Value	
	87-61-6	1,2,3-Trichlorobenzene	--	2,800	2,800	
	96-18-4	1,2,3-Trichloropropane	4.4	14,000	4.4	
	120-82-1	1,2,4-Trichlorobenzene	4,500	35,000	4,500	
	95-63-6	1,2,4-Trimethylbenzene	--	35,000	35,000	
	96-12-8	1,2-Dibromo-3-Chloropropane	160	700	160	
	106-93-4	1,2-Dibromoethane	66	32,000	66	
	95-50-1	1,2-Dichlorobenzene	--	320,000	320,000	
	107-06-2	1,2-Dichloroethane	1,400	21,000	1,400	
	78-87-5	1,2-Dichloropropane	3,500	140,000	3,500	
	108-67-8	1,3,5-Trimethylbenzene	--	35,000	35,000	
	541-73-1	1,3-Dichlorobenzene	--	--	No Value	
	142-28-9	1,3-Dichloropropane	--	70,000	70,000	
	106-46-7	1,4-Dichlorobenzene	24,000	250,000	24,000	
	540-36-3	1,4-Difluorobenzene	--	--	No Value	
	594-20-7	2,2-Dichloropropane	--	--	No Value	
	78-93-3	2-Butanone	--	2,100,000	2,100,000	
	110-75-8	2-Chloroethyl vinyl ether	--	--	No Value	
	95-49-8	2-Chlorotoluene	--	70,000	70,000	
	591-78-6	2-Hexanone	--	18,000	18,000	
	107-87-9	2-Pentanone	--	--	No Value	
	460-00-4	4-Bromofluorobenzene	--	--	No Value	
	106-43-4	4-Chlorotoluene	--	70,000	70,000	
	108-10-1	4-Methyl-2-Pentanone	--	280,000	280,000	
	67-64-1	Acetone	--	3,200,000	3,200,000	
	107-02-8	Acrolein	--	1,800	1,800	
	107-13-1	Acrylonitrile	240	3,500	240	
	71-43-2	Benzene	2,400	14,000	2,400	
	108-86-1	Bromobenzene	--	28,000	28,000	
	74-97-5	Bromochloromethane	--	--	No Value	
	75-27-4	Bromodichloromethane	2,100	70,000	2,100	
	75-25-2	Bromoform	17,000	70,000	17,000	
	74-83-9	Bromomethane	--	4,900	4,900	
	75-15-0	Carbon Disulfide	--	350,000	350,000	
	56-23-5	Carbon tetrachloride	1,900	14,000	1,900	
	108-90-7	Chlorobenzene	--	70,000	70,000	
	75-00-3	Chloroethane	--	--	No Value	
	67-66-3	Chloroform	4,200	35,000	4,200	
	74-87-3	Chloromethane	--	--	No Value	
	156-59-2	cis-1,2-Dichloroethene	--	7,000	7,000	
	542-75-6	cis-1,3-Dichloropropene	1,300	110,000	1,300	
	108-94-1	Cyclohexanone	--	18,000,000	18,000,000	
	124-48-1	Dibromochloromethane	1,600	70,000	1,600	
	74-95-3	Dibromomethane	--	35,000	35,000	
	75-71-8	Dichlorodifluoromethane	--	700,000	700,000	
	100-41-4	Ethylbenzene	--	350,000	350,000	
	87-68-3	Hexachloro-1,3-butadiene	1,700	3,500	1,700	
	74-88-4	Iodomethane	--	--	No Value	
	98-82-8	Isopropylbenzene	--	350,000	350,000	
	99-87-6	Isopropyltoluene	--	14,000	14,000	
	108-38-3	m,p-Xylene	--	700,000	700,000	
	1634-04-4	Methyl tert-Butyl Ether	73,000	--	73,000	
	75-09-2	Methylene chloride	66,000	21,000	21,000	
	91-20-3	Naphthalene	--	70,000	70,000	
	104-51-8	n-Butylbenzene	--	180,000	180,000	
	110-54-3	n-Hexane	--	210,000	210,000	
	103-65-1	n-Propylbenzene	--	350,000	350,000	
	95-47-6	o-Xylene	--	700,000	700,000	
	363-72-4	Pentafluorobenzene	--	--	No Value	
	135-98-8	sec-Butylbenzene	--	350,000	350,000	
	100-42-5	Styrene	--	700,000	700,000	
	98-06-6	tert-Butylbenzene	--	350,000	350,000	
	127-18-4	Tetrachloroethene	63,000	21,000	21,000	
	108-88-3	Toluene	--	280,000	280,000	
	1330-20-7	Total Xylenes	--	700,000	700,000	
	156-60-5	trans-1,2-Dichloroethene	--	70,000	70,000	
	542-75-6	trans-1,3-Dichloropropene	1,300	110,000	1,300	
	110-57-6	trans-1,4-Dichloro 2-Butene	--	--	No Value	
	79-01-6	Trichloroethene	2,900	1,800	1,800	
	75-69-4	Trichlorofluoromethane	--	1,100,000	1,100,000	
	108-05-4	Vinyl Acetate	--	3,500,000	3,500,000	
	75-01-4	Vinyl Chloride	88	11,000	88	
	71-36-3	n-Butyl Alcohol	--	350,000	350,000	
TPH	unavailable08	TPH-G	--	--	1,500	(3)
	unavailable09	TPH-D	--	--	2,000	(4)
	unavailable10	TPH-HO	--	--	2,000	(4)

Table 2b: Calculation of Soil Direct Contact Screening Levels

Constituent Category	CAS No.	Constituent	Standard Method C Soil Value for Carcinogens [1] (mg/kg)	Standard Method C Soil Value for Non-carcinogens [1] (mg/kg)	Soil Direct Contact SL for Industrial Properties [2] (mg/kg)	Adjustment Note
Metals	7440-36-0	Antimony	--	1,400	1,400	
	7440-38-2	Arsenic	4.1	210	20	(5)
	7440-39-3	Barium	--	700,000	700,000	
	7440-43-9NP	Cadmium	--	3,500	3,500	
	16065-83-1	Chromium (III)	--	5,300,000	5,300,000	
	18540-29-9	Chromium (VI)	820	3,200	820	
	7440-47-3	Total Chromium	--	--	No Value	
	7440-50-8	Copper	--	140,000	140,000	
	7439-92-1	Lead	--	--	1,000	(6)
	7439-96-5	Manganese	--	--	No Value	
	7439-97-6	Mercury	--	--	1,100	(7)
	7440-02-0	Nickel	--	70,000	70,000	
	7782-49-2	Selenium	--	18,000	18,000	
	7440-22-4	Silver	--	18,000	18,000	
	7440-66-6	Zinc	--	1,100,000	1,100,000	
Cyanide	57-12-5	Free Cyanide	--	2,200	2,200	
PCBs	1336-36-3	Total PCBs	66	--	10	(8)
SVOCs	120-82-1	1,2,4-Trichlorobenzene	4,500	35,000	4,500	
	95-50-1	1,2-Dichlorobenzene	--	320,000	320,000	
	541-73-1	1,3-Dichlorobenzene	--	--	No Value	
	106-46-7	1,4-Dichlorobenzene	24,000	250,000	24,000	
	90-12-0	1-Methylnaphthalene	2,600	250,000	2,600	
	108-60-1	2,2'-Oxybis(1-chloropropane)	1,900	140,000	1,900	
	95-95-4	2,4,5-Trichlorophenol	--	350,000	350,000	
	88-06-2	2,4,6-Trichlorophenol	12,000	3,500	3,500	
	120-83-2	2,4-Dichlorophenol	--	11,000	11,000	
	105-67-9	2,4-Dimethylphenol	--	70,000	70,000	
	51-28-5	2,4-Dinitrophenol	--	7,000	7,000	
	121-14-2	2,4-Dinitrotoluene	420	7,000	420	
	606-20-2	2,6-Dinitrotoluene	88	1,100	88	
	91-58-7	2-Chloronaphthalene	--	280,000	280,000	
	95-57-8	2-Chlorophenol	--	18,000	18,000	
	91-57-6	2-Methylnaphthalene	--	14,000	14,000	
	95-48-7	2-Methylphenol	--	180,000	180,000	
	88-74-4	2-Nitroaniline	--	35,000	35,000	
	88-75-5	2-Nitrophenol	--	--	No Value	
	91-94-1	3,3'-Dichlorobenzidine	290	--	290	
	99-09-2	3-Nitroaniline	--	--	No Value	
	534-52-1	4,6-Dinitro-2-methylphenol	--	280	280	
	101-55-3	4-Bromophenyl phenyl ether	--	--	No Value	
	59-50-7	4-Chloro-3-Methylphenol	--	350,000	350,000	
	106-47-8	4-Chloroaniline	660	14,000	660	
	7005-72-3	4-Chlorophenylphenyl ether	--	--	No Value	
	106-44-5	3&4-Methylphenol	--	350,000	350,000	
	100-01-6	4-Nitroaniline	6,600	14,000	6,600	
	100-02-7	4-Nitrophenol	--	--	No Value	
	83-32-9	Acenaphthene	--	210,000	210,000	
	208-96-8	Acenaphthylene	--	--	No Value	
	120-12-7	Anthracene	--	1,100,000	1,100,000	
	191-24-2	Benzo(g,h,i)perylene	--	--	No Value	
	65-85-0	Benzoic acid	--	14,000,000	14,000,000	
	100-51-6	Benzyl Alcohol	--	350,000	350,000	
	111-91-1	Bis(2-Chloroethoxy)methane	--	11,000	11,000	
	111-44-4	bis(2-chloroethyl) ether	120	--	120	
	117-81-7	bis(2-Ethylhexyl)phthalate	9,400	70,000	9,400	
	85-68-7	Butylbenzylphthalate	69,000	700,000	69,000	
	86-74-8	Carbazole	--	--	No Value	
	132-64-9	Dibenzofuran	--	3,500	3,500	
	84-66-2	Diethyl phthalate	--	2,800,000	2,800,000	
	131-11-3	Dimethylphthalate	--	--	No Value	
	84-74-2	Di-n-Butylphthalate	--	350,000	350,000	
	117-84-0	Di-n-Octylphthalate	--	35,000	35,000	
	206-44-0	Fluoranthene	--	140,000	140,000	
	86-73-7	Fluorene	--	140,000	140,000	
	118-74-1	Hexachlorobenzene	82	2,800	82	
	87-68-3	Hexachlorobutadiene	1,700	3,500	1,700	
	77-47-4	Hexachlorocyclopentadiene	--	21,000	21,000	
	67-72-1	Hexachloroethane	3,300	2,500	2,500	
	78-59-1	Isophorone	140,000	700,000	140,000	
	91-20-3	Naphthalene	--	70,000	70,000	
	98-95-3	Nitrobenzene	--	7,000	7,000	
	62-75-9	N-Nitrosodimethylamine	2.6	28	2.6	
	621-64-7	N-Nitroso-di-n-Propylamine	19	--	19	
	86-30-6	N-Nitrosodiphenylamine	27,000	--	27,000	
	87-86-5	Pentachlorophenol	330	18,000	330	
	85-01-8	Phenanthrene	--	--	No Value	
	108-95-2	Phenol	--	1,100,000	1,100,000	
	129-00-0	Pyrene	--	110,000	110,000	
	50-32-8	Total cPAHs	130	1,100	130	
Dioxins/ Furans	1746-01-6	Total Dioxins/Furans	0.0017	0.0041	1.7E-03	
Organotins	56-35-9	Tributyltin oxide	--	1,100	1,100	

Table 2b: Calculation of Soil Direct Contact Screening Levels

Constituent Category	CAS No.	Constituent	Standard Method C Soil Value for Carcinogens [1] (mg/kg)	Standard Method C Soil Value for Non-carcinogens [1] (mg/kg)	Soil Direct Contact SL for Industrial Properties [2] (mg/kg)	Adjustment Note
Pesticides	72-54-8	4,4´-DDD	550	1,800	550	
	72-55-9	4,4´-DDE	390	1,800	390	
	50-29-3	4,4´-DDT	390	1,800	390	
	309-00-2	Aldrin	7.7	110	7.7	
	319-84-6	alpha-BHC	21	3,200	21	
	5103-71-9	alpha-Chlordane	--	1,800	1,800	
	319-85-7	beta-BHC	73	--	73	
	319-86-8	delta-BHC	--			
	60-57-1	Dieldrin	8.2	180	8.2	
	959-98-8	Endosulfan I	--	--	No Value	
	33213-65-9	Endosulfan II	--	--	No Value	
	1031-07-8	Endosulfan sulfate	--	21,000	21,000	
	72-20-8	Endrin	--	1,100	1,100	
	7421-93-4	Endrin aldehyde	--	--	No Value	
	53494-70-5	Endrin ketone	--	--	No Value	
	58-89-9	gamma-BHC	120	1,100	120	
	5103-74-2	gamma-Chlordane	--	1,800	1,800	
	76-44-8	Heptachlor	29	1,800	29	
	1024-57-3	Heptachlor epoxide	14	46	14	
	72-43-5	Methoxychlor	--	18,000	18,000	
	8001-35-2	Toxaphene	120	320	120	

Notes:

--: No value exists for this constituent in the Cleanup Levels and Risk Calculation (CLARC) database (Ecology 2025). No Value: A screening level cannot be calculated because no values exist in CLARC.

All values are presented as two significant figures in standard notation, except numbers greater than 100 are rounded to a whole number.

[1] Values from CLARC (Ecology 2025), unless otherwise noted.

[2] The screening level is the most stringent of the carcinogenic and non-carcinogenic values, unless otherwise noted.

[3] The generic TPH cleanup level of 1,500 mg/kg for "situations where only TPH-Gx is present or for mixtures that include TPH-Gx" in Ecology's model remedies guidance (Ecology 2017), which was designed for unrestricted land use, was conservatively used based on May 2024 personal correspondence with Sandy Smith (Ecology). This generic value greatly overestimates potential soil direct contact exposures for TPH-G at industrial properties (e.g., 150,000 mg/kg was the conservative soil direct contact value used to develop Method A soil cleanup levels for TPH-G at industrial properties). The TPH screening levels may be re-evaluated in the future if necessary.

[4] Method A soil cleanup levels for TPH-D and TPH-HO, which are based on default residual saturation values for the soil-to-groundwater pathway, were conservatively used based on May 2024 personal correspondence with Sandy Smith (Ecology). This Method A value greatly overestimates potential soil direct contact exposures for industrial properties (e.g., 39,000 mg/kg was the conservative soil direct contact value used to develop Method A soil cleanup levels for TPH-D and TPH-HO at industrial properties [Ecology 2001b]). The TPH screening levels may be re-evaluated in the future if necessary.

[5] Adjusted to Ecology's accepted soil background concentration of 20 mg/kg per WAC 173-340-740(5)(c) (see MTCA Table 740-1 footnote b).

[6] The lead direct contract value is the MTCA Method A soil cleanup level for industrial land use.

[7] Mercuric chloride was used as a surrogate for mercury per May 2024 personal correspondence with Sandy Smith (Ecology).

[8] In accordance with WAC 173-340-745(6)(b), the total PCBs cleanup level is 10 mg/kg since Toxics Substance Control Act regulations in 40 CFR 761.61 are the governing rules for PCB cleanup. Per 40 CFR 761.61(a)(4)(i)(A), the cleanup level for bulk PCB remediation waste in high occupancy areas covered with a cap is 10 mg/kg. This 10 mg/kg value is also the MTCA Method A soil cleanup level for industrial properties (see MTCA Table 745-1 footnote p).

Table 2c: Calculation of Saturated Zone Soil-to-Groundwater Screening Levels

Constituent Category	CAS No.	Constituent	Preliminary Groundwater SL [1] (ug/L)	Physiochemical Properties [2]				Soil-to-Groundwater Calculations		Saturated Zone Soil-to-Groundwater SL [5] (mg/kg)	Adjustment Note
				Henry's Law Constant (Hcc) (unitless)	Organic Carbon Partitioning Coefficient (Koc) (L/kg)	Aqueous Solubility (mg/L)	Distribution Coefficient (Kd) for Metals (L/kg)	Soil Concentration Protective of Groundwater SL [3] (mg/kg)	Soil Saturation Concentration [4] (mg/kg)		
VOCs	630-20-6	1,1,1,2-Tetrachloroethane	71	0.047	86	1,070	--	0.026	399	0.026	
	71-55-6	1,1,1-Trichloroethane	12,000	0.42	135	1,290	--	5.1	544	5.1	
	79-34-5	1,1,2,2-Tetrachloroethane	0.30	0.0073	79	2,830	--	0.00011	1,035	0.00011	
	76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	360	14	197	170	--	0.17	82	0.17	
	79-00-5	1,1,2-Trichloroethane	0.90	0.018	75	4,590	--	0.00033	1,660	0.00033	
	75-34-3	1,1-Dichloroethane	110	0.14	53	5,040	--	0.037	1,712	0.037	
	75-35-4	1,1-Dichloroethene	280	0.70	65	2,420	--	0.098	851	0.098	
	563-58-6	1,1-Dichloropropene	No Value	--	--	--	--	--	--	No Value	
	87-61-6	1,2,3-Trichlorobenzene	No Value	0.017	1,383	18	--	--	30	30	
	96-18-4	1,2,3-Trichloropropane	44	0.0069	116	1,750	--	0.018	704	0.018	
	120-82-1	1,2,4-Trichlorobenzene	0.037	0.024	1,659	49	--	0.000072	95	0.000072	
	95-63-6	1,2,4-Trimethylbenzene	520	0.11	614	57	--	0.47	51	0.47	
	96-12-8	1,2-Dibromo-3-Chloropropane	1.6	0.0026	116	1,230	--	0.00064	495	0.00064	
	106-93-4	1,2-Dibromoethane	3.0	0.014	66	3,910	--	0.0011	1,379	0.0011	
	95-50-1	1,2-Dichlorobenzene	800	0.037	379	156	--	0.53	104	0.53	
	107-06-2	1,2-Dichloroethane	35	0.028	38	8,600	--	0.011	2,792	0.011	
	78-87-5	1,2-Dichloropropane	3.1	0.065	47	2,800	--	0.0010	934	0.0010	
	108-67-8	1,3,5-Trimethylbenzene	370	0.16	602	48	--	0.33	43	0.33	
	541-73-1	1,3-Dichlorobenzene	2.0	0.051	375	125	--	0.0013	83	0.0013	
	142-28-9	1,3-Dichloropropane	No Value	0.021	72	2,750	--	--	987	987	
	106-46-7	1,4-Dichlorobenzene	50	0.046	616	81	--	0.045	73	0.045	
	540-36-3	1,4-Difluorobenzene	No Value	--	--	--	--	--	--	No Value	
	594-20-7	2,2-Dichloropropane	No Value	--	--	--	--	--	--	No Value	
	78-93-3	2-Butanone	3,700,000	0.0013	4.5	223,000	--	1,077	64,932	1,077	
	110-75-8	2-Chloroethyl vinyl ether	No Value	--	--	--	--	--	--	No Value	
	95-49-8	2-Chlorotoluene	No Value	0.071	383	374	--	--	250	250	
	591-78-6	2-Hexanone	16,000	0.0019	15	17,200	--	4.8	5,188	4.8	
	107-87-9	2-Pentanone	No Value	--	--	--	--	--	--	No Value	
	460-00-4	4-Bromofluorobenzene	No Value	--	--	--	--	--	--	No Value	
	106-43-4	4-Chlorotoluene	No Value	0.081	375	106	--	--	70	70	
	108-10-1	4-Methyl-2-Pentanone	1,000,000	0.0029	13	19,000	--	299	5,686	299	
	67-64-1	Acetone	No Value	0.00088	2.4	1,000,000	--	--	289,031	289,031	
	107-02-8	Acrolein	1.1	0.0031	1.0	212,000	--	0.00032	60,985	0.00032	
	107-13-1	Acrylonitrile	0.028	0.0032	8.5	74,500	--	0.0000083	21,991	0.0000083	
	71-43-2	Benzene	1.6	0.13	62	1,750	--	0.00056	610	0.00056	
	108-86-1	Bromobenzene	1,400	0.043	234	446	--	0.73	232	0.73	
	74-97-5	Bromochloromethane	No Value	0.036	22	16,700	--	--	5,150	5,150	
	75-27-4	Bromodichloromethane	2.8	0.049	32	3,032	--	0.00089	966	0.00089	
	75-25-2	Bromoform	12	0.010	126	3,100	--	0.0050	1,279	0.0050	
	74-83-9	Bromomethane	24	0.21	9.0	15,200	--	0.0071	4,494	0.0071	
	75-15-0	Carbon Disulfide	1,800	0.38	22	2,160	--	0.56	666	0.56	
	56-23-5	Carbon tetrachloride	0.35	0.68	152	793	--	0.00015	348	0.00015	
	108-90-7	Chlorobenzene	200	0.066	224	498	--	0.10	254	0.10	
	75-00-3	Chloroethane	32,000	0.31	22	6,710	--	9.9	2,069	9.9	
	67-66-3	Chloroform	12	0.092	53	7,950	--	0.0041	2,700	0.0041	
	74-87-3	Chloromethane	330	0.27	6.0	5,320	--	0.097	1,557	0.097	
	156-59-2	cis-1,2-Dichloroethene	400	0.10	40	6,410	--	0.13	2,091	0.13	
	542-75-6	cis-1,3-Dichloropropene	1.2	0.079	27	2,800	--	0.00038	878	0.00038	
	108-94-1	Cyclohexanone	4,500,000	0.00016	17	25,000	--	1,368	7,601	1,368	
	124-48-1	Dibromochloromethane	2.2	0.021	32	2,700	--	0.00070	860	0.00070	
	74-95-3	Dibromomethane	210	0.019	22	11,900	--	0.065	3,670	0.065	

Table 2c: Calculation of Saturated Zone Soil-to-Groundwater Screening Levels

Constituent Category	CAS No.	Constituent	Preliminary Groundwater SL [1] (ug/L)	Physiochemical Properties [2]				Soil-to-Groundwater Calculations		Saturated Zone Soil-to-Groundwater SL [5] (mg/kg)	Adjustment Note
				Henry's Law Constant (Hcc) (unitless)	Organic Carbon Partitioning Coefficient (Koc) (L/kg)	Aqueous Solubility (mg/L)	Distribution Coefficient (Kd) for Metals (L/kg)	Soil Concentration Protective of Groundwater SL [3] (mg/kg)	Soil Saturation Concentration [4] (mg/kg)		
VOCs	75-71-8	Dichlorodifluoromethane	9.2	11	44	280	--	0.0030	93	0.0030	
	100-41-4	Ethylbenzene	21	0.16	204	169	--	0.010	83	0.010	
	87-68-3	Hexachloro-1,3-butadiene	0.010	0.18	845	3.2	--	0.000011	3.6	0.000011	
	74-88-4	Iodomethane	No Value	--	--	--	--	--	--	No Value	
	98-82-8	Isopropylbenzene	2,000	0.20	698	61	--	2.0	60	2.0	
	99-87-6	Isopropyltoluene	190	0.21	1,120	23	--	0.267	33	0.2673	
	108-38-3	m,p-Xylene	No Value	0.15	196	161	--	--	78	78	
	1634-04-4	Methyl tert-Butyl Ether	8,600	0.011	11	50,000	--	2.6	14,878	2.6	
	75-09-2	Methylene chloride	100	0.084	10.0	13,000	--	0.030	3,857	0.030	
	91-20-3	Naphthalene	88	0.0083	1,191	31	--	0.13	46	0.13	
	104-51-8	n-Butylbenzene	No Value	0.29	1,482	12	--	--	21	21	
	110-54-3	n-Hexane	16	45	3,410	9.5	--	0.059	35	0.059	
	103-65-1	n-Propylbenzene	4,900	0.20	813	52	--	5.4	57	5.4	
	95-47-6	o-Xylene	No Value	0.11	241	178	--	--	94	94	
	363-72-4	Pentafluorobenzene	No Value	--	--	--	--	--	--	No Value	
	135-98-8	sec-Butylbenzene	No Value	0.28	1,331	18	--	--	28	28	
	100-42-5	Styrene	19,000	0.054	912	310	--	23	372	23	
	98-06-6	tert-Butylbenzene	No Value	0.21	1,001	30	--	--	38	38	
	127-18-4	Tetrachloroethene	2.9	0.38	265	206	--	0.0016	114	0.0016	
	108-88-3	Toluene	102	0.15	140	526	--	0.044	224	0.044	
	1330-20-7	Total Xylenes	106	0.14	233	171	--	0.055	89	0.055	
	156-60-5	trans-1,2-Dichloroethene	170	0.24	38	4,520	--	0.055	1,467	0.055	
	542-75-6	trans-1,3-Dichloropropene	1.2	0.079	27	2,800	--	0.00038	878	0.00038	
	110-57-6	trans-1,4-Dichloro 2-Butene	No Value	0.013	132	850	--	--	355	355	
	79-01-6	Trichloroethene	0.70	0.23	94	1,280	--	0.00027	487	0.00027	
	75-69-4	Trichlorofluoromethane	260	2.7	44	1,100	--	0.086	364	0.086	
	108-05-4	Vinyl Acetate	18,000	0.011	5.6	20,000	--	5.3	5,845	5.3	
	75-01-4	Vinyl Chloride	0.18	0.85	22	8,800	--	0.000056	2,714	0.000056	
	71-36-3	n-Butyl Alcohol	No Value	0.00015	3.5	63,200	--	--	18,337	18,337	
TPH	unavailable08	TPH-G	1,700	--	--	--	--	30 [6]	1,000 [6]	30	
	unavailable09	TPH-D	2,100	--	--	--	--	1,000,000 [6]	2,000 [6]	2,000	
	unavailable10	TPH-HO	No Value	--	--	--	--	1,000,000 [6]	2,000 [6]	2,000	
Metals	7440-36-0	Antimony	90	0.0	--	--	45	4.1	Not Applicable	4.1	
	7440-38-2	Arsenic	8.0	0.0	--	--	29	0.23	Not Applicable	20	(7)
	7440-39-3	Barium	No Value	0.0	--	--	41	--	Not Applicable	No Value	
	7440-43-9NP	Cadmium	7.9	0.0	--	--	6.7	0.055	Not Applicable	0.77	(8)
	16065-83-1	Chromium (III)	240,000	0.0	--	--	1,000	240,069	Not Applicable	240,069	
	18540-29-9	Chromium (VI)	4.1	0.0	--	1,690,000	19	0.079	Not Applicable	0.079	
	7440-47-3	Total Chromium	No Value	0.0	--	--	1,000	--	Not Applicable	No Value	
	7440-50-8	Copper	3.1	0.0	--	--	22	0.069	Not Applicable	36	(8)
	7439-92-1	Lead	8.1	0.0	--	--	10,000	81	Not Applicable	81	
	7439-96-5	Manganese	100	0.0	--	--	65	6.5	Not Applicable	1,146	(8)
	7439-97-6	Mercury	0.025	0.17	--	0.060	52	0.0013	Not Applicable	0.070	(8)
	7440-02-0	Nickel	8.2	0.0	--	--	65	0.54	Not Applicable	38	(8)
	7782-49-2	Selenium	71	0.0	--	--	5.0	0.38	Not Applicable	0.78	(8)
	7440-22-4	Silver	0.91	0.0	--	--	8.3	0.0078	Not Applicable	0.61	(8)
	7440-66-6	Zinc	81	0.0	--	--	62	5.0	Not Applicable	85	(8)
Cyanide	57-12-5	Free Cyanide	2.8	*0.0042*	--	95,400	9.9	0.029	Not Applicable	0.029	
PCBs	1336-36-3	Total PCBs	0.0000070	*0.017*	78,100	0.70	--	0.00000055	55	1.0	(9)

Table 2c: Calculation of Saturated Zone Soil-to-Groundwater Screening Levels

Constituent Category	CAS No.	Constituent	Preliminary Groundwater SL [1] (ug/L)	Physiochemical Properties [2]				Soil-to-Groundwater Calculations		Saturated Zone Soil-to-Groundwater SL [5] (mg/kg)	Adjustment Note
				Henry's Law Constant (Hcc) (unitless)	Organic Carbon Partitioning Coefficient (Koc) (L/kg)	Aqueous Solubility (mg/L)	Distribution Coefficient (Kd) for Metals (L/kg)	Soil Concentration Protective of Groundwater SL [3] (mg/kg)	Soil Saturation Concentration [4] (mg/kg)		
	120-82-1	1,2,4-Trichlorobenzene	0.037	0.024	1,659	49	--	0.000072	95	0.000072	
	95-50-1	1,2-Dichlorobenzene	800	0.037	379	156	--	0.53	104	0.53	
	541-73-1	1,3-Dichlorobenzene	2.0	0.051	375	125	--	0.0013	83	0.0013	
	106-46-7	1,4-Dichlorobenzene	50	0.046	616	81	--	0.045	73	0.045	
	90-12-0	1-Methylnaphthalene	0.37	0.0082	2,528	26	--	0.0010	73	0.0010	
	108-60-1	2,2'-Oxybis(1-chloropropane)	370	0.0014	83	1,700	--	0.14	628	0.14	
	95-95-4	2,4,5-Trichlorophenol	600	0.000026	1,597	1,200	--	1.1	2,260	1.1	
	88-06-2	2,4,6-Trichlorophenol	0.28	0.000041	381	800	--	0.00019	534	0.00019	
	120-83-2	2,4-Dichlorophenol	10.0	0.000075	147	5,550	--	0.0043	2,407	0.0043	
	105-67-9	2,4-Dimethylphenol	97	0.000014	492	7,870	--	0.076	6,127	0.076	
	51-28-5	2,4-Dinitrophenol	100	*0.0000035*	0.010	2,790	--	0.029	800	0.029	
	121-14-2	2,4-Dinitrotoluene	0.18	0.00000048	576	200	--	0.00016	172	0.00016	
	606-20-2	2,6-Dinitrotoluene	No Value	0.0000073	587	182	--	--	159	159	
	91-58-7	2-Chloronaphthalene	100	0.0048	2,478	12	--	0.28	32	0.28	
	95-57-8	2-Chlorophenol	17	0.00021	388	11,300	--	0.011	7,624	0.011	
	91-57-6	2-Methylnaphthalene	No Value	0.0070	2,478	25	--	--	68	68	
	95-48-7	2-Methylphenol	No Value	0.000020	307	25,900	--	--	15,363	15,363	
	88-74-4	2-Nitroaniline	No Value	0.00000061	111	1,470	--	--	585	585	
	88-75-5	2-Nitrophenol	No Value	--	--	--	--	--	--	No Value	
	91-94-1	3,3'-Dichlorobenzidine	0.0033	*1.2E-9*	3,190	3.1	--	0.000011	11	0.000011	
	99-09-2	3-Nitroaniline	No Value	--	--	--	--	--	--	No Value	
	534-52-1	4,6-Dinitro-2-methylphenol	7.0	*0.000057*	754	198	--	0.0073	206	0.0073	
	101-55-3	4-Bromophenyl phenyl ether	No Value	--	--	--	--	--	--	No Value	
	59-50-7	4-Chloro-3-Methylphenol	36	0.000040	492	3,834	--	0.028	2,985	0.028	
	106-47-8	4-Chloroaniline	No Value	0.000017	113	3,900	--	--	1,558	1,558	
SVOCs	7005-72-3	4-Chlorophenylphenyl ether	No Value	--	--	--	--	--	--	No Value	
	106-44-5	3&4-Methylphenol	No Value	0.000015	300	21,500	--	--	12,622	12,622	
	100-01-6	4-Nitroaniline	No Value	0.000000011	109	728	--	--	288	288	
	100-02-7	4-Nitrophenol	No Value	--	--	--	--	--	--	No Value	
	83-32-9	Acenaphthene	30	0.0025	4,898	3.9	--	0.16	20	0.16	
	208-96-8	Acenaphthylene	No Value	--	--	--	--	--	--	No Value	
	120-12-7	Anthracene	100	0.00065	23,493	0.043	--	2.4	1.0	1.0	
	191-24-2	Benzo(g,h,i)perylene	No Value	--	--	--	--	--	--	No Value	
	65-85-0	Benzoic acid	No Value	0.00000052	0.60	3,400	--	--	977	977	
	100-51-6	Benzyl Alcohol	No Value	0.0000049	21	42,900	--	--	13,219	13,219	
	111-91-1	Bis(2-Chloroethoxy)methane	No Value	0.000066	14	7,800	--	--	2,348	2,348	
	111-44-4	bis(2-chloroethyl) ether	0.060	0.00028	76	17,200	--	0.000022	6,238	0.000022	
	117-81-7	bis(2-Ethylhexyl)phthalate	0.046	0.0000023	111,123	0.27	--	0.0051	30	0.0051	
	85-68-7	Butylbenzylphthalate	0.013	0.000015	13,746	2.7	--	0.00018	38	0.00018	
	86-74-8	Carbazole	No Value	--	--	--	--	--	--	No Value	
	132-64-9	Dibenzofuran	No Value	0.000018	9,161	3.1	--	--	29	29	
	84-66-2	Diethyl phthalate	200	0.0000065	82	1,080	--	0.074	398	0.074	
	131-11-3	Dimethylphthalate	600	0.0000023	32	4,000	--	0.19	1,273	0.19	
	84-74-2	Di-n-Butylphthalate	8.0	0.000010	1,567	11	--	0.015	21	0.015	
	117-84-0	Di-n-Octylphthalate	No Value	0.000015	140,800	0.022	--	--	3.1	3.1	
	206-44-0	Fluoranthene	6.0	0.000091	49,096	0.26	--	0.30	13	0.30	
	86-73-7	Fluorene	10.0	0.0012	7,707	1.7	--	0.080	14	0.080	
	118-74-1	Hexachlorobenzene	0.0000050	0.022	80,000	0.0062	--	0.00000040	0.50	0.00000040	
	87-68-3	Hexachlorobutadiene	0.010	0.18	845	3.2	--	0.000011	3.6	0.000011	
	77-47-4	Hexachlorocyclopentadiene	1.0	0.022	1,404	1.8	--	0.0017	3.0	0.0017	
	67-72-1	Hexachloroethane	0.020	0.059	197	50	--	0.0000097	24	0.0000097	

Table 2c: Calculation of Saturated Zone Soil-to-Groundwater Screening Levels

Constituent Category	CAS No.	Constituent	Preliminary Groundwater SL [1] (ug/L)	Physiochemical Properties [2]				Soil-to-Groundwater Calculations		Saturated Zone Soil-to-Groundwater SL [5] (mg/kg)	Adjustment Note
				Henry's Law Constant (Hcc) (unitless)	Organic Carbon Partitioning Coefficient (Koc) (L/kg)	Aqueous Solubility (mg/L)	Distribution Coefficient (Kd) for Metals (L/kg)	Soil Concentration Protective of Groundwater SL [3] (mg/kg)	Soil Saturation Concentration [4] (mg/kg)		
SVOCs	78-59-1	Isophorone	110	0.00011	65	12,000	--	0.039	4,222	0.039	
	91-20-3	Naphthalene	88	0.0083	1,191	31	--	0.13	46	0.13	
	98-95-3	Nitrobenzene	100	0.00040	119	2,090	--	0.041	848	0.041	
	62-75-9	N-Nitrosodimethylamine	0.34	0.000037	23	1,000,000	--	0.00011	309,457	0.00011	
	621-64-7	N-Nitroso-di-n-Propylamine	0.058	*0.00022*	275	13,000	--	0.000033	7,307	0.000033	
	86-30-6	N-Nitrosodiphenylamine	0.69	*0.000049*	2,632	35	--	0.0020	102	0.0020	
	87-86-5	Pentachlorophenol	0.0020	*0.0000010*	592	14	--	0.0000018	12	0.0000018	
	85-01-8	Phenanthrene	No Value	--	--	--	--	--	--	No Value	
	108-95-2	Phenol	70,000	0.0000055	187	82,800	--	33	39,236	33	
	129-00-0	Pyrene	8.0	0.00011	67,992	0.14	--	0.55	9.2	0.55	
	50-32-8	Total cPAHs	0.000016	0.0000036	968,774	0.0016	--	0.000016	1.6	0.084	(10)
Dioxins/ Furans	1746-01-6	Total Dioxins/Furans	5.1E-09	*0.0020*	249,100	0.00020	--	1.3E-09	0.050	5.2E-06	(11)
Organotins	56-35-9	Tributyltin oxide	0.050	*0.000012*	25,930,000	20	--	1.3	505,641	1.3	
Pesticides	72-54-8	4,4´-DDD	0.0000079	*0.00027*	45,800	0.090	--	0.00000036	4.1	0.00000036	
	72-55-9	4,4´-DDE	0.00000088	0.00044	86,405	0.040	--	0.000000076	3.5	0.000000076	
	50-29-3	4,4´-DDT	0.0000012	0.00013	677,934	0.0055	--	0.00000081	3.7	0.00000081	
	309-00-2	Aldrin	0.000000041	0.000081	48,685	0.017	--	2.0E-9	0.83	2.0E-9	
	319-84-6	alpha-BHC	0.000048	*0.00027*	1,762	2.0	--	0.000000098	4.1	0.000000098	
	5103-71-9	alpha-Chlordane	No Value	*0.0020*	67,540	0.056	--	--	3.8	3.8	
	319-85-7	beta-BHC	0.0014	*0.000018*	2,139	0.24	--	0.0000034	0.58	0.0000034	
	319-86-8	delta-BHC	No Value	--	2,807	31.40	--	--	--	No Value	
	60-57-1	Dieldrin	0.000000070	0.000088	25,546	0.20	--	1.8E-9	5.0	1.8E-9	
	959-98-8	Endosulfan I	0.0087	*0.00029*	6,761	0.51	--	0.000061	3.6	0.000061	
	33213-65-9	Endosulfan II	0.0087	*0.000016*	6,761	0.45	--	0.000061	3.2	0.000061	
	1031-07-8	Endosulfan sulfate	10.0	*0.000013*	9,847	0.48	--	0.10	4.9	0.10	
	72-20-8	Endrin	0.0020	*0.00026*	10,811	0.25	--	0.000022	2.8	0.000022	
	7421-93-4	Endrin aldehyde	0.035	*0.00017*	3,271	0.024	--	0.00012	0.085	0.00012	
	53494-70-5	Endrin ketone	No Value	--	--	--	--	--	--	No Value	
	58-89-9	gamma-BHC	0.430	*0.00021*	1,352	7.3	--	0.000705	12	0.000705	
	5103-74-2	gamma-Chlordane	No Value	*0.0020*	67,540	0.056	--	--	3.8	3.8	
	76-44-8	Heptachlor	0.00000034	0.0038	9,528	0.18	--	3.3E-9	1.8	3.3E-9	
	1024-57-3	Heptachlor epoxide	0.0000024	0.00020	10,110	0.20	--	0.000000025	2.1	0.000000025	
	72-43-5	Methoxychlor	0.020	*0.0000083*	80,000	0.10	--	0.0016	8.0	0.0016	
	8001-35-2	Toxaphene	0.000032	*0.00025*	95,816	0.55	--	0.0000031	53	0.0000031	

Notes:

--: No value exists for this constituent in the Cleanup Levels and Risk Calculation (CLARC) database (Ecology 2025). No Value: A screening level cannot be calculated because no values exist in CLARC.

All values are presented as two significant figures in standard notation, except numbers greater than 100 are rounded to a whole number.

[1] See Table 1 for calculation of these screening levels.

[2] Values from CLARC (Ecology 2025), unless otherwise noted. Henry's Law Constant values are for 13 degrees Celsius, with the exception that values for the following constituents are for 25 degrees Celsius (due to a lack of data at 13 degrees Celsius): cyanide, total PCBs, 2,4-dinitrophenol, 3,3'-dichlorobenzidine, 4,6-dinitro-2-methylphenol, n-nitroso-di-n-propylamine, n-nitrosodiphenylamine, pentachlorophenol, total dioxins/furans, tributyltin oxide, 4,4´-DDD, alpha-BHC, alpha-chlordane, beta-BHC, endosulfan I, endosulfan II, endosulfan sulfate, endrin, endrin aldehyde, gamma-BHC, gamma-chlordane, methoxychlor, and toxaphene.

[3] Calculated with the MTCA three-phase partitioning model using standard MTCA default inputs in WAC 173-340-747(4).

[4] Calculated by substituting aqueous solubility value for target groundwater concentration * dilution factor in MTCA Equation 747-1 (Ecology 2001a), unless otherwise noted.

[5] Most stringent of soil concentration protective of target groundwater concentration and soil saturation concentration, unless a subsequent adjustment is necessary.

[6] These Soil Concentrations Protective of Groundwater Screening Level are the screening levels in Ecology 2001a. The Soil Saturation Concentrations are the default residual soil saturation concentrations in MTCA Table 745-5.

[7] Adjusted to Ecology's accepted soil background concentration of 20 mg/kg per WAC 173-340-740(5)(c) (see MTCA Table 740-1 footnote b).

[8] Adjusted to Puget Sound natural background concentration (Ecology 1994) in accordance with WAC 173-340-740(5)(c).

[9] In accordance with WAC 173-340-740(5)(b), the total PCBs cleanup level is 1 mg/kg since Toxics Substance Control Act regulations in 40 CFR 761.61 are the governing rules for PCB cleanup. Per 40 CFR 761.61(a)(4)(i)(A), "the cleanup level for bulk PCB remediation waste in high occupancy areas is ≤ 1 ppm without further conditions." This 1 mg/kg value is also the MTCA Method A soil cleanup level for unrestricted land uses (see MTCA Table 740-1 footnote p).

[10] In accordance with WAC 173-340-740(5)(c), adjusted to the median urban background concentration identified in the Toxics Cleanup Program's investigation of soil concentrations in six Seattle neighborhoods to determine typical urban area concentrations (Ecology 2011). Although the median background concentration (0.084 mg/kg) in Ecology's study was substantially lower than the 90th percentile concentration (0.39 mg/kg), which is the statistic typically used to establish background concenrations, the median concentration was conservatively used for initial RI screening purposes. Note that the MTCA Method A soil cleanup level for unrestrictred land uses is 0.1 mg/kg.

[11] Adjusted to natural background concentration for Washington soil (Ecology 2010) in accordance with WAC 173-340-740(5)(c).

Table 3: Calculation of Preliminary Indoor Air Screening Levels

Constituent Category	CAS No.	Constituent	Standard Method C Air Cleanup Level for Carcinogens [1] (ug/m^3)	Standard Method C Air Cleanup Level for Non-carcinogens [1] (ug/m^3)	Preliminary Indoor Air SL for Industrial Properties [2,3] (ug/m^3)
VOCs	630-20-6	1,1,1,2-Tetrachloroethane	3.4	--	3.4
	71-55-6	1,1,1-Trichloroethane	--	5,000	5,000
	79-34-5	1,1,2,2-Tetrachloroethane	0.43	--	0.43
	76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	--	5,000	5,000
	79-00-5	1,1,2-Trichloroethane	1.6	0.20	0.20
	75-34-3	1,1-Dichloroethane	16	--	16
	75-35-4	1,1-Dichloroethene	--	200	200
	563-58-6	1,1-Dichloropropene	--	--	No Value
	87-61-6	1,2,3-Trichlorobenzene	--	--	No Value
	96-18-4	1,2,3-Trichloropropane	--	0.30	0.30
	120-82-1	1,2,4-Trichlorobenzene	--	2.0	2.0
	95-63-6	1,2,4-Trimethylbenzene	--	60	60
	96-12-8	1,2-Dibromo-3-Chloropropane	0.0042	0.20	0.0042
	106-93-4	1,2-Dibromoethane	0.042	9.0	0.042
	95-50-1	1,2-Dichlorobenzene	--	200	200
	107-06-2	1,2-Dichloroethane	0.96	7.0	0.96
	78-87-5	1,2-Dichloropropane	6.8	4.0	4.0
	108-67-8	1,3,5-Trimethylbenzene	--	60	60
	541-73-1	1,3-Dichlorobenzene	--	--	No Value
	142-28-9	1,3-Dichloropropane	--	--	No Value
	106-46-7	1,4-Dichlorobenzene	2.3	800	2.3
	540-36-3	1,4-Difluorobenzene	--	--	No Value
	594-20-7	2,2-Dichloropropane	--	--	No Value
	78-93-3	2-Butanone	--	5,000	5,000
	110-75-8	2-Chloroethyl vinyl ether	--	--	No Value
	95-49-8	2-Chlorotoluene	--	--	No Value
	591-78-6	2-Hexanone	--	30	30
	107-87-9	2-Pentanone	--	--	No Value
	460-00-4	4-Bromofluorobenzene	--	--	No Value
	106-43-4	4-Chlorotoluene	--	--	No Value
	108-10-1	4-Methyl-2-Pentanone	--	3,000	3,000
	67-64-1	Acetone	--	--	No Value
	107-02-8	Acrolein	--	0.020	0.020
	107-13-1	Acrylonitrile	0.37	2.0	0.37
	71-43-2	Benzene	3.2	30	3.2
	108-86-1	Bromobenzene	--	60	60
	74-97-5	Bromochloromethane	--	--	No Value
	75-27-4	Bromodichloromethane	0.68	--	0.68
	75-25-2	Bromoform	23	--	23
	74-83-9	Bromomethane	--	5.0	5.0
	75-15-0	Carbon Disulfide	--	700	700
	56-23-5	Carbon tetrachloride	4.2	100	4.2
	108-90-7	Chlorobenzene	--	50	50
	75-00-3	Chloroethane	--	10,000	10,000
	67-66-3	Chloroform	1.1	2	1.1
	74-87-3	Chloromethane	--	90	90
	156-59-2	cis-1,2-Dichloroethene	--	40	40
	542-75-6	cis-1,3-Dichloropropene	6.3	20	6.3
	108-94-1	Cyclohexanone	--	700	700
	124-48-1	Dibromochloromethane	--	--	No Value
	74-95-3	Dibromomethane	--	4.0	4.0
	75-71-8	Dichlorodifluoromethane	--	100	100
	100-41-4	Ethylbenzene	--	1,000	1,000
	87-68-3	Hexachloro-1,3-butadiene	1.1	--	1.1
	74-88-4	Iodomethane	--	--	No Value
	98-82-8	Isopropylbenzene	--	400	400
	99-87-6	Isopropyltoluene	--	40	40
	108-38-3	m,p-Xylene	--	--	No Value
	1634-04-4	Methyl tert-Butyl Ether	96	3,000	96
	75-09-2	Methylene chloride	2,500	600	600
	91-20-3	Naphthalene	0.74	3.0	0.74
	104-51-8	n-Butylbenzene	--	--	No Value
	110-54-3	n-Hexane	--	700	700
	103-65-1	n-Propylbenzene	--	1,000	1,000
	95-47-6	o-Xylene	--	--	No Value
	363-72-4	Pentafluorobenzene	--	--	No Value
	135-98-8	sec-Butylbenzene	--	--	No Value
	100-42-5	Styrene	--	1,000	1,000
	98-06-6	tert-Butylbenzene	--	--	No Value
	127-18-4	Tetrachloroethene	96	40	40
	108-88-3	Toluene	--	5,000	5,000
	1330-20-7	Total Xylenes	--	100	100
	156-60-5	trans-1,2-Dichloroethene	--	40	40
	542-75-6	trans-1,3-Dichloropropene	6.3	20	6.3
	110-57-6	trans-1,4-Dichloro 2-Butene	--	--	No Value
	79-01-6	Trichloroethene	6.1	2.0	2.0
	75-69-4	Trichlorofluoromethane	--	700	700
	108-05-4	Vinyl Acetate	--	200	200
	75-01-4	Vinyl Chloride	2.8	100	2.8
	71-36-3	n-Butyl Alcohol	--	--	No Value
TPH	No Value	TPH-Generic Cleanup Level	--	46	46
SVOCs	90-12-0	1-Methylnaphthalene	--	0.0030	0.0030

Notes:

--: No value exists for this constituent in the Cleanup Levels and Risk Calculation (CLARC) database (Ecology 2025). No Value: A screening level cannot be calculated because no values exist in CLARC or no CAS number is available.

All values are presented as two significant figures in standard notation, except numbers greater than 100 are rounded to a whole number.

[1] Values from CLARC (Ecology 2025), unless otherwise noted.

[2] The screening level is the most stringent of the carcinogenic and non-carcinogenic values.

Table 4: Calculation of Preliminary Sub-Slab Soil Gas Screening Levels

Constituent Category	CAS No.	Constituent	Standard Method C Sub-Slab Soil Gas SL for Carcinogens [1] (ug/m^3)	Standard Method C Sub-Slab Soil Gas SL for Non-carcinogens [1] (ug/m^3)	Preliminary Sub-Slab Soil Gas SL for Industrial Properties [2] (ug/m^3)
VOCs	630-20-6	1,1,1,2-Tetrachloroethane	110	--	110
	71-55-6	1,1,1-Trichloroethane	--	170,000	170,000
	79-34-5	1,1,2,2-Tetrachloroethane	14	--	14
	76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	--	170,000	170,000
	79-00-5	1,1,2-Trichloroethane	52	6.7	6.7
	75-34-3	1,1-Dichloroethane	520	--	520
	75-35-4	1,1-Dichloroethene	--	6,700	6,700
	563-58-6	1,1-Dichloropropene	--	--	No Value
	87-61-6	1,2,3-Trichlorobenzene	--	--	No Value
	96-18-4	1,2,3-Trichloropropane	--	10.0	10.0
	120-82-1	1,2,4-Trichlorobenzene	--	67	67
	95-63-6	1,2,4-Trimethylbenzene	--	2,000	2,000
	96-12-8	1,2-Dibromo-3-Chloropropane	0.14	6.7	0.14
	106-93-4	1,2-Dibromoethane	1.4	300	1.4
	95-50-1	1,2-Dichlorobenzene	--	6,700	6,700
	107-06-2	1,2-Dichloroethane	32	230	32
	78-87-5	1,2-Dichloropropane	230	130	130
	108-67-8	1,3,5-Trimethylbenzene	--	2,000	2,000
	541-73-1	1,3-Dichlorobenzene	--	--	No Value
	142-28-9	1,3-Dichloropropane	--	--	No Value
	106-46-7	1,4-Dichlorobenzene	76	27,000	76
	540-36-3	1,4-Difluorobenzene	--	--	No Value
	594-20-7	2,2-Dichloropropane	--	--	No Value
	78-93-3	2-Butanone	--	170,000	170,000
	110-75-8	2-Chloroethyl vinyl ether	--	--	No Value
	95-49-8	2-Chlorotoluene	--	--	No Value
	591-78-6	2-Hexanone	--	1,000	1,000
	107-87-9	2-Pentanone	--	--	No Value
	460-00-4	4-Bromofluorobenzene	--	--	No Value
	106-43-4	4-Chlorotoluene	--	--	No Value
	108-10-1	4-Methyl-2-Pentanone	--	100,000	100,000
	67-64-1	Acetone	--	--	No Value
	107-02-8	Acrolein	--	0.67	0.67
	107-13-1	Acrylonitrile	12	67	12
	71-43-2	Benzene	110	1,000	110
	108-86-1	Bromobenzene	--	2,000	2,000
	74-97-5	Bromochloromethane	--	--	No Value
	75-27-4	Bromodichloromethane	23	--	23
	75-25-2	Bromoform	760	--	760
	74-83-9	Bromomethane	--	170	170
	75-15-0	Carbon Disulfide	--	23,000	23,000
	56-23-5	Carbon tetrachloride	140	3,300	140
	108-90-7	Chlorobenzene	--	1,700	1,700
	75-00-3	Chloroethane	--	330,000	330,000
	67-66-3	Chloroform	36	67	36
	74-87-3	Chloromethane	--	3,000	3,000
	156-59-2	cis-1,2-Dichloroethene	--	1,300	1,300
	542-75-6	cis-1,3-Dichloropropene	210	670	210
	108-94-1	Cyclohexanone	--	23,000	23,000
	124-48-1	Dibromochloromethane	--	--	No Value
	74-95-3	Dibromomethane	--	130	130
	75-71-8	Dichlorodifluoromethane	--	3,300	3,300
	100-41-4	Ethylbenzene	--	33,000	33,000
	87-68-3	Hexachloro-1,3-butadiene	38	--	38
	74-88-4	Iodomethane	--	--	No Value
	98-82-8	Isopropylbenzene	--	13,000	13,000
	99-87-6	Isopropyltoluene	--	1,300	1,300
	108-38-3	m,p-Xylene	--	--	No Value
	1634-04-4	Methyl tert-Butyl Ether	3,200	100,000	3,200
	75-09-2	Methylene chloride	83,000	20,000	20,000
	91-20-3	Naphthalene	25	100	25
	104-51-8	n-Butylbenzene	--	--	No Value
	110-54-3	n-Hexane	--	23,000	23,000
	103-65-1	n-Propylbenzene	--	33,000	33,000
	95-47-6	o-Xylene	--	--	No Value
	363-72-4	Pentafluorobenzene	--	--	No Value
	135-98-8	sec-Butylbenzene	--	--	No Value
	100-42-5	Styrene	--	33,000	33,000
	98-06-6	tert-Butylbenzene	--	--	No Value
	127-18-4	Tetrachloroethene	3,200	1,300	1,300
	108-88-3	Toluene	--	170,000	170,000
	1330-20-7	Total Xylenes	--	3,300	3,300
	156-60-5	trans-1,2-Dichloroethene	--	1,300	1,300
	542-75-6	trans-1,3-Dichloropropene	210	670	210
	110-57-6	trans-1,4-Dichloro 2-Butene	--	--	No Value
	79-01-6	Trichloroethene	200	67	67
	75-69-4	Trichlorofluoromethane	--	23,000	23,000
	108-05-4	Vinyl Acetate	--	6,700	6,700
	75-01-4	Vinyl Chloride	95	3,300	95
	71-36-3	n-Butyl Alcohol	--	--	No Value
TPH	No Value	TPH-Generic Cleanup Level	--	1,500	1,500
SVOCs	90-12-0	1-Methylnaphthalene	--	0.10	0.10

Notes:

--: No value exists for this constituent in the Cleanup Levels and Risk Calculation (CLARC) database (Ecology 2025). No Value: A screening level cannot be calculated because no values exist in CLARC or no CAS number is available.

All values are presented as two significant figures in standard notation, except numbers greater than 100 are rounded to a whole number.

[1] Values from CLARC (Ecology 2025), unless otherwise noted.

[2] The screening level is the most stringent of the carcinogenic and non-carcinogenic values.

Memo

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Date: March 13, 2025

Subject: Quality Assurance Project Plan (QAPP)
Earley Business Center (EBC) Site
Agreed Order No. DE 9553, Facility/Site No. 9762715, Cleanup Site No. 2395
401 Alexander Avenue, Tacoma, Washington 98421

The purpose of this QAPP is to summarize the methodology for generating usable sampling and analysis data of acceptable quality during forthcoming remedial investigation (RI) and interim action (IA) activities at the EBC site (Site). The constituents of interest (COIs) and associated laboratory analyses included in this QAPP were identified with the intent to provide a comprehensive list of likely and reasonably possible analytes that will or may be analyzed during future RI and IA activities at the Site.[1] As the RI and IA activities become better defined, new laboratory analyses are identified, and/or new Site information is obtained, this Site-wide QAPP will be updated as necessary. This QAPP was prepared in general accordance with Washington Administrative Code (WAC) 173-340-820, WAC 173-340-830, and Ecology guidance (Ecology 2016). Field procedures associated with quality assurance (e.g., equipment decontamination, field recordkeeping, sample identification schema, sample handling and shipment) will be presented in the RI-specific or IA-specific Site SAPs. Site-wide screening levels (SLs) are presented in PIONEER's companion SL Calculations Memo, which is included in the same Site-wide Plans package as this QAPP.

Laboratory Analyses

Laboratory analyses will be performed on samples collected from Site soil, groundwater, surface water, indoor air, sub-slab soil gas, and/or ambient air. Soil and groundwater will be the most commonly and frequently sampled and analyzed media at the Site. Soil and/or groundwater samples may be analyzed pursuant to a given SAP for volatile organic compounds (VOCs), total petroleum hydrocarbons (TPH), metals, cyanide, polychlorinated biphenyls (PCBs), semi-volatile organic compounds (SVOCs), polycyclic aromatic hydrocarbons (PAHs), chlorinated dibenzo-p-dioxins and chlorinated dibenzofurans (dioxins/furans), organotins, pesticides, toxicity characteristic leaching procedure (TCLP) analytes, and/or various conventional constituents. Indoor air, sub-slab soil gas, and/or ambient air samples may be analyzed for VOCs, TPH, and/or gases. The specific analytes and the expected analytical method for the analyses listed above are presented in Table 1. The analytical methods being used are Ecology-approved methods (or an American Society for Testing of Materials method as allowed in WAC 173-340-830(4)(a)), and each method is being performed by a laboratory accredited by Ecology to perform that method (with the possible exception of some conventional analyses being used for geochemical purposes).

[1] For a given RI-specific or IA-specific Sampling and Analysis Plan (SAP), the applicable analytes will be determined based on the objectives and nature of the investigation activities.

Sample Containers

Sample container expectations, preservation requirements, and holding times for the listed laboratory analyses are included in Table 1.

In addition, requirements associated with filling sample containers include:

- Sample containers will be provided by the project laboratories.
- Unless otherwise noted below, sample containers will be filled until almost full to provide the laboratory with sufficient sample volume.
- At each sampling location, sample containers for analyses of VOCs, TPH in the gasoline range (TPH-G), and volatile petroleum hydrocarbons (VPH) will be filled before all other containers.
- Soil samples for analyses of VOCs, TPH-G, and VPH will be collected and prepared in accordance with United States Environmental Protection Agency (USEPA) Method SW846-5035. Also, the field team will not place additional labeling stickers on the pre-tared sampling vials for these analyses since it will alter the pre-tared weight.
- Excess water will be decanted from soil samples to the extent practicable.
- Particles larger than approximately 1/4-inch will not be included in soil sample containers to conservatively comply with the two-millimeter size requirement in WAC 173-340-740(7)(a).
- Water sample containers for analyses of VOCs, TPH-G, and VPH will be filled to a positive meniscus so that the containers do not contain any headspace.
- Water samples designated for dissolved metals analyses will be field filtered with an in-line, 0.45-micron filter. If it is not practicable to field filter some samples for some reason, then the field team will request the laboratory to filter the sample with a 0.45-micron filter in an expedited fashion.

Field Measurements and Calibration

Field measurements, observations, and notes (e.g., utility-related activities, lithologic logging of soil borings, photoionization detector [PID] measurements, static water level measurements, non-aqueous phase liquid measurements, water quality measurements) are of vital importance and will be documented. The PID and water quality meter will be calibrated in accordance with the manufacturer's recommendations. The PID calibration will include a two-point calibration: a zero gas (i.e., the atmosphere) and an appropriate span gas (e.g., isobutylene at 100 parts per million). Field calibrations will be documented in the field notes.

Field Quality Control Samples

Field quality control (QC) samples will include field duplicates, matrix spike/matrix spike duplicates,[2] equipment rinsate blanks, VOC trip blanks, and cooler temperature blanks. The frequency expectation for each type of field QC sample is listed below:

- Field duplicates: One field duplicate per 20 samples per matrix.
- Matrix spike/matrix spike duplicate: One sample per 20 samples per matrix.

[2] Matrix spikes and matrix spike duplicates are lab QC samples, but are also included with the field QC samples since the field sampling team is responsible for ensuring that appropriate sample volumes are collected for analysis of matrix spikes and matrix spike duplicates.

- Equipment rinsate blank: One sample per 20 samples per matrix per equipment type.
- VOC trip blank: One per cooler of samples being analyzed for VOCs and/or TPH-G.
- Cooler temperature blanks: One per cooler of samples.

Unless otherwise noted, field QC samples will be collected, handled, preserved, and documented in the same manner as primary samples. Field duplicates and the matrix spike/matrix spike duplicate will be collected at random locations selected by the field sampling team. Field duplicate and matrix spike/matrix spike samples will be collected simultaneously with the primary sample using the same sample collection and preparation techniques. Blind duplicates will not be collected; rather, the duplicate sample will be identified with the same Site ID as the primary sample. Equipment rinsate blanks will be collected by pouring deionized water on non-dedicated sampling equipment following its decontamination. Field duplicates, matrix spike/matrix spike duplicates, and equipment rinsate blanks will be analyzed for the same constituents as the applicable primary sample. VOC trip blanks and cooler temperature blanks will be prepared and provided by the laboratory performing the analyses. VOC trip blanks will consist of organic-free water and will be analyzed for VOCs and/or TPH-G (depending on the designated analyses for the samples in a particular cooler).

Laboratory Quality Control Samples

The project laboratories will be responsible for conducting laboratory QC procedures and reporting laboratory QC results in accordance with the analytical methods and their standard operating procedures. Laboratory QC samples provide important qualitative results used to evaluate the laboratory QC procedures. Laboratory QC samples for applicable analyses will include method blanks, laboratory control samples (also known as blank spikes), matrix spikes, and matrix spike duplicates once per batch of analyses. Expectations for current laboratory control limits for laboratory control samples, matrix spikes, and matrix spike duplicates are presented in Table 2. In addition, it is also expected that the project laboratories will perform and report results of surrogate recovery for every sample being analyzed for an organic analysis. Expectations for current laboratory control limits for surrogate recoveries are shown in Table 2.

Laboratory Target MDLs, Target PQLs, and Sensitivity Analysis

Analytical methods (see Table 1) and the project laboratories have been selected to achieve low target method detection limits (MDLs) and practical quantitation limits (PQLs). The target MDLs and target PQLs for constituents that may be analyzed in soil, groundwater, indoor air, and sub-slab soil gas are presented in Table 3. The project laboratories will report all results down to the MDL, unless otherwise noted in Table 3. Results between the MDL and the PQL will be J-flagged (estimated concentration).

A sensitivity analysis that compared target MDLs and target PQLs with the corresponding SLs presented in PIONEER's accompanying SL Calculations Memo is shown in Table 3. All indoor air and sub-slab soil gas constituents have target MDLs and PQLs below corresponding SLs, and most soil and groundwater constituents have target MDLs and target PQLs that are lower than the corresponding SLs. The constituents with a soil and/or groundwater target MDL exceeding a corresponding SL are 1,2,4-trichlorobenzene, acrolein, acrylonitrile, hexachloro-1,3-butadiene, chromium VI, total PCBs, 2,4,6-trichlorophenol, 2,4-dinitrophenol, 3,3'-dichlorobenzidine, bis(2-chloroethyl) ether, bis(2-ethylhexyl)phthalate, butylbenzylphthalate, hexachlorobenzene, hexachlorobutadiene, hexachloroethane, n-nitrosodimethylamine, n-nitroso-

di-n-propylamine, pentachlorophenol, total carcinogenic polycyclic aromatic hydrocarbons, total dioxins/furans, tributyltin oxide, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, aldrin, alpha-BHC, beta-BHC, dieldrin, endosulfan I, endosulfan II, endrin, heptachlor, heptachlor epoxide, methoxychlor, and toxaphene (see Table 3). These same constituents also have a soil and/or groundwater target PQL that exceeds a corresponding SL. In addition, the soil and/or groundwater target PQLs for vinyl chloride, mercury, free cyanide 2,4-dichlorophenol, 4,6-dinitro-2-methylphenol, hexachlorocyclopentadiene, endrin aldehyde, and gamma-BHC exceed the corresponding SLs. The target MDLs and target PQLs for the constituents listed above are reasonably sensitive. Therefore, the target MDLs and target PQLs are considered appropriate for the purposes of this QAPP.

Data Quality Review

An evaluation of data quality will be performed for all field and lab data to determine if the data is useable. Specifically, field records will be reviewed by PIONEER for completeness, accuracy, and legibility. Each laboratory will review their analytical results relative to method criteria and laboratory QC procedures as the data are generated. Each laboratory will report their QC results and qualify data as necessary in a report and electronic data deliverable suitable for a Stage 2B validation (USEPA 2009). A data quality validator will perform a Stage 2B validation of all analytical laboratory data generated by the laboratories using the recommended Stage 2B verification and validation checks listed in Sections 1.1 through 1.3 of Appendix A in the USEPA 2009 document. The data quality validator will evaluate the validity of the sample and QC data using method-specific and laboratory-established quality control requirements, USEPA data verification and validation guidance (USEPA 2002), and/or national functional guidelines (USEPA 2020a, 2020b) as appropriate. The data quality validator may reject data or add other qualifications in addition to the laboratory qualifications. The data quality validator will prepare a Stage 2B validation document, which will be included with the applicable laboratory reports for reporting purposes.

Key QAPP Roles and Responsibilities

Key anticipated QAPP roles and responsibilities are summarized in Table 4.

Corrective Action

The need for corrective action will be evaluated as appropriate for deviations from the QAPP (and associated SAP[s]) and other potential data quality issues that arise in the field or the laboratory. Relatively minor field issues will be discussed, resolved, and documented by the PIONEER Project Manager. Relatively minor laboratory issues will be discussed, resolved, and documented by the laboratory, the PIONEER Project Manager, and/or the data quality validator. Corrective action decisions will be situation-dependent. Potential corrective action decisions may include one or more of the following:

- Revising the sampling and analysis methodology
- Collecting a new sample
- Reanalyzing an existing sample
- Accepting the data with a recognized level of uncertainty
- Revising the investigation design

In the event of a significant data quality issue, the PIONEER Project Manager will call a meeting to discuss, resolve, and document the situation with the Port and Ecology.

References

Ecology. 2016. Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies, Publication No. 04-03-030. December.

USEPA. 2002. Guidance on Environmental Data Verification and Data Validation, EPA QA/G-8. EPA/240/R-02/004. November.

USEPA. 2009. Guidance for Labelling Externally Validated Laboratory Analytical Data for Superfund Use, EPA 540-R-08-005. January 13.

USEPA. 2020a. National Functional Guidelines for Inorganic Superfund Methods Data Review. EPA-542-R-20-006. November.

USEPA. 2020b. National Functional Guidelines for Organic Superfund Methods Data Review. EPA-540-R-20-005. November.

Enclosures

Table 1	Analytical Methods, Sample Containers, Preservation, and Holding Times
Table 2	Current Laboratory Control Limits
Table 3	Target MDLs, Target PQLs, and Sensitivity Analysis
Table 4	Key QAPP Roles and Responsibilities

Table 1: Analytical Methods, Sample Containers, Preservation, and Holding Times

Category	Sub-Category	Analytes	Analytical Method	Media	Sample Container Expectations [1]	Preservation Requirements	Extraction Holding Time (days)	Analysis Holding Time (days)
VOCs	--	See Table 3 list	USEPA SW846-8260D	Solid	Two pre-tared 40 mL VOA vials with Teflon septa lids [2]	Pre-preserved with methanol [2], cool to ≤ 4°C +/- 2°C	--	14
					Three pre-tared 40 mL VOA vials with Teflon septa lids [2]	Pre-preserved with sodium bisulfate [2], cool to ≤ 4°C +/- 2°C		
				Water	Three 40 mL glass VOA vials with Teflon septa lids	Pre-preserved with HCl, no headspace in VOA, cool to ≤ 4°C +/- 2°C	--	14
		n-Butyl Alcohol [4]	USEPA SW846-8260D	Solid	One pre-tared 40 mL VOA vial with Teflon septa lid [2]	Pre-preserved with methanol [2], cool to ≤ 4°C +/- 2°C	--	14
				Water	Three 40 mL glass VOA vials with Teflon septa lids	Pre-preserved with HCl, no headspace in VOA, cool to ≤ 4°C +/- 2°C	--	14
TPH	NWTPH-HCID	TPH Hydrocarbon Identification	NWTPH-HCID	Solid	One 8 oz glass jar	Cool to ≤ 4°C +/- 2°C	--	14
				Water	One 500 mL amber glass bottle	Cool to ≤ 4°C +/- 2°C	--	7
	NWTPH-G	TPH in the Gasoline Range	NWTPH-G	Solid	Two pre-tared 40 mL VOA vials with Teflon septa lids and one 2 oz glass jar with Teflon septa lid [2]	Pre-preserved with methanol [2], cool to ≤ 4°C +/- 2°C	--	14
				Water	Two 40 mL glass VOA vials with Teflon septa lids	Pre-preserved with HCl, no headspace in VOA, cool to ≤ 4°C +/- 2°C	--	14
	NWTPH-Dx	TPH in the Diesel Range, TPH in the Heavy Oil Range	NWTPH-Dx	Solid	One 8 oz glass jar	Cool to ≤ 4°C +/- 2°C	14	40
				Water	Two 500 mL amber glass bottles	Pre-preserved with HCl for longer hold time, cool to ≤ 4°C +/- 2°C	14	40
	EPH	Extractable Petroleum Hydrocarbons (EPH) Fractions	NWEPH	Solid	One 4 oz amber glass jar	Cool to 4°C +/- 2°C	--	14
				Water	One 1 Liter amber glass jar		--	7
	VPH	Volatile Petroleum Hydrocarbons (VPH) Fractions	NWVPH	Solid	One pre-tared 40 mL VOA vial with Teflon septa lid (and one 4 oz amber glass jar for moisture analysis) [2]	Pre-preserved with methanol [2], cool to ≤ 4°C +/- 2°C	--	14
				Water	Two 40 mL glass VOA vials with Teflon septa lids	Pre-preserved with HCl, no headspace in VOA, cool to ≤ 4°C +/- 2°C	--	14
Metals	13 Metal COIs	Antimony, Arsenic*, Barium, Cadmium*, Chromium, Copper*, Lead, Manganese, Nickel*, Selenium*, Silver, Zinc*	USEPA SW846-6020B	Solid	One 4 oz glass jar	Cool to ≤ 4°C +/- 2°C	--	180
				Water	One 500 mL HDPE bottle	Pre-preserved with HNO_3, cool to ≤ 4°C +/- 2°C	--	180
		Mercury	USEPA SW846-7471B	Solid	Same container as other metals	Cool to ≤ 4°C +/- 2°C	--	28
			USEPA SW846-7470A	Water	Same container as other metals	Pre-preserved with HNO_3, cool to ≤ 4°C +/- 2°C	--	28
	Chromium VI	Chromium VI	USEPA SW846-7196A	Solid	One 4 oz glass jar	Cool to ≤ 4°C +/- 2°C	--	28
				Water	One 500 mL HDPE bottle	Pre-preserved with sodium hydroxide, cool to ≤ 4°C +/- 2°C	--	28 [3]
Cyanide	--	Total Cyanide	USEPA SW846-9014	Solid	One 8 oz glass jar	Cool to ≤ 4°C +/- 2°C	--	14
		Free Cyanide [4]	SM 4500-CN^- E	Water	One 125 mL HDPE bottle	Pre-preserved with sodium hydroxide, cool to ≤ 4°C +/- 2°C	--	14 [3]
PCBs	--	Aroclor 1016, Aroclor 1221, Aroclor 1232, Aroclor 1242, Aroclor 1248, Aroclor 1254, Aroclor 1260	USEPA SW846-8082A	Solid	One 8 oz glass jar	Cool to ≤ 4°C +/- 2°C	14	40
				Water	Two 500 mL amber glass bottles	Cool to ≤ 4°C +/- 2°C	7	40
SVOCs	All SVOCs	See Table 3 list	USEPA SW846-8270E	Solid	One 8 oz glass jar	Cool to ≤ 4°C +/- 2°C	14	40
				Water	Two 500 mL amber glass bottles	Cool to ≤ 4°C +/- 2°C	7	40
	PAHs Only		USEPA SW846-8270E-SIM (0.01 ug/L level)	Water	Two 500 mL amber glass bottles	Cool to ≤ 4°C +/- 2°C	7	40
Dioxins/Furans	--	See Table 2 list	USEPA 1613B	Solid	One 8-oz wide mouth glass jar with Teflon-lined lid	Cool to ≤ 4°C +/- 2°C	30	45
				Water	Two 1-liter Level 2 amber glass bottles	Cool to ≤ 4°C +/- 2°C	30	45
Organotins	--	Tributyltin oxide	USEPA SW846-3545 followed by Krone-mod/USEPA SW846-8270E-SIM	Solid	One 8 oz glass jar	Cool to ≤ 4°C +/- 2°C	14	40
				Water	Two 500 mL amber glass bottles	Cool to ≤ 4°C +/- 2°C	--	7
Pesticides		See Table 3 list	USEPA SW846-8081B	Solid	One 8-oz wide mouth glass jar with Teflon-lined lid	Cool to ≤ 4°C +/- 2°C	14	40
						Freeze to -18°C	365	40
				Water	One 1-liter Level 2 amber glass bottle	Cool to ≤ 4°C +/- 2°C	7	40
TO15 VOCs (Air)	--	See Table 3 list [4]	USEPA TO-15-SIM	Indoor Air, Sub-slab Soil Gas, and Ambient Air	6-liter evacuated SUMMA® Canister, individually certified clean by the laboratory, equipped with a Swagelok 1/4-inch stainless steel bellows valve, brass cap, particulate filter, and vacuum gauge. Regulator shall be adjusted for a flow rate for an 8-hour sample collection.	None	N/A	30
TPH (Air)	--	C5-C8 Aliphatics, C9-C12 Aliphatics, and C9-C10 Aromatics [4]	Massachusetts DEP APH Test Methods WSC-CAM-IX			None	N/A	30
Gases (Air)	--	Oxygen, Carbon Dioxide, and Methane [4]	USEPA 3C			None	N/A	30

Table 1: Analytical Methods, Sample Containers, Preservation, and Holding Times

Category	Sub-Category	Analytes	Analytical Method	Media	Sample Container Expectations [1]	Preservation Requirements	Extraction Holding Time (days)	Analysis Holding Time (days)
TCLP	VOCs	Benzene, Carbon Tetrachloride, Chlorobenzene, Chloroform, 1,4-Dichlorobenzene, 1,2-Dichloroethane, 1,1-Dichlorethylene, Methyl Ethyl Ketone, Tetrachloroethylene, Trichloroethylene, Vinyl Chloride	USEPA SW846-1311 followed by USEPA SW846-8260D	Solid	One 8 oz glass jar	Cool to ≤ 4°C +/- 2°C	--	14
	Metals	Arsenic, Barium, Cadmium, Chromium, Lead, Selenium, Silver	USEPA SW846-1311 followed by USEPA SW846-6010D	Solid	One 8 oz glass jar	Cool to ≤ 4°C +/- 2°C	--	180
		Mercury	USEPA SW846-1311 followed by USEPA SW846-7470A				--	28
	SVOCs	Total Methylphenols (Cresols), 2,4-Dinitrotoluene, Hexachlorobenzene, Hexachlorobutadiene, Hexachloroethane, Nitrobenzene, Pentachlorophenol, Pyridine, 2,4,5-Trichlorophenol, 2,4,6-Trichlorophenol	USEPA SW846-1311 followed by USEPA SW846-8270E	Solid	One 8 oz glass jar	Cool to ≤ 4°C +/- 2°C	14	40
	Pesticides	Chlordane, Endrin, Heptachlor, Heptachlor Epoxide, gamma-BHC (Lindane), Methoxychlor, Toxaphene	USEPA SW846-1311 followed by USEPA SW846-8081B	Solid	One 8-oz wide mouth glass jar with Teflon-lined lid	Cool to ≤ 4°C +/- 2°C	14	40
						Freeze to -18°C	365	40
Solid and Water Conventionals	Nutrients	Total Nitrate + Nitrite as Nitrogen	USEPA 353.2	Solid	One 8 oz glass jar	Cool to ≤ 4°C +/- 2°C	--	7
		Total Kjeldahl Nitrogen	SM 4500-N				--	28
		Total Phosphorus	SM 4500-P				--	28
		Total Sulfur [4]	ASTM D4239-85C		One 8 oz glass jar	None	--	--
		Soluble Potash [4]	SM 3120		One 8 oz glass jar	Cool to ≤ 4°C +/- 2°C	TBD [4]	TBD [4]
		Total Nitrate + Nitrite as Nitrogen	SM 4500-$NO3^-$	Water	One 1 Liter HDPE bottle	Pre-preserved with H_2SO_4, cool to ≤ 4°C +/- 2°C	--	28
		Total Kjeldahl Nitrogen	SM 4500-N				--	28
		Total Phosphorus	SM 4500-P				--	28
		Total Sulfur [4]	ASTM D4239-85C		TBD [4]	TBD [4]	TBD [4]	TBD [4]
		Soluble Potash [4]	SM 3120		TBD [4]	TBD [4]	TBD [4]	TBD [4]
	Alkalinity	Total Alkalinity	USEPA 2320	Solid	One 4 oz glass jar	Cool to ≤ 4°C +/- 2°C	--	14
				Water	One 500mL HDPE bottle	Minimize headspace, cool to ≤ 4°C +/- 2°C	--	14
	Major Anions	Bromide, Chloride, Fluoride, Sulfate	USEPA 300.0	Solid	One 4 oz glass jar	Cool to ≤ 4°C +/- 2°C	--	28
		Nitrate, Nitrite						7
		Ortho-Phosphorus					--	2
		Bromide, Chloride, Fluoride, Sulfate		Water	One 500 mL HDPE bottle	Cool to ≤ 4°C +/- 2°C	--	28
		Nitrate, Nitrite, Ortho-Phosphorus					--	2
		Sulfide	SM 4500-S2 D (PSEP)	Solid	One 2 oz glass jar	Pre-preserved with zinc acetate, no headspace in jar, cool to ≤ 4°C +/- 2°C	--	7
			SM 4500-S2 D	Water	One 500 mL HDPE bottle	Pre-preserved with zinc acetate, no headspace in bottle, cool to ≤ 4°C +/- 2°C, 1 mL of sodium hydroxide added upon receipt	--	7
	Major Cations	Aluminum, Calcium, Iron, Magnesium, Manganese, Potassium, Sodium	USEPA SW846-6020B	Solid	One 4 oz glass jar	Cool to ≤ 4°C +/- 2°C	--	180
				Water	One 500 mL HDPE bottle	Pre-preserved with HNO_3, cool to ≤ 4°C +/- 2°C	--	180
	Miscellaneous Conventionals	Biological Oxygen Demand	SM 5210 B	Water	One 1 Liter HDPE bottle	Cool to ≤ 4°C +/- 2°C	--	2
		Chemical Oxygen Demand	USEPA 410.4	Water	One 250 mL amber glass bottle with teflon-lined cap	Pre-preserved with H_2SO_4, cool to ≤ 4°C +/- 2°C	--	28
		Dissolved Organic Carbon	SM 5310 B	Water	One 250 mL amber glass bottle with teflon-lined cap	Field filtered, pre-preserved with H_2SO_4, cool to ≤ 4°C +/- 2°C	--	28
		Total Organic Carbon	USEPA SW846-9060A Mod	Solid	One 4 oz glass jar	Cool to ≤ 4°C +/- 2°C	--	28
				Water	One 250 mL amber glass bottle with teflon-lined cap	Pre-preserved with H_2SO_4, cool to ≤ 4°C +/- 2°C	--	28
		Total Dissolved Solids	SM 2540 C	Water	One 1 Liter HDPE bottle	Cool to ≤ 4°C +/- 2°C	--	7
		Total Suspended Solids	SM 2540 D	Water	One 1 Liter HDPE bottle	Cool to ≤ 4°C +/- 2°C	--	7

Notes:

--: not applicable; *: ARI standard practice is to analyze these metals using universal cell technology-kinetic energy discrimination technology; °C: degrees Celsius; H_2SO_4: sulfuric acid; HC: hydrocarbon; HCl: hydrochloric acid; HDPE: high density polyethylene; HNO_3: nitric acid; mL: milliliter; oz: ounce; SIM: select ion monitoring; SM: Standard Method; TBD: to be determined

[1] The field team will need to coordinate with the laboratory beforehand about sample containers to (1) ensure analytical volume needs are satisfied, and (2) see if some analyses can use the same sample containers.

[2] Soil samples for analyses of VOCs and TPH-G will be collected and prepared in accordance with USEPA Method SW846-5035. Also, do not place additional labeling stickers on the pre-tared VOA vials for soil analyses since it will alter the pre-tared weight.

[3] One day if not chemically preserved for chromium VI. Two days if not chemically preserved for free cyanide.

[4] These analyses are expected to be performed by subcontracted labs (e.g., Eurofins Seattle for n-butyl alcohol [which is not included on the standard VOC list], AmTest Laboratories for free cyanide in water, ACZ Laboratories for total sulfur in solids) or directly contracted labs (Alliance Technical Group for air samples). Samples will be shipped directly to the subcontracted or direct contracted laboratory. A laboratory that analyzes for total sulfur in water and soluble potash has not been identified yet. If a suitable laboratory cannot be found prior to the applicable activity, the applicable samples will not be analyzed for these analytes.

Table 2: Current Laboratory Control Limits

Category	Sub-Category	Analytes	Analytical Method	Media	LCS	MS/MSD		Surrogates
					% R	% R	RPD %	% R
VOCs	VOCs (Solid)	1,1,1,2-Tetrachloroethane	USEPA SW846-8260D	Solid	80-120	80-120	30	80-120 [1]
		1,1,1-Trichloroethane			78-133	78-133		
		1,1,2,2-Tetrachloroethane			74-120	74-120		
		1,1,2-Trichloro-1,2,2-Trifluoroethane			74-143	74-143		
		1,1,2-Trichloroethane			79-120	79-120		
		1,1-Dichloroethane			80-126	80-126		
		1,1-Dichloroethene			77-134	77-134		
		1,1-Dichloropropene			63-145	63-145		
		1,2,3-Trichlorobenzene			68-132	68-132		
		1,2,3-Trichloropropane			73-120	73-120		
		1,2,4-Trichlorobenzene			66-140	66-140		
		1,2,4-Trimethylbenzene			75-121	75-121		
		1,2-Dibromo-3-Chloropropane			72-136	72-136		
		1,2-Dibromoethane			80-120	80-120		
		1,2-Dichlorobenzene			76-120	76-120		
		1,2-Dichloroethane			76-120	76-120		
		1,2-Dichloropropane			79-120	79-120		
		1,3,5-Trimethylbenzene			74-122	74-122		
		1,3-Dichlorobenzene			75-120	75-120		
		1,3-Dichloropropane			78-120	78-120		
		1,4-Dichlorobenzene			73-120	73-120		
		2,2-Dichloropropane			77-138	77-138		
		2-Butanone			70-132	70-132		
		2-Chloroethyl vinyl ether			51-129	51-129		
		2-Chlorotoluene			75-120	75-120		
		2-Hexanone			68-122	68-122		
		2-Pentanone			77-120	77-120		
		4-Chlorotoluene			69-124	69-124		
		4-Methyl-2-Pentanone			73-121	73-121		
		Acetone			48-137	48-137		
		Acrolein			59-140	59-140		
		Acrylonitrile			69-134	69-134		
		Benzene			80-120	80-120		
		Bromobenzene			76-120	76-120		
		Bromochloromethane			80-129	80-129		
		Bromodichloromethane			80-122	80-122		
		Bromoform			64-128	64-128		
		Bromomethane			53-144	53-144		
		Carbon Disulfide			71-137	71-137		
		Carbon tetrachloride			71-129	71-129		
		Chlorobenzene			78-120	78-120		
		Chloroethane			55-149	55-149		
		Chloroform			80-126	80-126		
		Chloromethane			64-132	64-132		
		cis-1,2-Dichloroethene			80-125	80-125		
		cis-1,3-Dichloropropene			80-120	80-120		
		Cyclohexanone			30-160	30-160		
		Dibromochloromethane			74-125	74-125		
		Dibromomethane			80-120	80-120		
		Dichlorodifluoromethane			67-142	67-142		
		Ethylbenzene			80-125	80-125		
		Hexachloro-1,3-butadiene			67-133	67-133		
		Iodomethane			31-162	31-162		
		Isopropylbenzene			74-121	74-121		
		Isopropyltoluene			75-125	75-125		
		m,p-Xylene			76-121	76-121		
		Methyl tert-Butyl Ether			79-127	79-127		
		Methylene chloride			69-129	69-129		
		Naphthalene			69-125	69-125		
		n-Butylbenzene			73-130	73-130		
		n-Hexane			30-160	30-160		
		n-Propylbenzene			72-124	72-124		
		o-Xylene			67-132	67-132		
		sec-Butylbenzene			70-128	70-128		
		Styrene			80-120	80-120		
		tert-Butylbenzene			72-122	72-122		
		Tetrachloroethene			74-124	74-124		
		Toluene			75-120	75-120		
		Total Xylenes			67-132	67-132		
		trans-1,2-Dichloroethene			79-130	79-130		
		trans-1,3-Dichloropropene			80-124	80-124		
		trans-1,4-Dichloro 2-Butene			65-125	65-125		
		Trichloroethene			80-120	80-120		
		Trichlorofluoromethane			61-164	61-164		
		Vinyl Acetate			66-141	66-141		
		Vinyl Chloride			74-135	74-135		
		n-Butyl Alcohol			42-150	42-150	40	80-120

Table 2: Current Laboratory Control Limits

Category	Sub-Category	Analytes	Analytical Method	Media	LCS	MS/MSD		Surrogates
					% R	% R	RPD %	% R
VOCs	VOCs (Water)	1,1,1,2-Tetrachloroethane	USEPA SW846-8260D	Water	80-120	80-120	30	80-129 (2)
		1,1,1-Trichloroethane			79-123	79-123		
		1,1,2,2-Tetrachloroethane			77-123	77-123		
		1,1,2-Trichloro-1,2,2-Trifluoroethane			76-129	76-129		
		1,1,2-Trichloroethane			80-121	80-121		
		1,1-Dichloroethane			76-124	76-124		
		1,1-Dichloroethene			69-135	69-135		
		1,1-Dichloropropene			80-127	80-127		
		1,2,3-Trichlorobenzene			49-133	49-133		
		1,2,3-Trichloropropane			76-125	76-125		
		1,2,4-Trichlorobenzene			64-124	64-124		
		1,2,4-Trimethylbenzene			80-127	80-127		
		1,2-Dibromo-3-Chloropropane			62-123	62-123		
		1,2-Dibromoethane			80-121	80-121		
		1,2-Dichlorobenzene			80-120	80-120		
		1,2-Dichloroethane			75-123	75-123		
		1,2-Dichloropropane			80-120	80-120		
		1,3,5-Trimethylbenzene			80-129	80-129		
		1,3-Dichlorobenzene			80-120	80-120		
		1,3-Dichloropropane			80-120	80-120		
		1,4-Dichlorobenzene			80-120	80-120		
		2,2-Dichloropropane			66-147	66-147		
		2-Butanone			61-140	61-140		
		2-Chloroethyl vinyl ether			64-120	64-120		
		2-Chlorotoluene			78-122	78-122		
		2-Hexanone			69-133	69-133		
		2-Pentanone			69-134	69-134		
		4-Chlorotoluene			80-121	80-121		
		4-Methyl-2-Pentanone			67-133	67-133		
		Acetone			58-142	58-142		
		Acrolein			52-190	52-190		
		Acrylonitrile			64-134	64-134		
		Benzene			80-120	80-120		
		Bromobenzene			80-120	80-120		
		Bromochloromethane			80-121	80-121		
		Bromodichloromethane			80-121	80-121		
		Bromoform			51-134	51-134		
		Bromomethane			72-131	72-131		
		Carbon Disulfide			78-125	78-125		
		Carbon tetrachloride			53-137	53-137		
		Chlorobenzene			80-120	80-120		
		Chloroethane			60-155	60-155		
		Chloroform			80-122	80-122		
		Chloromethane			60-138	60-138		
		cis-1,2-Dichloroethene			80-121	80-121		
		cis-1,3-Dichloropropene			80-124	80-124		
		Cyclohexanone			--	--		
		Dibromochloromethane			65-135	65-135		
		Dibromomethane			80-120	80-120		
		Dichlorodifluoromethane			48-147	48-147		
		Ethylbenzene			80-120	80-120		
		Hexachloro-1,3-butadiene			58-123	58-123		
		Iodomethane			56-147	56-147		
		Isopropylbenzene			80-128	80-128		
		Isopropyltoluene			79-130	79-130		
		m,p-Xylene			80-121	80-121		
		Methyl tert-Butyl Ether			71-132	71-132		
		Methylene chloride			65-135	65-135		
		Naphthalene			50-134	50-134		
		n-Butylbenzene			74-129	74-129		
		n-Hexane			70-130	70-130		
		n-Propylbenzene			78-130	78-130		
		o-Xylene			80-121	80-121		
		sec-Butylbenzene			78-129	78-129		
		Styrene			80-124	80-124		
		tert-Butylbenzene			78-125	78-125		
		Tetrachloroethene			80-120	80-120		
		Toluene			80-120	80-120		
		Total Xylenes			76-127	76-127		
		trans-1,2-Dichloroethene			78-128	78-128		
		trans-1,3-Dichloropropene			71-127	71-127		
		trans-1,4-Dichloro 2-Butene			55-129	55-129		
		Trichloroethene			80-120	80-120		
		Trichlorofluoromethane			62-141	62-141		
		Vinyl Acetate			55-138	55-138		
		Vinyl Chloride			66-133	66-133		
		n-Butyl Alcohol			46-140	46-140	31	80-120
TPH	NWTPH-HCID	TPH Hydrocarbon Identification	NWTPH-HCID	Solid	--	--	--	50-150
				Water	--	--	--	50-150
	NWTPH-G	TPH in the Gasoline Range	NWTPH-G	Solid	70-121	28-162	30	80-120 (3)
				Water	30-160	30-160	30	80-120 (4)
	NWTPH-Dx	TPH in the Diesel Range, TPH in the Heavy Oil Range	NWTPH-Dx	Solid	30-160	30-160	30	50-150
				Water	30-160	30-160	30	50-150
	EPH	EPH Fractions	NWEPH	Solid	70-130	70-130	30	60-140
				Water	70-130	70-130	30	45-123
	VPH	VPH Fractions	NWVPH	Solid	70-130	70-130	30	60-140
				Water	70-130	70-130	30	60-140

Table 2: Current Laboratory Control Limits

Category	Sub-Category	Analytes	Analytical Method	Media	LCS	MS/MSD		Surrogates
					% R	% R	RPD %	% R
Metals	13 Metal COIs	Antimony, Arsenic, Barium, Cadmium, Chromium, Copper, Lead, Manganese, Nickel, Selenium, Silver, Zinc	USEPA SW846-6020B	Solid	80-120	75-125	20	--
				Water	80-120	75-125	20	--
		Mercury	USEPA SW846-7471B	Solid	80-120	75-125	20	--
			USEPA SW846-7470A	Water	80-120	75-125	20	--
	Chromium VI	Chromium VI	USEPA SW846-7196A	Solid	80-120	75-125	30	--
				Water	85-115	85-115	20	--
Cyanide	--	Total Cyanide	USEPA SW846-9014	Solid	75-125	75-125	20	--
		Free Cyanide	SM 4500-CN^- E	Water	81.2-119	64.9-135	--	--
PCBs	--	Aroclor 1016	USEPA SW846-8082A	Solid	52-120	52-120	30	40-133 (5)
		Aroclor 1260			57-120	57-120	30	
		Aroclor 1221, Aroclor 1232, Aroclor 1242, Aroclor 1248, Aroclor 1254			--	--	--	
		Aroclor 1016		Water	51-120	51-120	30	26-120 (6)
		Aroclor 1260			56-120	56-120	30	
		Aroclor 1221, Aroclor 1232, Aroclor 1242, Aroclor 1248, Aroclor 1254			--	--	--	
SVOCs	SVOCs (Solid)	1,2,4-Trichlorobenzene	USEPA SW846-8270E	Solid	35-120	35-120	30	24-134 (7)
		1,2-Dichlorobenzene			40-120	40-120		
		1,3-Dichlorobenzene			40-120	40-120		
		1,4-Dichlorobenzene			39-120	39-120		
		1-Methylnaphthalene			42-120	42-120		
		2,2'-Oxybis(1-chloropropane)			32-120	32-120		
		2,4,5-Trichlorophenol			51.5-129	51.5-129		
		2,4,6-Trichlorophenol			44.6-132	44.6-132		
		2,4-Dichlorophenol			28-120	28-120		
		2,4-Dimethylphenol			10-120	10-120		
		2,4-Dinitrophenol			10-120	10-120		
		2,4-Dinitrotoluene			44-150	44-150		
		2,6-Dinitrotoluene			31-156	31-156		
		2-Chloronaphthalene			40-120	40-120		
		2-Chlorophenol			39-120	39-120		
		2-Methylnaphthalene			43-120	43-120		
		2-Methylphenol			28-120	28-120		
		2-Nitroaniline			40-152	40-152		
		2-Nitrophenol			30-120	30-120		
		3,3'-Dichlorobenzidine			10-120	10-120		
		3-Nitroaniline			22-120	22-120		
		4,6-Dinitro-2-methylphenol			33-144	33-144		
		4-Bromophenyl phenyl ether			39-120	39-120		
		4-Chloro-3-Methylphenol			32-120	32-120		
		4-Chloroaniline			11-120	11-120		
		4-Chlorophenylphenyl ether			36-141	36-141		
		3&4-Methylphenol			29-120	29-120		
		4-Nitroaniline			24-168	24-168		
		4-Nitrophenol			15-138	15-138		
		Acenaphthene			45-120	45-120		
		Acenaphthylene			42-120	42-120		
		Anthracene			45-120	45-120		
		Benzo(a)anthracene			49-120	49-120		
		Benzo(a)pyrene			42-120	42-120		
		Benzo(b)fluoranthene			42-132	42-132		
		Benzo(g,h,i)perylene			46-148	46-148		
		Benzo(k)fluoranthene			39-129	39-129		
		Benzofluoranthenes, Total			30-160	30-160		
		Benzoic acid			10-120	10-120		
		Benzyl Alcohol			19-120	19-120		
		Bis(2-Chloroethoxy)methane			39-120	39-120		
		bis(2-chloroethyl) ether			36-120	36-120		
		bis(2-Ethylhexyl)phthalate			34-130	34-130		
		Butylbenzylphthalate			45-132	45-132		
		Carbazole			43-135	43-135		
		Chrysene			47-120	47-120		
		Dibenzo(a,h)anthracene			30-133	30-133		
		Dibenzofuran			43-120	43-120		
		Diethyl phthalate			50-120	50-120		
		Dimethylphthalate			43-120	43-120		
		Di-n-Butylphthalate			48-126	48-126		
		Di-n-Octylphthalate			28-124	28-124		
		Fluoranthene			53-145	53-145		
		Fluorene			45-120	45-120		
		Hexachlorobenzene			33-120	33-120		
		Hexachlorobutadiene			37-120	37-120		
		Hexachlorocyclopentadiene			10-120	10-120		
		Hexachloroethane			38-120	38-120		
		Indeno(1,2,3-cd)pyrene			42-163	42-163		
		Isophorone			37-120	37-120		
		Naphthalene			43-120	43-120		
		Nitrobenzene			36-120	36-120		
		N-Nitrosodimethylamine			17-120	17-120		
		N-Nitroso-di-n-Propylamine			34-120	34-120		
		N-Nitrosodiphenylamine			70-154	70-154		
		Pentachlorophenol			16-120	16-120		
		Phenanthrene			49-120	49-120		
		Phenol			34-120	34-120		
		Pyrene			52-134	52-134		
	SVOCs (Water)	See Table 3 list	USEPA SW846-8270E/8270E-SIM	Water	30-160	30-160	30	30-160

Table 2: Current Laboratory Control Limits

Category	Sub-Category	Analytes	Analytical Method	Media	LCS	MS/MSD		Surrogates
					% R	% R	RPD %	% R
Dioxins/ Furans	--	2,3,7,8-TCDF	USEPA 1613B	Solid and Water	75-158	--	--	24-169
		2,3,7,8-TCDD			67-158	--	--	25-164
		1,2,3,7,8-PeCDF			80-134	--	--	24-185
		2,3,4,7,8-PeCDF			68-160	--	--	21-178
		1,2,3,7,8-PeCDD			70-142	--	--	25-181
		1,2,3,4,7,8-HxCDF			72-134	--	--	26-152
		1,2,3,6,7,8-HxCDF			84-130	--	--	26-123
		2,3,4,6,7,8-HxCDF			70-156	--	--	28-136
		1,2,3,7,8,9-HxCDF			78-130	--	--	29-147
		1,2,3,4,7,8-HxCDD			70-164	--	--	32-141
		1,2,3,6,7,8-HxCDD			76-134	--	--	28-130
		1,2,3,7,8,9-HxCDD			64-162	--	--	--
		1,2,3,4,6,7,8-HpCDF			82-122	--	--	28-143
		1,2,3,4,7,8,9-HpCDF			78-138	--	--	26-138
		1,2,3,4,6,7,8-HpCDD			70-140	--	--	23-140
		OCDF			63-170	--	--	--
		OCDD			78-144	--	--	17-157
Organotins	--	Tributyltin oxide	USEPA SW846-3545 followed by Krone-mod/USEPA SW846-8270E-SIM	Solid	30-160	30-160	30	30-160
				Water	30-160	30-160	30	30-160
Pesticides	Pesticides (Solid)	4,4´-DDD	USEPA SW846-8081B	Solid	60-120	60-120	30	34-145 [8]
		4,4´-DDE			60-134	60-134		
		4,4´-DDT			63-120	63-120		
		Aldrin			40-120	40-120		
		alpha-BHC			39-120	39-120		
		alpha-Chlordane			43-127	43-127		
		beta-BHC			43-120	43-120		
		delta-BHC			31-132	31-132		
		Dieldrin			44-129	44-129		
		Endosulfan I			41-130	41-130		
		Endosulfan II			56-120	56-120		
		Endosulfan sulfate			47-120	47-120		
		Endrin			56-120	56-120		
		Endrin aldehyde			32-120	32-120		
		Endrin ketone			64-120	64-120		
		gamma-BHC (Lindane)			46-120	46-120		
		gamma-Chlordane			44-125	44-125		
		Heptachlor			40-120	40-120		
		Heptachlor epoxide			46-126	46-126		
		Methoxychlor			58-120	58-120		
		Toxaphene			30-160	30-160		
	Pesticides (Water)	4,4´-DDD	USEPA SW846-8081B	Water	60-120	60-120	30	11-144 [9]
		4,4´-DDE			47-133	47-133		
		4,4´-DDT			57-122	57-122		
		Aldrin			47-120	47-120		
		alpha-BHC			54-124	54-124		
		alpha-Chlordane			51-132	51-132		
		beta-BHC			53-123	53-123		
		delta-BHC			53-122	53-122		
		Dieldrin			55-130	55-130		
		Endosulfan I			48-137	48-137		
		Endosulfan II			60-120	60-120		
		Endosulfan sulfate			56-120	56-120		
		Endrin			52-121	52-121		
		Endrin aldehyde			53-120	53-120		
		Endrin ketone			61-120	61-120		
		gamma-BHC (Lindane)			53-127	53-127		
		gamma-Chlordane			47-127	47-127		
		Heptachlor			50-120	50-120		
		Heptachlor epoxide			50-127	50-127		
		Methoxychlor			55-120	55-120		
		Toxaphene			--	30-160		

Table 2: Current Laboratory Control Limits

Category	Sub-Category	Analytes	Analytical Method	Media	LCS	MS/MSD		Surrogates
					% R	% R	RPD %	% R
TO15 VOCs (Air)	--	1,1,1-Trichloroethane	USEPA TO-15 SIM	Air	67-129	--	--	70-130
		1,1,2,2-Tetrachloroethane			65-127	--	--	
		1,1,2-Trichloro-1,2,2-trifluoroethane (CFC-113)			66-126	--	--	
		1,1,2-Trichloroethane			73-119	--	--	
		1,1-Dichloroethane			68-126	--	--	
		1,1-Dichloroethene			61-133	--	--	
		1,2,4-Trichlorobenzene			55-142	--	--	
		1,2,4-Trimethylbenzene			66-132	--	--	
		1,2-Dibromoethane			74-122	--	--	
		1,2-Dichlorobenzene			63-129	--	--	
		1,2-Dichloroethane			65-128	--	--	
		1,2-Dichloropropane			69-123	--	--	
		1,3,5-Trimethylbenzene			67-130	--	--	
		1,3-Butadiene			66-134	--	--	
		1,3-Dichlorobenzene			65-130	--	--	
		1,4-Dichlorobenzene			60-131	--	--	
		1,4-Dioxane			71-122	--	--	
		2-Butanone			67-130	--	--	
		2-Hexanone			62-128	--	--	
		Isopropyl Alcohol			52-125	--	--	
		4-Methyl-2-pentanone			67-130	--	--	
		Acetone			58-128	--	--	
		Acrolein			62-126	--	--	
		Benzene			69-119	--	--	
		Benzyl chloride			50-147	--	--	
		Bromodichloromethane			72-128	--	--	
		Bromoform			66-139	--	--	
		Bromomethane			63-134	--	--	
		Carbon disulfide			57-134	--	--	
		Carbon tetrachloride			68-132	--	--	
		Chlorobenzene			70-119	--	--	
		Chloroethane			63-127	--	--	
		Chloroform			68-123	--	--	
		Chloromethane			59-132	--	--	
		cis-1,2-Dichloroethene			70-121	--	--	
		cis-1,3-dichloropropene			70-128	--	--	
		Cyclohexane			70-117	--	--	
		Dibromochloromethane			70-130			
		Dichlorodifluoromethane (CFC-12)			59-128	--	--	
		Dichlorotetrafluoroethane (CFC-114)			70-130	--	--	
		Ethyl acetate			65-128	--	--	
		Ethylbenzene			70-124	--	--	
		Heptane			69-123	--	--	
		Hexachlorobutadiene			56-138	--	--	
		m,p-Xylene			61-134	--	--	
		Methyl methacrylate			70-128	--	--	
		Methylene chloride			62-115	--	--	
		n-Hexane			62-120	--	--	
		Naphthalene			57-138	--	--	
		o-Xylene			67-125	--	--	
		4-Ethyltoluene			67-129	--	--	
		Propylene			57-136	--	--	
		Styrene			73-127	--	--	
		Methyl tert-butyl ether			66-126	--	--	
		Tetrachloroethene			66-124	--	--	
		Tetrahydrofuran			64-123	--	--	
		Toluene			66-119	--	--	
		trans-1,2-Dichloroethene			67-124	--	--	
		trans-1,3-dichloropropene			75-133	--	--	
		Trichloroethene			71-123	--	--	
		Trichlorofluoromethane (CFC-11)			62-126	--	--	
		Vinyl acetate			56-139	--	--	
		Vinyl chloride			64-127	--	--	
TPH (Air)	--	C5-C8 Aliphatics, C9-C12 Aliphatics, and C9-C10 Aromatics	Massachusetts DEP APH Test Methods WSC-CAM-IX	Air	70-130	--	--	70-130
Gases (Air)	--	Oxygen	USEPA 3C	Air	90-110	--	--	--
		Carbon Dioxide			90-110	--	--	--
		Methane			90-110	--	--	--
TCLP	VOCs	Benzene, Carbon Tetrachloride, Chlorobenzene, Chloroform, 1,4-Dichlorobenzene, 1,2-Dichloroethane, 1,1-Dichlorethylene, Methyl Ethyl Ketone, Tetrachloroethylene, Trichloroethylene, Vinyl Chloride	USEPA SW846-1311 followed by USEPA SW846-8260D	Solid	80-120	80-120	40	40
	Metals	Arsenic, Barium, Cadmium, Chromium, Lead, Selenium, Silver	USEPA SW846-1311 followed by USEPA SW846-6010D	Solid	80-120	75-125	20	--
		Mercury	USEPA SW846-1311 followed by USEPA SW846-7470A	Solid	80-120	75-125	20	--
	SVOCs	Total Methylphenols (Cresols)	USEPA SW846-1311 followed by USEPA SW846-8270E	Solid	46-120	46-120	40	23-120 (10)
		2,4-Dinitrotoluene			33-134	33-134		
		Hexachlorobenzene			54-120	54-120		
		Hexachlorobutadiene			22-120	22-120		
		Hexachloroethane			19-120	19-120		
		Nitrobenzene			46-120	46-120		
		Pentachlorophenol			25-144	25-144		
		Pyridine			43-120	43-120		
		2,4,5-Trichlorophenol			37-124	37-124		
		2,4,6-Trichlorophenol			37-120	37-120		
	Pesticides	Chlordane, Endrin, Heptachlor, Heptachlor Epoxide, gamma-BHC, Methoxychlor, Toxaphene	USEPA SW846-1311 followed by USEPA SW846-8081B	Solid	30-160	30-160	30	30-160

Table 2: Current Laboratory Control Limits

Category	Sub-Category	Analytes	Analytical Method	Media	LCS	MS/MSD		Surrogates
					% R	% R	RPD %	% R
Solid and Water Conventionals	Nutrients	Total Nitrate + Nitrite as Nitrogen	USEPA 353.2	Solid	90-110	75-125	--	--
		Total Kjeldahl Nitrogen	SM 4500-N		90-110	75-125	--	--
		Total Phosphorus	SM 4500-P		90-110	75-125	--	--
		Total Sulfur	ASTM D4239-85C		80-120	80-120	--	--
		Soluble Potash	SM 3120		TBD (11)	TBD (11)		--
		Total Nitrate + Nitrite as Nitrogen	SM 4500-$NO3^-$	Water	90-110	75-125	--	--
		Total Kjeldahl Nitrogen	SM 4500-N		90-110	75-125	--	--
		Total Phosphorus	SM 4500-P		90-110	75-125	--	--
		Total Sulfur	ASTM D4239-85C		TBD (11)	TBD (11)	--	--
		Soluble Potash	SM 3120		TBD (11)	TBD (11)	--	--
	Alkalinity	Total Alkalinity	USEPA 2320	Solid	90-110	--	--	--
				Water	90-110	--	--	--
	Major Anions	Bromide, Chloride, Fluoride, Nitrate, Nitrite, Ortho-Phosphorus, Sulfate	USEPA 300.0	Solid	90-110	75-125	20	--
		Sulfide	SM 4500-S2 D (PSEP)		75-125	75-125	--	--
		Bromide, Chloride, Fluoride, Nitrate, Nitrite, Ortho-Phosphorus, Sulfate	USEPA 300.0	Water	90-110	75-125	20	--
		Sulfide	SM 4500-S2 D	Water	75-125	75-125	--	--
	Major Cations	Aluminum, Calcium, Iron, Magnesium, Manganese, Potassium, Sodium	USEPA SW846-6020B	Solid	80-120	75-125	20	--
				Water	80-120	75-125	20	--
	Miscellaneous Conventionals	Biological Oxygen Demand	SM 5210 B	Water	84.6-115.4	--	--	--
		Chemical Oxygen Demand	USEPA 410.4	Water	90-110	90-110	10	--
		Dissolved Organic Carbon	SM 5310 B	Water	90-110	75-125	20	--
		Total Organic Carbon	USEPA SW846-9060A Mod	Solid	80-120	75-125	20	--
				Water	90-110	75-125	20	--
		Total Dissolved Solids	SM 2540 C	Water	90-110	--	--	--
		Total Suspended Solids	SM 2540 D	Water	90-110	--	--	--

Notes:

--: not applicable; %R: pecent recovery; HC: hydrocarbon; LCS: Laboratory control sample; MS/MSD: Matrix spike/matrix spike duplicate; RPD: Relative percent difference; SM: Standard Method; TBD: to be determined

-The laboratories listed in Table 4 (e.g., ARI) provided these laboratory control limits.

(1) Control limits are 80-120% for dibromofluoromethane, 4-bromofluorobenzene, and 1,2-dichlorobenzene-d4, 77-120% for toluene-d8, and 80-149% for 1,2-dichloroethane-d4.

(2) Control limits are 80-120% for dibromofluoromethane, toluene-d8, 4-bromofluorobenzene, and 1,2-dichlorobenzene-d4, and 80-129% for 1,2-dichloroethane-d4.

(3) Control limits are 80-120% for 1,2-dichlorobenzene-d4, toluene-d8, dibromofluoromethane, 74-152% for 1,2-dichloroethane-d4, and 78-123% for 4-bromofluorobenzene.

(4) Control limits are 80-120% for 1,2-dichlorobenzene-d4, toluene-d8, 4-bromofluorobenzene, dibromofluoromethane, and 72-133% for 1,2-dichloroethane-d4.

(5) Control limits are 40-133% for decachlorobiphenyl and 53-120% for tetrachlorometaxylene.

(6) Control limits are 26-120% for decachlorobiphenyl and 39-120% for tetrachlorometaxylene.

(7) Control limits are 27-120% for 2-fluorophenol, 29-120% for phenol-d5, 31-120% for 2-chlorophenol-d4, 32-120% for 1,2-dichlorobenzene-d4, 30-120% for nitrobenzene-d5, 35-120% for 2-fluorobiphenyl, 24-134% for 2,4,6-tribromophenol, and 37-120% for p-terphenyl-d14.

(8) Control limits are 34-145% for decachlorobiphenyl and 23-135% for tetrachlorometaxylene.

(9) Control limits are 11-144% for decachlorobiphenyl and 30-120% for tetrachlorometaxylene.

(10) Control limits are 23-120% for 2-fluorophenol, 16-120% for phenol-d5, 33-120% for 2-chlorophenol-d4, 27-120% for 1,2-dichlorobenzene-d4, 34-120% for nitrobenzene-d5, 38-120% for 2-fluorobiphenyl, 31-128% for 2,4,6-tribromophenol, and 27-122% for p-terphenyl-d14.

(11) A laboratory that analyzes for total sulfur in water and soluble potash has not been identified yet. If a suitable laboratory cannot be found prior to the applicable activity, the applicable samples will not be analyzed for these analytes.

Table 3: Target MDLs, Target PQLs, and Sensitivity Analysis

Category	Analytical Method	Analytes	Soil			Groundwater			Indoor Air			Sub-Slab Soil Gas		
			Target MDL [1,2] (mg/kg)	Target PQL [1,2] (mg/kg)	Soil SL [2,3] (mg/kg)	Target MDL [1] (ug/L)	Target PQL [1] (ug/L)	Groundwater SL [3] (ug/L)	Target MDL [1,4,5] (ug/m^3)	Target PQL [1,4,5] (ug/m^3)	Indoor Air SL [3,5] (ug/m^3)	Target MDL [1,4,5] (ug/m^3)	Target PQL [1,4,5] (ug/m^3)	Sub-slab Soil Gas SL [3,5] (ug/m^3)
VOCs TO15 VOCs (Air)	USEPA SW846-8260D (solid and water) USEPA TO-15 (air)	1,1,1,2-Tetrachloroethane	0.00035	0.0010	0.41	0.090	0.20	71	--	--	3.4	--	--	110
		1,1,1-Trichloroethane	0.00060	0.0010	89	0.077	0.20	12,000	0.014	0.055	5,000	0.042	0.16	170,000
		1,1,2,2-Tetrachloroethane	0.00027	0.0010	0.0017	0.034	0.20	0.30	0.013	0.14	0.43	0.038	0.41	14
		1,1,2-Trichloro-1,2,2-Trifluoroethane	0.00085	0.0020	11	0.11	0.20	360	0.010	0.38	5,000	0.031	1.1	170,000
		1,1,2-Trichloroethane	0.00027	0.0010	0.0050	0.10	0.20	0.90	0.0023	0.055	0.20	0.0068	0.16	6.7
		1,1-Dichloroethane	0.00028	0.0010	0.58	0.037	0.20	110	0.0016	0.041	16	0.0048	0.12	520
		1,1-Dichloroethene	0.00037	0.0010	1.8	0.075	0.20	280	0.0021	0.040	200	0.0064	0.12	6,700
		1,1-Dichloropropene	0.00028	0.0010	No Value	0.095	0.20	No Value	--	--	--	--	--	--
		1,2,3-Trichlorobenzene	0.0023	0.0050	29	0.25	0.50	No Value	--	--	--	--	--	--
		1,2,3-Trichloropropane	0.0015	0.0020	0.28	0.16	0.50	44	--	--	0.30	--	--	10.0
		1,2,4-Trichlorobenzene	**0.0018**	**0.0050**	0.0014	**0.21**	**0.50**	0.037	0.038	1.5	2.0	0.11	4.4	67
		1,2,4-Trimethylbenzene	0.00027	0.0010	8.6	0.049	0.20	520	0.020	0.74	60	0.061	2.2	2,000
		1,2-Dibromo-3-Chloropropane	0.0024	0.0050	0.010	0.39	0.50	1.6	--	--	0.0042	--	--	0.14
		1,2-Dibromoethane	0.00031	0.0010	0.016	0.086	0.20	3.0	0.0015	0.0015	0.042	0.0046	0.0046	1.4
		1,2-Dichlorobenzene	0.00065	0.0010	9.3	0.085	0.20	800	0.010	0.060	200	0.030	0.18	6,700
		1,2-Dichloroethane	0.00023	0.0010	0.17	0.076	0.20	35	0.00076	0.041	0.96	0.0023	0.12	32
		1,2-Dichloropropane	0.00033	0.0010	0.016	0.066	0.20	3.1	0.015	0.23	4.0	0.045	0.69	130
		1,3,5-Trimethylbenzene	0.00025	0.0010	6.0	0.070	0.20	370	0.0071	0.49	60	0.021	1.5	2,000
		1,3-Dichlorobenzene	0.00024	0.0010	0.023	0.075	0.20	2.0	0.012	0.060	No Value	0.036	0.18	No Value
		1,3-Dichloropropane	0.00023	0.0010	753	0.066	0.20	No Value	--	--	--	--	--	--
		1,4-Dichlorobenzene	0.00043	0.0010	0.82	0.10	0.20	50	0.0092	0.060	2.3	0.027	0.18	76
		2,2-Dichloropropane	0.00031	0.0010	No Value	0.12	0.20	No Value	--	--	--	--	--	--
		2-Butanone	0.0024	0.0050	15,142	1.8	5.0	3,700,000	0.017	0.44	5,000	0.052	1.3	170,000
		2-Chloroethyl vinyl ether	0.0030	0.0050	No Value	0.55	1.0	No Value	--	--	--	--	--	--
		2-Chlorotoluene	0.00022	0.0010	220	0.063	0.20	No Value	--	--	--	--	--	--
		2-Hexanone	0.0013	0.0050	69	2.1	5.0	16,000	0.018	2.1	30	0.055	6.2	1,000
		2-Pentanone	0.0022	0.0050	No Value	2.3	5.0	No Value	--	--	--	--	--	--
		4-Chlorotoluene	0.00029	0.0010	62	0.061	0.20	No Value	--	--	--	--	--	--
		4-Methyl-2-Pentanone	0.0014	0.0050	4,044	1.9	5.0	1,000,000	0.014	2.1	3,000	0.043	6.2	100,000
		Acetone	0.0063	0.010	202,440	1.9	5.0	No Value	1.1	4.8	No Value	3.4	14	No Value
		Acrolein	0.0018	**0.0050**	0.0044	**2.7**	**5.0**	1.1	0.0021	0.0021	0.020	0.0063	0.0063	0.67
		Acrylonitrile	**0.0043**	**0.0050**	0.00012	**0.40**	**1.0**	0.028	--	--	0.37	--	--	12
		Benzene	0.00017	0.0010	0.0088	0.053	0.20	1.6	0.010	0.032	3.2	0.031	0.096	110
		Bromobenzene	0.00025	0.0010	12	0.066	0.20	1,400	--	--	60	--	--	2,000
		Bromochloromethane	0.00040	0.0010	3,755	0.087	0.20	No Value	--	--	--	--	--	--
		Bromodichloromethane	0.00026	0.0010	0.013	0.090	0.20	2.8	0.0061	0.34	0.68	0.018	1.0	23
		Bromoform	0.00046	0.0010	0.078	0.15	0.20	12	0.022	0.10	23	0.065	0.31	760
		Bromomethane	0.0012	0.0010	0.11	0.23	1.0	24	0.039	0.19	5.0	0.12	0.58	170
		Carbon Disulfide	0.00033	0.0010	9.2	0.060	0.20	1,800	0.95	3.1	700	2.8	9.3	23,000
		Carbon tetrachloride	0.00031	0.0010	0.0029	0.087	0.20	0.35	0.0029	0.32	4.2	0.0086	0.95	140
		Chlorobenzene	0.00021	0.0010	1.7	0.058	0.20	200	0.0048	0.046	50	0.014	0.14	1,700
		Chloroethane	0.0012	0.0020	159	0.053	0.20	32,000	0.044	0.40	10,000	0.13	1.2	330,000
		Chloroform	0.00029	0.0010	0.063	0.055	0.20	12	0.0026	0.049	1.1	0.0079	0.15	36
		Chloromethane	0.00038	0.0010	1.5	0.27	0.50	330	0.084	0.31	90	0.25	0.93	3,000
		cis-1,2-Dichloroethene	0.00026	0.0010	2.0	0.081	0.20	400	0.026	0.20	40	0.077	0.59	1,300
		cis-1,3-Dichloropropene	0.00026	0.0010	0.0056	0.089	0.20	1.2	0.0098	0.68	6.3	0.029	2.0	210
		Cyclohexanone	0.050	0.050	5,435	--	**--**	4,500,000	--	--	700	--	--	23,000
		Dibromochloromethane	0.00027	0.0010	0.010	0.095	0.20	2.2	0.014	0.43	No Value	0.041	1.3	No Value
		Dibromomethane	0.00036	0.0010	0.94	0.064	0.20	210	--	--	4.0	--	--	130
		Dichlorodifluoromethane	0.00040	0.0010	0.22	0.13	0.20	9.2	0.021	0.25	100	0.063	0.74	3,300
		Ethylbenzene	0.00023	0.0010	0.18	0.051	0.20	21	0.0016	0.65	1,000	0.0048	2.0	33,000
		Hexachloro-1,3-butadiene	**0.0042**	**0.0050**	0.00021	**1.0**	**2.0**	0.010	0.063	0.53	1.1	0.19	1.6	38
		Iodomethane	0.00091	0.0010	No Value	0.15	1.0	No Value	--	--	--	--	--	--

Table 3: Target MDLs, Target PQLs, and Sensitivity Analysis

Category	Analytical Method	Analytes	Soil			Groundwater			Indoor Air			Sub-Slab Soil Gas		
			Target MDL [1,2] (mg/kg)	Target PQL [1,2] (mg/kg)	Soil SL [2,3] (mg/kg)	Target MDL [1] (ug/L)	Target PQL [1] (ug/L)	Groundwater SL [3] (ug/L)	Target MDL [1,4,5] (ug/m^3)	Target PQL [1,4,5] (ug/m^3)	Indoor Air SL [3,5] (ug/m^3)	Target MDL [1,4,5] (ug/m^3)	Target PQL [1,4,5] (ug/m^3)	Sub-slab Soil Gas SL [3,5] (ug/m^3)
VOCs TO15 VOCs (Air)	USEPA SW846-8260D (solid and water) USEPA TO-15 (air)	Isopropylbenzene	0.00026	0.0010	37	0.074	0.20	2,000	--	--	400	--	--	13,000
		Isopropyltoluene	0.00029	0.0010	5.1	0.075	0.20	190	--	--	40	--	--	1,300
		m,p-Xylene	0.00049	0.0020	66	0.14	0.40	No Value	0.0076	1.3	No Value	0.023	3.9	No Value
		Methyl tert-Butyl Ether	0.00025	0.0010	36	0.14	0.50	8,600	0.00081	0.18	96	0.0024	0.54	3,200
		Methylene chloride	0.0044	0.0050	0.43	0.53	1.0	100	0.061	1.7	600	0.18	5.2	20,000
		Naphthalene	0.0025	0.0050	2.4	0.27	0.50	88	0.048	0.073	0.74	0.14	0.22	25
		n-Butylbenzene	0.00028	0.0010	20	0.18	0.20	No Value	--	--	--	--	--	--
		n-Hexane	0.0010	0.0010	2.4	0.10	0.20	16	0.0084	0.53	700	0.025	1.6	23,000
		n-Propylbenzene	0.00024	0.0010	54	0.068	0.20	4,900	--	--	1,000	--	--	33,000
		o-Xylene	0.00024	0.0010	80	0.079	0.20	No Value	0.0040	0.43	No Value	0.012	1.3	No Value
		sec-Butylbenzene	0.00024	0.0010	27	0.063	0.20	No Value	--	--	--	--	--	--
		Styrene	0.00025	0.0010	346	0.088	0.20	19,000	0.0084	0.21	1,000	0.025	0.64	33,000
		tert-Butylbenzene	0.00025	0.0010	36	0.071	0.20	No Value	--	--	--	--	--	--
		Tetrachloroethene	0.00020	0.0010	0.029	0.091	0.20	2.9	0.0036	0.068	40	0.011	0.20	1,300
		Toluene	0.00025	0.0010	0.72	0.049	0.20	102	0.0050	0.75	5,000	0.015	2.3	170,000
		Total Xylenes	0.00070	0.0020	0.94	0.22	0.60	106	0.012	1.7	100	0.035	5.1	3,300
		trans-1,2-Dichloroethene	0.00053	0.0010	0.88	0.069	0.20	170	0.035	0.60	40	0.10	1.8	1,300
		trans-1,3-Dichloropropene	0.00041	0.0010	0.0056	0.089	0.20	1.2	0.0085	0.23	6.3	0.026	0.68	210
		trans-1,4-Dichloro 2-Butene	0.0028	0.0050	283	0.60	1.0	No Value	--	--	--	--	--	--
		Trichloroethene	0.00026	0.0010	0.0044	0.070	0.20	0.70	0.0017	0.054	2.0	0.0051	0.16	67
		Trichlorofluoromethane	0.00098	0.0020	2.5	0.13	0.20	260	0.022	0.28	700	0.067	0.84	23,000
		Vinyl Acetate	0.0033	0.0050	74	0.12	0.20	17,000	0.042	0.53	200	0.13	1.6	6,700
		Vinyl Chloride	0.00034	0.0010	0.0011	0.082	**0.20**	0.18	0.00032	0.026	2.8	0.00097	0.077	95
		n-Butyl Alcohol	0.92	3.0	12,860	29	60	No Value	--	--	--	--	--	--
		1,3-Butadiene	--	--	--	--	--	--	0.0027	0.022	No Value	0.0082	0.066	No Value
		1,4-Dioxane	--	--	--	--	--	--	0.015	0.54	No Value	0.045	1.6	No Value
		Isopropyl Alcohol	--	--	--	--	--	--	0.49	2.5	No Value	1.5	7.4	No Value
		4-Ethyltoluene	--	--	--	--	--	--	0.0087	0.25	No Value	0.026	0.74	No Value
		Benzyl Chloride	--	--	--	--	--	--	0.0090	0.26	No Value	0.027	0.78	No Value
		Cyclohexane	--	--	--	--	--	--	0.026	0.17	No Value	0.077	0.52	No Value
		Ethyl Acetate	--	--	--	--	--	--	0.22	1.8	No Value	0.67	5.4	No Value
		Dichlorotetrafluoroethane	--	--	--	--	--	--	0.086	0.35	No Value	0.26	1.1	No Value
		Heptane	--	--	--	--	--	--	0.029	0.60	No Value	0.087	1.8	No Value
		Methyl Methacrylate	--	--	--	--	--	--	0.078	0.61	No Value	0.23	1.8	No Value
		Propylene	--	--	--	--	--	--	0.072	0.69	No Value	0.22	2.1	No Value
		Tetrahydrofuran	--	--	--	--	--	--	0.074	0.44	No Value	0.22	1.3	No Value
TPH	NWTPH-HCID	TPH in the Gasoline Range	--	--	--	--	--	--	--	--	--	--	--	--
		TPH in the Diesel Range	--	--	--	--	--	--	--	--	--	--	--	--
		TPH in the Heavy Oil Range	--	--	--	--	--	--	--	--	--	--	--	--
	NWTPH-G	TPH in the Gasoline Range	2.5	5.0	30	17	100	1,700	--	--	--	--	--	--
	NWTPH-Dx	TPH in the Diesel Range [6]	2.5	5.0	2,000	50	100	2,100	--	--	--	--	--	--
		TPH in the Heavy Oil Range [6]	5.0	10.0	2,000	100	200	No Value	--	--	--	--	--	--
	NWEPH	EPH	2.5	5.0	No Value	50	50	No Value	--	--	--	--	--	--
	NWVPH	VPH	2.5	5.0	No Value	50	50	No Value	--	--	--	--	--	--

Table 3: Target MDLs, Target PQLs, and Sensitivity Analysis

Category	Analytical Method	Analytes	Soil			Groundwater			Indoor Air			Sub-Slab Soil Gas		
			Target MDL [1,2] (mg/kg)	Target PQL [1,2] (mg/kg)	Soil SL [2,3] (mg/kg)	Target MDL [1] (ug/L)	Target PQL [1] (ug/L)	Groundwater SL [3] (ug/L)	Target MDL [1,4,5] (ug/m^3)	Target PQL [1,4,5] (ug/m^3)	Indoor Air SL [3,5] (ug/m^3)	Target MDL [1,4,5] (ug/m^3)	Target PQL [1,4,5] (ug/m^3)	Sub-slab Soil Gas SL [3,5] (ug/m^3)
Metals	USEPA SW846-6020B	Antimony	0.10	0.20	81	0.10	0.20	90	--	--	--	--	--	--
		Arsenic	0.038	0.20	20	0.037	0.20	8.0	--	--	--	--	--	--
		Barium	0.26	0.50	700,000	0.11	0.50	No Value	--	--	--	--	--	--
		Cadmium	0.040	0.10	1.1	0.040	0.10	7.9	--	--	--	--	--	--
		Chromium	0.26	0.50	No Value	0.26	0.50	No Value	--	--	--	--	--	--
		Copper	0.35	0.50	36	0.35	0.50	3.1	--	--	--	--	--	--
		Lead	0.052	0.10	1,000	0.051	0.10	8.1	--	--	--	--	--	--
		Manganese	0.14	0.50	1,146	0.14	0.50	100	--	--	--	--	--	--
		Nickel	0.22	0.50	38	0.22	0.50	8.2	--	--	--	--	--	--
		Selenium	0.18	0.50	7.4	0.18	0.50	71	--	--	--	--	--	--
		Silver	0.022	0.20	0.61	0.022	0.20	0.91	--	--	--	--	--	--
		Zinc	2.9	6.0	101	2.9	6.0	81	--	--	--	--	--	--
	USEPA SW846-7471B/7470A	Mercury	0.0053	0.025	0.070	0.013	**0.10**	0.025	--	--	--	--	--	--
	USEPA SW846-7196A	Chromium VI	0.40	0.40	1.6	**12.5**	**12.5**	4.1	--	--	--	--	--	--
Cyanide	USEPA SW846-9014	Total Cyanide	0.10	0.10	0.57	--	--	--	--	--	--	--	--	--
	SM 4500-CN^- E	Free Cyanide	--	--	--	2.0	**5.0**	2.8	--	--	--	--	--	--
PCBs	USEPA SW846-8082A	Total PCBs [7]	0.057	0.14	1.0	**0.12**	**0.70**	0.0000070	--	--	--	--	--	--
SVOCs	USEPA SW846-8270E	1,2,4-Trichlorobenzene	**0.0085**	**0.020**	0.0014	0.032	**0.20**	0.037	--	--	--	--	--	--
		1,2-Dichlorobenzene	0.0061	0.020	9.3	0.033	0.20	800	--	--	--	--	--	--
		1,3-Dichlorobenzene	0.0031	0.020	0.023	0.031	0.20	2.0	--	--	--	--	--	--
		1,4-Dichlorobenzene	0.0064	0.020	0.82	0.028	0.20	50	--	--	--	--	--	--
		1-Methylnaphthalene	0.0053	0.020	0.020	0.026	0.20	0.37	--	--	0.030	--	--	0.10
		2,2'-Oxybis(1-chloropropane)	0.0034	0.020	2.1	0.028	0.20	370	--	--	--	--	--	--
		2,4,5-Trichlorophenol	0.026	0.10	22	0.13	1.0	600	--	--	--	--	--	--
		2,4,6-Trichlorophenol	**0.0090**	**0.10**	0.0033	0.16	**1.0**	0.28	--	--	--	--	--	--
		2,4-Dichlorophenol	0.015	**0.10**	0.069	0.10	1.0	10.0	--	--	--	--	--	--
		2,4-Dimethylphenol	0.0089	0.10	1.3	0.27	1.0	97	--	--	--	--	--	--
		2,4-Dinitrophenol	0.034	0.20	0.40	0.22	2.0	100	--	--	--	--	--	--
		2,4-Dinitrotoluene	**0.016**	**0.10**	0.0028	0.11	**1.0**	0.18	--	--	--	--	--	--
		2,6-Dinitrotoluene	0.021	0.10	88	0.17	1.0	No Value	--	--	--	--	--	--
		2-Chloronaphthalene	0.0080	0.020	5.4	0.030	0.20	100	--	--	--	--	--	--
		2-Chlorophenol	0.014	0.020	0.20	0.029	0.20	17	--	--	--	--	--	--
		2-Methylnaphthalene	0.0045	0.020	66	0.029	0.20	No Value	--	--	--	--	--	--
		2-Methylphenol	0.0067	0.020	13,118	0.027	0.20	No Value	--	--	--	--	--	--
		2-Nitroaniline	0.016	0.10	458	0.17	1.0	No Value	--	--	--	--	--	--
		2-Nitrophenol	0.0049	0.020	No Value	0.036	1.0	No Value	--	--	--	--	--	--
		3,3'-Dichlorobenzidine	**0.0071**	**0.10**	0.00022	**0.34**	**1.0**	0.0033	--	--	--	--	--	--
		3-Nitroaniline	0.022	0.10	No Value	0.15	1.0	No Value	--	--	--	--	--	--
		4,6-Dinitro-2-methylphenol	0.038	**0.20**	0.13	0.36	2.0	7.0	--	--	--	--	--	--
		4-Bromophenyl phenyl ether	0.017	0.020	No Value	0.019	0.20	No Value	--	--	--	--	--	--
		4-Chloro-3-Methylphenol	0.012	0.10	0.50	0.13	1.0	36	--	--	--	--	--	--
		4-Chloroaniline	0.026	0.10	660	0.042	1.0	No Value	--	--	--	--	--	--
		4-Chlorophenylphenyl ether	0.019	0.050	No Value	0.020	0.20	No Value	--	--	--	--	--	--
		3&4-Methylphenol	0.0074	0.020	10,759	0.029	0.20	No Value	--	--	--	--	--	--
		4-Nitroaniline	0.029	0.10	225	0.17	1.0	No Value	--	--	--	--	--	--
		4-Nitrophenol	0.033	0.10	No Value	0.056	1.0	No Value	--	--	--	--	--	--
		Acenaphthene	0.0052	0.020	3.1	0.029	0.20	30	--	--	--	--	--	--
		Acenaphthylene	0.0062	0.020	No Value	0.020	0.20	No Value	--	--	--	--	--	--
		Anthracene	0.0072	0.020	1.0	0.028	0.20	100	--	--	--	--	--	--
		Benzo(g,h,i)perylene	0.014	0.020	No Value	0.041	0.20	No Value	--	--	--	--	--	--
		Benzoic acid	0.039	0.20	682	0.13	2.0	No Value	--	--	--	--	--	--
		Benzyl Alcohol	0.016	0.020	9,501	0.023	0.20	No Value	--	--	--	--	--	--

Table 3: Target MDLs, Target PQLs, and Sensitivity Analysis

Category	Analytical Method	Analytes	Soil			Groundwater			Indoor Air			Sub-Slab Soil Gas		
			Target MDL [1,2] (mg/kg)	Target PQL [1,2] (mg/kg)	Soil SL [2,3] (mg/kg)	Target MDL [1] (ug/L)	Target PQL [1] (ug/L)	Groundwater SL [3] (ug/L)	Target MDL [1,4,5] (ug/m^3)	Target PQL [1,4,5] (ug/m^3)	Indoor Air SL [3,5] (ug/m^3)	Target MDL [1,4,5] (ug/m^3)	Target PQL [1,4,5] (ug/m^3)	Sub-slab Soil Gas SL [3,5] (ug/m^3)
SVOCs	USEPA SW846-8270E	Bis(2-Chloroethoxy)methane	0.0043	0.020	1,672	0.030	0.20	No Value	--	--	--	--	--	--
		bis(2-chloroethyl) ether	**0.019**	**0.050**	0.00033	0.028	**0.20**	0.060	--	--	--	--	--	--
		bis(2-Ethylhexyl)phthalate	0.014	0.050	0.10	**0.16**	**0.20**	0.046	--	--	--	--	--	--
		Butylbenzylphthalate	**0.0094**	**0.020**	0.0036	**0.066**	**0.20**	0.013	--	--	--	--	--	--
		Carbazole	0.0043	0.020	No Value	0.037	0.20	No Value	--	--	--	--	--	--
		Dibenzofuran	0.014	0.020	29	0.020	0.20	No Value	--	--	--	--	--	--
		Diethyl phthalate	0.020	0.050	1.1	0.060	0.20	200	--	--	--	--	--	--
		Dimethylphthalate	0.0044	0.020	2.8	0.035	0.20	600	--	--	--	--	--	--
		Di-n-Butylphthalate	0.0056	0.020	0.28	0.051	0.20	8.0	--	--	--	--	--	--
		Di-n-Octylphthalate	0.0044	0.020	3.1	0.045	0.20	No Value	--	--	--	--	--	--
		Fluoranthene	0.0061	0.020	5.9	0.033	0.20	6.0	--	--	--	--	--	--
		Fluorene	0.015	0.020	1.6	0.021	0.20	10.0	--	--	--	--	--	--
		Hexachlorobenzene	**0.014**	**0.020**	0.0000080	**0.036**	**0.20**	0.0000050	--	--	--	--	--	--
		Hexachlorobutadiene	**0.0048**	**0.020**	0.00021	**0.038**	**0.20**	0.010	--	--	--	--	--	--
		Hexachlorocyclopentadiene	0.025	**0.10**	0.032	0.14	1.0	1.0	--	--	--	--	--	--
		Hexachloroethane	**0.0069**	**0.020**	0.00016	**0.037**	**0.20**	0.020	--	--	--	--	--	--
		Isophorone	0.0095	0.020	0.58	0.031	0.20	110	--	--	--	--	--	--
		Naphthalene	0.0042	0.020	2.4	0.025	0.20	88	--	--	--	--	--	--
		Nitrobenzene	0.0072	0.020	0.64	0.027	0.20	100	--	--	--	--	--	--
		N-Nitrosodimethylamine	**0.022**	**0.040**	0.0015	0.037	**0.40**	0.34	--	--	--	--	--	--
		N-Nitroso-di-n-Propylamine	**0.0075**	**0.020**	0.00055	0.035	**0.20**	0.058	--	--	--	--	--	--
		N-Nitrosodiphenylamine	0.0053	0.020	0.039	0.025	0.20	0.69	--	--	--	--	--	--
		Pentachlorophenol	**0.031**	**0.10**	0.000032	**0.14**	**1.0**	0.0020	--	--	--	--	--	--
		Phenanthrene	0.0087	0.020	No Value	0.021	0.20	No Value	--	--	--	--	--	--
		Phenol	0.0044	0.020	542	0.010	0.20	70,000	--	--	--	--	--	--
		Pyrene	0.0057	0.020	9.2	0.031	0.20	8.0	--	--	--	--	--	--
		Total cPAHs [8]	0.0093	0.030	0.084	**0.15**	**0.30**	0.000016	--	--	--	--	--	--
PAHs Only	USEPA SW846-8270E-SIM (0.01 ug/L level)	Total cPAHs [8]	--	--	--	**0.015**	**0.015**	0.000016	--	--	--	--	--	--
Dioxins/ Furans	USEPA 1613B	Total Dioxins/Furans [8]	1.5E-06	3.2E-06	5.2E-06	**3.2E-06**	**3.2E-05**	5.1E-09	--	--	--	--	--	--
Organotins	USEPA SW846-3545 followed by Krone-mod/USEPA SW846-8270E-SIM	Tributyltin oxide	0.0019	0.0039	26	**0.096**	**0.19**	0.050	--	--	--	--	--	--

Table 3: Target MDLs, Target PQLs, and Sensitivity Analysis

Category	Analytical Method	Analytes	Soil			Groundwater			Indoor Air			Sub-Slab Soil Gas		
			Target MDL [1,2] (mg/kg)	Target PQL [1,2] (mg/kg)	Soil SL [2,3] (mg/kg)	Target MDL [1] (ug/L)	Target PQL [1] (ug/L)	Groundwater SL [3] (ug/L)	Target MDL [1,4,5] (ug/m^3)	Target PQL [1,4,5] (ug/m^3)	Indoor Air SL [3,5] (ug/m^3)	Target MDL [1,4,5] (ug/m^3)	Target PQL [1,4,5] (ug/m^3)	Sub-slab Soil Gas SL [3,5] (ug/m^3)
Pesticides	USEPA SW846-8081A	4,4´-DDD	**0.00058**	**0.0033**	0.0000073	**0.019**	**0.050**	0.0000079	--	--	--	--	--	--
		4,4´-DDE	**0.00057**	**0.0033**	0.0000015	**0.018**	**0.050**	0.00000088	--	--	--	--	--	--
		4,4´-DDT	**0.00057**	**0.0033**	0.000016	**0.017**	**0.050**	0.0000012	--	--	--	--	--	--
		Aldrin	**0.00022**	**0.0017**	0.000000040	**0.010**	**0.025**	0.000000041	--	--	--	--	--	--
		alpha-BHC	**0.00017**	**0.0017**	0.0000019	**0.0080**	**0.025**	0.000048	--	--	--	--	--	--
		alpha-Chlordane	0.00028	0.0017	3.8	0.0080	0.025	No Value	--	--	--	--	--	--
		beta-BHC	**0.00032**	**0.0017**	0.000065	**0.010**	**0.025**	0.0014	--	--	--	--	--	--
		delta-BHC	0.00030	0.0017	0.21	0.0090	0.025	No Value	--	--	--	--	--	--
		Dieldrin	**0.00056**	**0.0033**	0.000000036	**0.017**	**0.050**	0.000000070	--	--	--	--	--	--
		Endosulfan I	0.00027	**0.0017**	0.0012	**0.0090**	**0.025**	0.0087	--	--	--	--	--	--
		Endosulfan II	0.00056	**0.0033**	0.0012	**0.014**	**0.050**	0.0087	--	--	--	--	--	--
		Endosulfan sulfate	0.00084	0.0033	2.0	0.024	0.050	10.0	--	--	--	--	--	--
		Endrin	**0.00052**	**0.0033**	0.00044	**0.017**	**0.050**	0.0020	--	--	--	--	--	--
		Endrin aldehyde	0.00096	**0.0033**	0.0024	0.016	**0.050**	0.035	--	--	--	--	--	--
		Endrin ketone	0.00066	0.0033	No Value	0.015	0.050	No Value	--	--	--	--	--	--
		gamma-BHC (Lindane)	0.00018	0.0017	0.013	0.016	0.025	0.43	--	--	--	--	--	--
		gamma-Chlordane	0.00026	0.0017	3.8	0.0080	0.025	No Value	--	--	--	--	--	--
		Heptachlor	**0.00022**	**0.0017**	0.000000066	**0.011**	**0.025**	0.00000034	--	--	--	--	--	--
		Heptachlor Epoxide	**0.00029**	**0.0017**	0.00000049	**0.0080**	**0.050**	0.0000024	--	--	--	--	--	--
		Methoxychlor	0.0035	0.017	0.032	**0.074**	**0.25**	0.020	--	--	--	--	--	--
		Toxaphene	**0.043**	**0.085**	0.000061	**0.22**	**1.3**	0.000032	--	--	--	--	--	--
TPH (Air)	MassDEP APH WSC-CAM-IX	C5-C8 Aliphatics	--	--	--	--	--	--	N/A	30	46	N/A	90	1,500
		C9-C12 Aliphatics	--	--	--	--	--	--	N/A	35	46	N/A	105	1,500
		C9-C10 Aromatics	--	--	--	--	--	--	N/A	25	46	N/A	75	1,500
Gases (Air)	USEPA 3C	Oxygen	--	--	--	--	--	--	N/A	0.05 %	No Value	N/A	0.15 %	No Value
		Carbon Dioxide	--	--	--	--	--	--	N/A	0.05 %	No Value	N/A	0.15 %	No Value
		Methane	--	--	--	--	--	--	N/A	0.05 %	1.25 %	N/A	0.15 %	5%

Table 3: Target MDLs, Target PQLs, and Sensitivity Analysis

Category	Analytical Method	Analytes	Soil			Groundwater			Indoor Air			Sub-Slab Soil Gas		
			Target MDL [1,2] (mg/kg)	Target PQL [1,2] (mg/kg)	Soil SL [2,3] (mg/kg)	Target MDL [1] (ug/L)	Target PQL [1] (ug/L)	Groundwater SL [3] (ug/L)	Target MDL [1,4,5] (ug/m^3)	Target PQL [1,4,5] (ug/m^3)	Indoor Air SL [3,5] (ug/m^3)	Target MDL [1,4,5] (ug/m^3)	Target PQL [1,4,5] (ug/m^3)	Sub-slab Soil Gas SL [3,5] (ug/m^3)
TCLP VOCs	USEPA SW846-1311 followed by USEPA SW846-8260D	Benzene (mg/L)	N/A	0.0020	0.50	--	--	--	--	--	--	--	--	--
		Carbon Tetrachloride (mg/L)	N/A	0.0020	0.50	--	--	--	--	--	--	--	--	--
		Chlorobenzene (mg/L)	N/A	0.0020	100	--	--	--	--	--	--	--	--	--
		Chloroform (mg/L)	N/A	0.0020	6.0	--	--	--	--	--	--	--	--	--
		1,4-Dichlorobenzene	N/A	0.0020	7.5	--	--	--	--	--	--	--	--	--
		1,2-Dichloroethane (mg/L)	N/A	0.0020	0.50	--	--	--	--	--	--	--	--	--
		1,1-Dichlorethylene (mg/L)	N/A	0.0020	0.70	--	--	--	--	--	--	--	--	--
		Methyl Ethyl Ketone (mg/L)	N/A	0.0020	200	--	--	--	--	--	--	--	--	--
		Tetrachloroethene (mg/L)	N/A	0.0020	0.70	--	--	--	--	--	--	--	--	--
		Trichloroethene (mg/L)	N/A	0.0020	0.50	--	--	--	--	--	--	--	--	--
		Vinyl Chloride (mg/L)	N/A	0.0020	0.20	--	--	--	--	--	--	--	--	--
TCLP Metals	USEPA SW846-1311 followed by USEPA SW846-6010D	Arsenic (mg/L)	N/A	0.050	5.0	--	--	--	--	--	--	--	--	--
		Barium (mg/L)	N/A	0.060	100	--	--	--	--	--	--	--	--	--
		Cadmium (mg/L)	N/A	0.0020	1.0	--	--	--	--	--	--	--	--	--
		Chromium (mg/L)	N/A	0.025	5.0	--	--	--	--	--	--	--	--	--
		Lead (mg/L)	N/A	0.020	5.0	--	--	--	--	--	--	--	--	--
		Selenium (mg/L)	N/A	0.050	1.0	--	--	--	--	--	--	--	--	--
		Silver (mg/L)	N/A	0.0030	5.0	--	--	--	--	--	--	--	--	--
	USEPA SW846-1311 followed by USEPA USEPA SW846-7470A	Mercury (mg/L)	0.0000070	0.00010	0.20	--	--	--	--	--	--	--	--	--
TCLP SVOCs	USEPA SW846-1311 followed by USEPA SW846-8270E	Total Methylphenols (Cresols) (mg/L)	0.015	0.030	200	--	--	--	--	--	--	--	--	--
		2,4-Dinitrotoluene (mg/L)	0.015	0.030	0.13	--	--	--	--	--	--	--	--	--
		Hexachlorobenzene (mg/L)	0.005	0.010	0.13	--	--	--	--	--	--	--	--	--
		Hexachlorobutadiene (mg/L)	0.015	0.030	0.50	--	--	--	--	--	--	--	--	--
		Hexachloroethane (mg/L)	0.010	0.020	3.0	--	--	--	--	--	--	--	--	--
		Nitrobenzene (mg/L)	0.005	0.010	2.0	--	--	--	--	--	--	--	--	--
		Pentachlorophenol (mg/L)	0.050	0.10	100	--	--	--	--	--	--	--	--	--
		Pyridine (mg/L)	0.025	0.050	5.0	--	--	--	--	--	--	--	--	--
		2,4,5-Trichlorophenol (mg/L)	0.025	0.05	400	--	--	--	--	--	--	--	--	--
		2,4,6-Trichlorophenol (mg/L)	0.015	0.03	2.0	--	--	--	--	--	--	--	--	--
TCLP Pesticides	USEPA SW846-1311 followed by USEPA SW846-8081B	Chlordane (Total) (mg/L)	0.00025	0.00050	0.030	--	--	--	--	--	--	--	--	--
		Endrin (mg/L)	0.00025	0.00050	0.020	--	--	--	--	--	--	--	--	--
		Heptachlor (mg/L)	0.00013	0.00025	0.0080	--	--	--	--	--	--	--	--	--
		Heptachlor Epoxide (mg/L)	0.00013	0.00025	0.0080	--	--	--	--	--	--	--	--	--
		gamma-BHC (Lindane) (mg/L)	0.00013	0.00025	0.40	--	--	--	--	--	--	--	--	--
		Methoxychlor (mg/L)	0.0013	0.0025	10.0	--	--	--	--	--	--	--	--	--
		Toxaphene (mg/L)	0.013	0.013	0.50	--	--	--	--	--	--	--	--	--

Table 3: Target MDLs, Target PQLs, and Sensitivity Analysis

Category	Analytical Method	Analytes	Soil			Groundwater			Indoor Air			Sub-Slab Soil Gas		
			Target MDL [1,2] (mg/kg)	Target PQL [1,2] (mg/kg)	Soil SL [2,3] (mg/kg)	Target MDL [1] (ug/L)	Target PQL [1] (ug/L)	Groundwater SL [3] (ug/L)	Target MDL [1,4,5] (ug/m^3)	Target PQL [1,4,5] (ug/m^3)	Indoor Air SL [3,5] (ug/m^3)	Target MDL [1,4,5] (ug/m^3)	Target PQL [1,4,5] (ug/m^3)	Sub-slab Soil Gas SL [3,5] (ug/m^3)
Solid and Water Conventionals	USEPA 353.2/SM 4500-NO_3^-	Total Nitrate + Nitrite as Nitrogen	N/A	0.10	N/A	N/A	10.0	N/A	--	--	--	--	--	--
	SM 4500-N	Total Kjeldahl Nitrogen	N/A	42	N/A	N/A	500	N/A	--	--	--	--	--	--
	SM 4500-P	Total Phosphorus	N/A	2.7	N/A	N/A	8.0	N/A	--	--	--	--	--	--
	ASTM D4239-85C	Total Sulfur	N/A	1,000	N/A	N/A	TBD [9]	N/A	--	--	--	--	--	--
	SM 3120	Soluble Potash	N/A	TBD [9]	N/A	N/A	TBD [9]	N/A	--	--	--	--	--	--
	USEPA 2320	Total Alkalinity	N/A	1.0	N/A	N/A	1,000	N/A	--	--	--	--	--	--
	USEPA 300.0	Bromide	N/A	1.0	N/A	N/A	100	N/A	--	--	--	--	--	--
		Chloride	N/A	1.0	N/A	N/A	100	N/A	--	--	--	--	--	--
		Fluoride	N/A	1.0	N/A	N/A	100	N/A	--	--	--	--	--	--
		Nitrate	N/A	1.0	N/A	N/A	100	N/A	--	--	--	--	--	--
		Nitrite	N/A	1.0	N/A	N/A	100	N/A	--	--	--	--	--	--
		Ortho-Phosphorus	N/A	1.0	N/A	N/A	100	N/A	--	--	--	--	--	--
		Sulfate	N/A	1.0	N/A	N/A	100	N/A	--	--	--	--	--	--
	USEPA SW846-6020B	Aluminum	2.9	20	N/A	2.9	20	N/A			--	--	--	--
		Calcium	11	50	N/A	11	50	N/A	--	--	--	--	--	--
		Iron	18	36	N/A	18	36	N/A	--	--	--	--	--	--
		Magnesium	2.2	20	N/A	2.2	20	N/A	--	--	--	--	--	--
		Manganese	0.14	0.50	1,146	0.14	0.50	100	--	--	--	--	--	--
		Potassium	11	20	N/A	11	20	N/A	--	--	--	--	--	--
		Sodium	16	100	N/A	16	100	N/A	--	--	--	--	--	--
	SM 4500-S2 D/SM 4500-S2 D (PSEP)	Sulfide	N/A	1.0	N/A	N/A	50	N/A	--	--	--	--	--	--
	SM 5210 B	Biological Oxygen Demand	--	--	--	N/A	1,000	N/A	--	--	--	--	--	--
	USEPA 410.4	Chemical Oxygen Demand	--	--	--	N/A	10,000	N/A	--	--	--	--	--	--
	SM 5310 B	Dissolved Organic Carbon	--	--	--	N/A	500	N/A	--	--	--	--	--	--
	USEPA SW846-9060A Mod	Total Organic Carbon	N/A	0.02 %	N/A	N/A	500	N/A	--	--	--	--	--	--
	SM 2540 C	Total Dissolved Solids	--	--	--	N/A	5,000	N/A	--	--	--	--	--	--
	SM 2540 D	Total Suspended Solids	--	--	--	N/A	1,000	N/A	--	--	--	--	--	--

Notes:

--: analyte not being analyzed in this media; HC: hydrocarbon; N/A: MDL not applicable because these constituents will not be reported to the MDL or SL not applicable because this analyte is for geochemical purposes only; No Value: a SL does not exist for this analyte; SM: Standard Method; TBD: to be determined

-The laboratories listed in Table 4 (e.g., ARI) provided these target MDLs and target PQLs.

Target MDL or target PQL in **bold font** exceeds the corresponding SL.

[1] It may not be possible to achieve these reporting limits in all samples (e.g., samples requiring extra dilution beyond the target dilution, interferences).

[2] All units are in mg/kg, with the exception that TCLP units are in mg/L and the total organic carbon unit is in %.

[3] With the following exceptions, these values are the preliminary SLs as determined in the SL calculations memorandum for the Site, provided under separate cover. The TCLP criteria are hazardous waste toxicity characteristic criteria in WAC 173-303-090(8). Methane based on ASTM International Designation E2993-16.

[4] MDL and PQL limits were provided for air samples (i.e., indoor air or ambient air). Sub-slab soil gas samples are analyzed with a three fold dilution, which results in target MDLs and PQLs for sub-slab soil gas that are three times higher than the target MDLs and PQLs for the indoor and ambient air samples.

[5] All units are in ug/m^3, with the exception units for gases are in %.

[6] TPH in the diesel range and TPH in the heavy oil range results will be combined in accordance with Ecology guidance (Ecology 2004) unless it can be demonstrated that separate products are present per Ecology 2004.

[7] The shown target MDLs and PQLs for total PCBs are the sum of the individual target reporting limits for the seven Aroclor congeners.

[8] The shown target MDLs and PQLs for total cPAHs and total dioxins/furans were calculated using the target reporting limits for the individual analytes and their associated toxicity equivalency factors.

[9] A laboratory that analyzes for total sulfur in water and soluble potash has not been identified yet. If a suitable laboratory cannot be found prior to the applicable activity, the applicable samples will not be analyzed for these analytes.

Table 4: Key QAPP Roles and Responsibilities

Role	Name	Contact Information	Key QAPP Responsibilities
Ecology Site Manager	Sandy Smith, PE, LG, LHG	sasm461@ecy.wa.gov 360-999-9588 (C)	▪ Review and approve QAPP ▪ Conduct field oversight as necessary
Port Project Manager	Melisa Bod	mbod@portoftacoma.com 253-592-6789 (O) 503-758-7363 (C)	▪ Review QAPP ▪ Communicate and coordinate with Ecology ▪ Communicate and coordinate within Port
PIONEER Project Manager	Troy Bussey, PE, LG, LHG	busseyt@uspioneer.com 360-570-1700 (O) 360-810-0640 (C)	▪ Prepare QAPP ▪ Implement the QAPP ▪ Communicate and coordinate with Port Project Manager and Ecology Site Manager
Primary Laboratory (ARI)	Kelly Bottem	kellyb@arilabs.com 206-695-6200 (O)	▪ Perform laboratory analyses for solid and water samples ▪ Perform associated laboratory quality control
Laboratory for Air Analyses (Alliance Technical Group FKA Fremont Analytical)	Kelley Lovejoy	Kelley.Lovejoy@allianceTG.com 206-352-3790 (O)	▪ Perform laboratory analyses for air samples ▪ Perform associated laboratory quality control
Laboratory for n-Butyl Alcohol Analyses (Eurofins Seattle)	To be determined	360-431-8510 (O)	▪ Perform laboratory analyses for n-butyl alcohol if necessary ▪ Perform associated laboratory quality control
Laboratory for Free Cyanide Analyses of Water Samples (AmTest Laboratories)	Aaron Young	aarony@amtestlab.com 425-885-1664 (O)	▪ Perform laboratory analyses for free cyanide in water samples if necessary ▪ Perform associated laboratory quality control
Laboratory for Total Sulfur Analyses of Soil Samples (ACZ Laboratories)	Jason Lombardi	jlombardi@acz.com 970-879-6590 x106 (O)	▪ Perform laboratory analyses for total sulfur in soil samples if necessary ▪ Perform associated laboratory quality control
Data Quality Validator (QA/QC Solutions)	James McAteer	jjmcateer@msn.com 503-763-6948 (O)	▪ Perform independent data quality validation of laboratory data from the project laboratories
Data Management and Risk Assessment Support	Chris Waldron, PE	waldronc@uspioneer.com 360-570-1700 (O)	▪ Provide data management support as necessary ▪ Provide risk assessment support as necessary

Health and Safety Plan

Earley Business Center Site
401 E Alexander Avenue
Tacoma, Washington

Prepared by:

PIONEER TECHNOLOGIES CORPORATION

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August 2024

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Revisions to the HASP

This Health and Safety Plan (HASP) is an "evergreen" document (i.e., it will be revised/updated as conditions change). Changes in conditions could range from updating phone numbers to discovering additional constituents of potential concern, underground utilities, and physical or biological hazards. All revisions to the HASP should be documented in the following table. Minor revisions to this HASP (e.g., updating phone numbers) should be made to the text and be documented in the table below. Major revisions to this HASP (e.g., discovering physical or biological hazards) will be added as addenda and documented in the table below.

HASP Revisions

Rev. No.	HASP Section	PM Initials	HSM Initials	SSO Initials	Date	Explanation
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						

SECTION 1: INTRODUCTION

1.1 Site Information

The location of the Earley Business Center Site (EBC; the Site) and the name and contact information for the Site contacts are presented below.

Project Name: **EBC**

Project Address: **401 E Alexander Avenue, Tacoma, Washington**

Title	Name	Phone Number
Client:	Melisa Bod, Port of Tacoma	Office: 253-592-6789 Cell: 503-758-7363
PIONEER Project Manager:	Troy Bussey	Office: 360-570-1700 Cell: 360-810-0640
PIONEER Health and Safety Manager:	Kevin Gallagher	Office: 360-570-1700 Cell: 206-226-3623
Site Contact:	Melisa Bod, Port of Tacoma	Office: 253-592-6789 Cell: 503-758-7363
Site Supervisor/Site Safety Officer:	Joel Hecker or a qualified person designated by the PM	Office: 360-570-1700 Cell: 360-828-3739

1.2 General Information

The purpose of this Health and Safety Plan (HASP) is to present health and safety (H&S) procedures that should be used during investigation field activities at the Site. This HASP was developed in compliance with requirements set forth in 29 Code of Federal Regulations (CFR) 1910.120, Hazardous Waste Operations and Emergency Response (HAZWOPER), Washington Administrative Code (WAC) 296-843-120, and WAC 173-340-810.

This document is for use in conjunction with any applicable work plans, hazard analyses, and any project-specific addendums to this HASP. The PM, Site Supervisor (SS), and Site Safety Officer (SSO) have shared responsibility for implementing and enforcing this HASP. The SSO will evaluate this HASP for continuing adequacy throughout the course of field activities. All proposed revisions to this HASP will be reviewed and approved prior to implementation by the project team and annotated on the revision checklist provided at the beginning of this document.

All participants involved in the project will be briefed on and afforded the opportunity to question this HASP. In addition, all field personnel will sign the HASP Compliance Form provided in Appendix A. Workers will keep a copy of this HASP at the Site for the duration of work activities.[1]

[1] Due to the temporary nature of the work activities and because PIONEER does not have a permanent on-Site storage repository, the HASP and other associated safety records will be maintained in a binder in the field vehicle during the duration of field activities and electronically on PIONEER servers following the completion of field activities.

This HASP (and any future addenda to this HASP) should be used with all applicable work plans, and project safety analyses (PSAs). This document is an "evergreen" document (i.e., it will be revised/updated as conditions change). Changes in conditions could range from updating phone numbers to discovering additional constituents of potential concern, underground utilities, and physical or biological hazards. All revisions to the HASP should be documented in the HASP Revisions table on page vii of this HASP. Minor revisions to this HASP (e.g., updating phone numbers) should be made to the text and be documented in the HASP revisions table. Major revisions to this HASP (e.g., discovering physical or biological hazards) will be added as addenda and documented in the HASP Revisions table.

ATTENTION CONTRACTORS

All contractors are responsible for protecting their employees in accordance the requirements set forth in Occupational Safety and Health Act (OSHA) and all other regulatory requirements.

1.3 Site Description/History

The Site is located at 401 Alexander Avenue in Tacoma, Washington at the end of the Blair-Hylebos Peninsula (see Figures 1 and 2). Approximately 50 acres of the 80-acre property are upland and the remaining 30 acres of the property are intertidal and sub-tidal land in Commencement Bay and the adjacent Blair and Hylebos Waterways.

The Site is situated at the northern end (toward Commencement Bay) of the peninsula between the Blair and Hylebos Waterways. The Blair-Hylebos Peninsula was formed using sandy and silty sediment dredged from the adjacent waterways. The earliest known uses of the Site included a World War (WW) I-era shipyard and sawmill. During WWII, shipbuilding recommenced to support the war effort. Ships were constructed on intertidal shipways while support work occurred in upland areas and on wharfs/piers along the waterways. Between WWII and approximately 1960, when the Port purchased the Site, the wharfs/piers and some of the shipyard's upland facilities were used for ship repair, dismantling, and salvage (Crete and PGG 2016).

After the Port purchased the Site from the Navy in 1960, it was leased to various tenants for commercial and industrial purposes. Known uses have included freight hauling and distribution; furniture manufacturing; fishing fleet outfitting; support drilling services; lumber milling; and vessel mooring, maintenance, decommissioning, and dismantling. Between 1960 and 1984, Zidell Dismantling Company leased a significant portion of the Site for ship scrapping/dismantling and building of barges. The Washington National Guard leased portions of the Site under and near Pier 23 for moorage, vessel maintenance, and training from the mid-1960s until 1995. The United States Army Reserve has leased the same approximate footprint for training and other marine-related purposes since 1995.

The majority of the Site is currently level and paved, with widely spaced buildings. The Site shoreline has variable construction, with the north-central (project north) shoreward edge consisting of a bulkhead, historical shipways, and riprap that abut the intertidal area of Commencement Bay. The eastern and western shorelines are slopes covered in riprap with an operating wharf on the Hylebos.

The work proposed for this Site is being performed as part of Agreed Order DE 9553 with the Washington State Department of Ecology (Ecology). The Agreed Order identifies seven "facilities" and two additional subareas, which were identified during previous Remedial Investigation (RI) activities; these 9 subareas are included in the Site, each due to presumed discrete releases. These subareas include the following (see Figure 2):

- Southwest Debris Layer (SWD) – a 6- to 12-inch layer of hard asphaltic sand and intermixed debris first discovered during storm drain construction in 1998. The debris layer is located across a relatively large area in the project northwestern (true southwestern) portion of the Site.
- Blair Shoreline Soil and Groundwater – the shoreline along the Blair Waterway where sampling occurred in 2006-2008 to characterize upland soil anticipated to be removed for widening of the mouth of the Blair Waterway. The planned removal never took place and the sampled soil remains in place.
- Historical Underground Storage Tanks (USTs) – multiple USTs identified on historical site maps that were installed in the 1940s and 1950s. The UST locations have been the subject of various soil and groundwater investigations. Some USTs were removed in the 1990s and one UST was removed in 2015 as an interim action (IA) under the Agreed Order.
- Pier 23 Soil and Groundwater – residual petroleum and metals impacts to soil and groundwater identified in 2008 following cleanup associated with construction of the Army Reserve Center building in 2003.
- "Zinc Hotspot" near Pier 24 – a small area in the northeastern portion of the Site where groundwater sampling in 2006 and 2008 indicated elevated levels of zinc.
- Sandblast Grit – areas within the Site where sandblast grit associated with ship dismantling and repair activities accumulated on the ground and in storm drains until 1995. The sandblast grit was removed to Ecology's satisfaction in 1995.
- Former AK-WA Giannotti Shipyard – an industrial lease area in the northeast portion of the Site where soil impacted by petroleum hydrocarbons, metals, and polychlorinated biphenyls (PCBs) was discovered and excavated during redevelopment in 1998.
- EP-113 Area – an area with elevated diesel-range petroleum contamination in soil and groundwater identified during general site characterization sampling at location HC08-EP-113, located near the Site entrance from Alexander Avenue. The origin of the diesel-range petroleum is unknown.
- Building 595 – a building in the southeast corner of the Site that Occidental Chemical Company (OCC) investigations identified as potentially having benzene vapor intrusion (VI) issues.

1.4 PIONEER Injury and Illness Prevention Plan and Accident Prevention Plan

PIONEER Technology Corporation's (PIONEER's) Injury and Illness Prevention Plan and Accident Prevention Plan are included as Appendix D to this HASP. PIONEER developed this corporate-wide program for injury, illness, and accident prevention to reflect its commitment to the safety of its employees. The Accident Prevention Plan is mandated by Washington Administrative Code 296-800-140. PIONEER's subcontractors are required to have their own Accident Prevention Plan per applicable state regulations.

SECTION 2: SCOPE OF WORK

This HASP applies to all PIONEER (and PIONEER subcontractor) field activities that will be conducted as part of RI, feasibility study (FS), and IA activities at the Site. PIONEER (and subcontractor) activities may include:

- Mobilizing vehicles, heavy equipment, and facilities
- Performing utility locates and geophysical investigation activities
- Auditing and overseeing field activities
- Advancing soil borings with a drill rig
- Performing field screening (e.g., photoionization detector [PID], x-ray fluorescence) during drilling
- installing monitoring wells with a drill rig
- Developing monitoring wells
- Installing soil vapor probes or soil vapor pins
- Excavating and backfilling test pits
- Collecting soil, groundwater, surface water, sediment, soil gas, indoor air, and/or ambient air samples
- Collecting sediment and/or surface water samples from a boat or using divers
- Decommissioning borings, monitoring wells, and soil vapor probes
- Decontaminating equipment and personnel
- Sampling and managing investigation-derived waste (IDW)
- Transporting wastes for off-site disposal
- Conducting global positioning system (GPS) and other field surveys
- Conducting a pilot-scale treatability study
- Overseeing the Port's Remediation Contractor implementation of the IA design such as (1) removing USTs, (2) removing contaminated soil, groundwater, and debris, (3) backfilling excavations, and (4) reconstructing the shoreline
- Demobilizing from the Site

Current environmental conditions are shown in Figure 3 and Figure 4. Project-specific hazard analysis will be prepared prior to the execution of work through the Project Safety Analysis (PSA) process (see Section 4).

SECTION 3: PROJECT ROLES AND RESPONSIBILITIES

3.1 PIONEER Responsibility

Safety is a core value at PIONEER. Safety is the primary focus for all PIONEER projects and safety is always prioritized over production. PIONEER will continually strive to engage management and employees in identifying and eliminating hazards that may develop during work activities with the goal of avoiding all injuries.

PIONEER will provide a copy of this HASP to each subcontractor in accordance with WAC 173-340-810 to inform them of Site hazards and emergency procedures. All subcontractors are expected to conduct work in accordance with this HASP.

However, PIONEER is not responsible for Remediation Contractor or PIONEER subcontractor employees. Remediation Contractor and PIONEER subcontractors are solely responsible for the safe and healthful performance of all work conducted by each employee and/or support personnel who may enter the Site.

3.2 Personnel Roles and Responsibilities

3.2.1 PIONEER Project Manager

Troy Bussey, PE, LG, LHG

The PIONEER project manager (PM) for RI, FS, and IA work is Troy Bussey. The PM is responsible for overall coordination of Site activities, day-to-day operational safety, and the H&S of all workers. The PM is also responsible for:

- Implementing the HASP throughout field activities.
- Ensuring a hazard analysis (e.g., PSA) is completed in advance of planned field activities.
- Demonstrating a personal commitment to safety at all times.
- Never compromising safety for any reason.
- Ensuring that projects are audited to verify compliance with the project H&S program (field audit procedures and form are included in Appendix B.

3.2.2 PIONEER Health and Safety Manager

Kevin Gallagher MS, CSP

The PIONEER Health and Safety Manager (HSM) for the RI, FS, and IA fieldwork is Kevin Gallagher. The HSM will be consulted on all H&S-related issues that arise in the field including any amendments to or deviations from the HASP. The HSM has final authority on the HASP. The HSM should be consulted when preparing PSAs, Job Safety Analyses (JSAs), and other safety processes. In addition, the HSM will perform site audits and assessments in accordance with PIONEER and Site requirements.

3.2.3 PIONEER Site Supervisor

***Joel Hecker* or a qualified person designated by the PM**

The PIONEER Site Supervisor (SS) for the RI, FS, and IA fieldwork is Joel Hecker. The SS is responsible for overseeing all field-related activities (under the direction of the PM), managing field operations in accordance with project requirements, and resolving H&S issues with the SSO. The SS is expected to (1) be an H&S leader, (2) oversee PIONEER's subcontractors, (3) monitor contract expenditures as necessary, and (4) facilitate the overall success of the projects. The SS may also serve as the SSO based on the nature of field activities.

3.2.4 Site Safety Officer

Joel Hecker or a qualified person designated by the PM and approved by the HSM

The SSO is responsible for the implementing and enforcing the HASP, overseeing the safety of daily operations (if applicable), serving as the Respiratory Protection Program Administrator, and coordinating safety with subcontractors. Specifically, the SSO is responsible for:

- Ensuring that workers are aware of the provisions of this HASP and are instructed in work practices, safety, waste management, and emergency procedures.
- Establishing and maintaining Site work zones.
- Monitoring the work area and worker breathing zone and ensuring workers are complying with pre-established, personal protection levels.
- Evaluating Site conditions (e.g., weather, chemical, physical) and recommending modifications to existing controls and personal protective equipment (PPE).
- Ensuring that daily safety briefings are conducted with assistance from the SS.
- Initiating emergency response procedures, if necessary, and immediately communicating with the PM.
- Exercising stop-work authority if workers are in imminent danger.
- Resolving noncompliance issues with the SS.
- Conducting regular inspections to determine the effectiveness of the HASP.
- Maintaining the SSO log book.
- Ensuring the Respiratory Protection Program is adequate and that workers properly use, clean, inspect, and store respirators.
- Maintaining copies of documents on site (e.g., training, medical, fit test).

3.2.5 Environmental Site Workers

PIONEER's workers (employees and subcontractors) will be identified on a task-specific basis. All workers will be responsible for the following:

- Reviewing and complying with this HASP
- Reviewing the PSA(s) applicable to their scope of work
- Taking all reasonable precautions to prevent injury to themselves and other workers
- Conducting only those tasks that they believe they can do safely
- Using safety equipment, PPE, and other devices and procedures necessary for their protection.
- Reporting all unexpected occurrences (UOs) and/or unsafe conditions to the SSO
- Exercising stop-work authority if workers are in imminent danger

SECTION 4: HAZARD EVALUATION

The processes for identifying hazards, assessing risks, and eliminating/controlling hazards (i.e., PSAs, tailgate briefings, and JSAs) are discussed in this section. Task-specific hazard evaluations will be conducted in accordance with the PSA process in Appendix C; the completed PSA form will be attached to the HASP.

A hazard is any condition in the workplace that can potentially cause occupational injury, death, or disease. Site hazards and risks are addressed using one or more of the control measures listed below (in order of preference):

1. **Elimination**: Physically removing a hazard (the most effective control method)
2. **Substitution**: Replacing something that causes a hazard with something that does not
3. **Engineering Controls**: Isolating workers from hazards (does not eliminate the hazard)
4. **Administrative Controls:** Changing work practices (e.g., adding worker training)
5. **PPE:** Wearing protective equipment (the least effective control method because if the equipment fails, workers are exposed to the hazard).

4.1 Project Safety Analysis

A PSA is required for all field activities and must be conducted before activities are conducted to achieve the following:

- Identify likely hazards associated with the field activities
- Reach consensus as to how eliminate or mitigate hazards
- Ensure work is performed safely in compliance with applicable regulations

The PSA is a process used to identify safety and health hazards in the field, which may be known or anticipated, and the associated control measures that should be implemented. During the PSA, the following should be reviewed:

- Physical hazards
- Chemical hazards
- Process safety hazards
- Non-regulated process and other hazards
- Project staffing and background documentation

The PSA procedures and a copy of the PSA template are included in Appendix C. The SSO will keep a copy of the complete PSA at the Site and will review it with Site workers.

Prior to conducting tasks that require physical labor or mechanical equipment, associated hazards and mitigation measures will be reviewed. If at any time, a task that was not in the PSA is being performed, a review of the hazards associated with that task will be conducted prior to the start of work. Additional hazard assessments will be completed when new substances, processes, procedures, workers, or equipment are brought onto the Site. The time and level of worker involvement in the PSA should be

appropriate to the complexity of the tasks being performed. The additional hazard assessment should be documented in the daily report.

4.2 Tailgate Briefings

Daily safety tailgate briefings will be conducted before each work shift at a location designated by the SSO. A tailgate briefing is a meeting in the field in which workers can discuss the safety aspects of the field activities for that day.[2] During the briefing, planned work tasks and associated hazards are identified, mitigation measures are discussed, and the need to evaluate modifications to the plan as work progresses is reinforced. Tailgate briefing attendance will be documented in the Tailgate Briefing Log, which is included in Appendix A.

4.3 Safety Inspection Procedures

PIONEER is committed to identifying hazardous conditions and practices likely to result in employee injury or illness. Safety inspections will include field audits and walk-around safety inspections as follows:

- In accordance with WAC 296-155-110, walk-around safety inspections will be conducted at the beginning of projects and weekly thereafter (minimum frequency) during site work lasting for more than one week in duration. The Site Supervisor and Remediation Contractor/PIONEER subcontractor representative will complete the weekly walk-around safety inspection and complete the inspection checklist provided in Appendix B.
- In addition, audits will be conducted at least once during site work lasting for more than one week in duration. The auditor will complete the Safety Audit Form in Appendix B to document and verify work is conducted in accordance with the site-specific HASP (see Appendix B). The audit results will be used to eliminate or control obvious hazards.

4.4 Chemical Hazards

The potential hazards that may be encountered on the Site and the procedures used to monitor/reduce these hazards are discussed in the listed in the following sections.

4.4.1 Constituents of Interest

Workers may encounter the following constituents of interest (COIs) (based on historical site investigations) in soil, groundwater, and/or soil gas/indoor air/ambient air at the Site while performing the field activities listed in Section 2.

Soil COIs	Groundwater COIs	Soil Gas / Indoor Air / Ambient Air COIs
Total petroleum hydrocarbons in the gasoline range (TPH-G)	TPH-G	TPH-G
Total petroleum hydrocarbons in the diesel range (TPH-D) and the heavy oil range (TPH-HO)	TPH-D and TPH-HO	TPH-D

[2] Workers who are unavailable for the tailgate briefing will be required to check in with the SSO for a briefing prior to starting work.

Soil COIs	Groundwater COIs	Soil Gas / Indoor Air / Ambient Air COIs
Volatile organic compounds (VOCs) including chlorinated solvents	VOCs including chlorinated solvents	VOCs including chlorinated solvents
Metals (e.g., arsenic, cadmium, chromium, copper, lead, manganese, mercury, nickel, selenium, zinc)	Metals (e.g., arsenic, cadmium, chromium, copper, lead, manganese, mercury, nickel, selenium, zinc)	
Cyanide	Cyanide	
PCBs	PCBs	
Semivolatile organic compounds (SVOCs) including polycyclic aromatic hydrocarbons (PAHs)	SVOCs including PAHs	
Dioxins/Furans	Dioxins/Furans	
Organochlorine Pesticides	Organochlorine Pesticides	

"Sources of soil and groundwater impacts at the Site are related to spills or releases from historical business operations, leaking USTs and associated piping, or the accumulation and placement or reworking of fill/debris. The primary contaminants are metals and petroleum (gasoline, diesel, and oils). PCBs and carcinogenic PAHs are also present. VOCs are also present but are associated with releases from OCC, which is undergoing a separate cleanup process. All known contamination (excluding contamination associated with OCC) are limited to vadose zone soil and the upper 5 to 15 feet of the shallow aquifer based on the distribution of releases, physical characteristics of the contaminants, and modest release quantities" (Ecology 2017).

"Petroleum releases from USTs and associated piping are associated with former shipbuilding operations. Bunker C fuel impacts to soil and groundwater at UST-N-1,2,3,4,25,26 and Pier 23 are associated with known former operations, the steam plant at UST-N-1,2,3,4,25,26 and the AST and fuel line at Pier 23. Diesel fuel impacts to soil and groundwater at Pier 23 and EP-113 have been documented; however, sources for these impacts have not been identified from available information" (Ecology 2017).

Applicable exposure limits, chemical characteristics, primary routes of exposure, and symptoms of exposure to COIs in Site soil and groundwater are presented in Table 1.

4.4.2 Potential Exposure Routes and Risk Mitigation Measures

The primary exposure pathways of concern and the associated risk mitigation measures are discussed in the following sections.

Ingestion of Contaminants

Incidental ingestion of COIs is possible during field activities. The potential for incidental ingestion of COIs will be controlled and minimized as follows:

- Eating, drinking, using tobacco products, chewing gum, and applying lip balm will be prohibited within exclusion zones and contamination reduction zones (see Section 8).
- All workers are required to decontaminate themselves (e.g., hands, exposed skin) prior to leaving exclusion zones and contamination reduction zones (see Section 8).
- Workers are required to wear task-appropriate PPE (see Section 5).

Skin and Eye Contact with Contaminants

Skin and eye contact with some of the Site COIs may cause eye, skin, throat, central nervous system, or mucous membrane irritation/damage. Dermal absorption is possible for some of the COIs via exposed skin and eyes. Potential hazards will be reduced through decontamination and the stipulated use of PPE (see Section 6). The hazard hierarchy (i.e., elimination, substitution, etc.) will also be used to eliminate and/or reduce risks posed to workers. Emergency eyewashes for use in the event of an accidental chemical exposure will be available in the personnel decontamination area.

Inhalation of Contaminants

Inhalation of particulates, dust, and vapors from volatile COIs is possible during work activities. During soil disturbing activities, soils will be wetted as necessary to reduce the potential for inhalation of particulates and dust during soil disturbing activities. During coring of concrete and drilling for sub-slab soil vapor pins (if necessary), concrete will be wetted and a dust mask will be worn. To minimize the potential for worker exposure to vapors from volatile COIs in subsurface soil and groundwater, workers will perform activities upwind of soil disturbing activities. The level of PPE will be assessed and may be upgraded if conditions change and additional controls will be used to limit worker exposure (see Section 5). Air monitoring will be performed to ensure that COI concentrations are below applicable limits and verify that the controls are adequate when performing drilling or other activities (e.g., excavation) that may expose workers to volatiles and/or dust (see Section 6).

Administrative Controls

The following administrative controls will be used to limit exposure to COIs.

- Workers will perform activities upwind of soil disturbing activities;
- Workers will use good personal hygiene including hand washing and personal decontamination;
- Workers will undergo proper task-specific training and hazard assessment;
- Workers considered essential to the field activities being performed are the only workers who will be allowed in the exclusion zones/work areas; and
- Workers will be required to seek medical attention for potential exposures to COI concentrations above action levels and/or PELs (see Section 7).

All PIONEER (and subcontractor) field staff will be 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) trained and have up-to-date certifications (see Section 7).

4.4.3 Safety Data Sheets

The SSO must receive Safety Data Sheets (SDSs) for all materials or products brought onto the Site to accomplish field activities. The SSO must review and approve the SDSs before the products can be used

on the Site. SDSs must be kept on-Site for the duration the products are used at the Site. All hazardous materials must be labeled and stored in accordance with regulatory requirements.

4.5 Physical Hazards

The physical hazards that may be encountered on the Site and the procedures to be used to monitor/reduce these hazards include the following:

4.5.1 Cutting Hazards

Identify all hand safety hazards as part of the job planning process BEFORE starting work. Remember that gloves are a secondary level of defense when it comes to hand safety; the primary way to avoid hand injuries is by proper hand placement and using the right tool for the job. When using any cutting tool, set up your work so that you cut away from your body or anyone else working nearby and pay attention to the location of your free hand when cutting. Workers will use tube cutters when cutting tubing. No glove can eliminate the potential for cuts or punctures; however, cut resistant (minimum cut resistance is ANSI level A3) gloves should be worn to reduce the hazard when handling sharp cutting tools or sharp objects. [3]

4.5.2 Excavation Safety

No workers will enter an excavation greater than four feet deep at any time for any reason (even to conduct sampling or inspections). Rather, samples should be collected from the excavator bucket, from the excavation using of a remote sampling tool, or from the stockpile/storage container. Excavation safety procedures apply whenever excavations are six inches or deeper. Safety procedures are presented in Appendix E. As part of these procedures, an Excavation Safety Checklist must be completed prior to excavation and a Daily Excavation Inspection Report must be completed for excavations left open (see forms in Appendix E).

Underground utilities include electric lines, communication lines, pipelines, sewer lines, etc., that are buried below the surface. Underground Service Alert (i.e. USA, 811) must be notified before intrusive work is conducted and utilities must be located before intrusive activities begin. The SSO is responsible for completing an underground obstruction evaluation and verifying that the appropriate method(s) of identifying underground utilities are implemented prior to initiating all subsurface work. The PM is responsible for ensuring that underground obstruction evaluations are in the project budget and are implemented. If an underground obstruction evaluation is deemed unnecessary, the PM is responsible for obtaining a variance. See the Underground Obstruction Evaluation SOP (Appendix E) for procedure methodology and information regarding underground hazards.

[3] Although not anticipated, gloves with a Cut resistance levels of ANSI A4 and above will be used in applications when the risk of cuts and lacerations is high.

4.5.3 Drum Handling

Do not attempt to move full drums by hand. Set drums in final location prior to filling them or partially fill drums to reduce weight when possible. Get help when moving drums. Use a drum cart or fork lift with a drum grappler or other mechanical lifting device, if possible. Wear gloves and pay close attention to the positions of hands and feet.

4.5.4 Portable Electrical Equipment

Portable electrical tools and equipment should only be plugged into electrical circuits protected by a properly-functioning ground fault circuit interrupter (GFCI). All electrical cords and extension cords should be inspected prior to use. Tools with damaged or defective cords should not be used. Do not overload plugs.

4.5.5 Underground Utilities and Subsurface Activities

Underground utilities include electric lines, communication lines, pipelines, sewer lines, etc., that are buried below the surface. Underground Service Alert (i.e. USA, 811) must be notified before intrusive work is conducted and utilities must be located before intrusive activities begin. The SS is responsible for completing an underground obstruction evaluation and verifying that the appropriate method(s) of identifying underground utilities are implemented prior to initiating all subsurface work. Both private and public utility locates will be completed, including a ground penetrating radar survey. A search for tension cables and/or pipes will be completed prior to coring/cutting through concrete. The PM is responsible for ensuring that underground obstruction evaluations are in the project budget and are implemented. If an underground obstruction evaluation is deemed unnecessary, the PM is responsible for obtaining a variance.

4.5.6 Exertion/Strains and Sprains

See Section 4.5.11 (Materials Handling).

4.5.7 Fire/Explosion

Fueling of gas- or diesel-powered equipment (e.g., generator, pressure washer, or drill rig) should be performed only after the equipment has cooled down. Generators and portable gas tanks should be removed from the bed of the truck prior to fueling. Portable gas tanks will be stored outside the exclusion zones at all times. An appropriately-sized spill kit will be provided by the Remediation Contractor/PIONEER subcontractor and readily accessible. Grounding techniques will be used during transfer of fuel and/or other flammable liquids. Type A/B/C fire extinguishers will be located at several locations in the work area. Because workers are not trained firefighters, never attempt to extinguish a fire under the following conditions and evacuate the area immediately:

- You don't know what's burning.
- The fire appears to be too large to handle with one extinguisher.
- The fire is spreading rapidly beyond the spot where it started.
- An adequate or appropriate fire extinguisher is unavailable.

- You might inhale toxic smoke.
- Your instincts tell you not to.

Avoid driving through tall grass in any vehicle. If driving through tall grass is absolutely necessary, get out of vehicle and inspect the undercarriage to confirm that no flammable materials are stuck against a heat source.

4.5.8 Heat Stress/Cold Stress

The SSO will inform all workers of anticipated weather conditions (e.g., weather forecasts) and associated concerns during tailgate meetings each day. The SSO will monitor changing weather conditions during the workday and is responsible for implementing changes, if needed. All workers should be trained on symptoms and prevention of heat and cold stress. During cold weather, wear layered clothing, and gloves/hats, as necessary. During wet weather, use rain gear and have a change of clothing available. During hot weather, try to schedule work (especially work involving non-breathable PPE) during the cooler times of the day, take regularly scheduled breaks, keep water and fluids available at all times, and drink water/fluids regularly (i.e., at least 1 quart per hour) to prevent dehydration. To prevent sunburn, apply sunscreen of SPF 30 or greater, and/or keep skin covered as much as possible. A shaded area will be provided as close as practicable to the work area whenever temperatures exceed 80°F or upon worker request.

During hot weather, the SSO will implement and document work/rest cycles. Use the buddy system and let other workers know if they are exhibiting signs of heat or cold stress. In addition, the SSO will monitor workers for signs of heat and cold stress as discussed in Section 6.3. Be aware that the use of PPE increases the potential for heat stress because it reduces evaporative cooling.

The following controls will be implemented by the SSO when outdoor temperatures are forecasted and/or exceed 80°F:

- Encourage and allow workers to take preventative cool-down rest periods;
- Provide shade, or other sufficient means for cooling down;
- Provide cool drinking water (at least a quart per hour); and
- Close observation for employees not acclimatized to the heat.

At or above 90°F, a 10-minute cool-down rest period every two hours and close observation to help identify employees showing signs and symptoms of heat-related illness.

At or above 100°F, the cool-down rest periods must be 15 minutes every hour.

4.5.9 Drill Rig

All operators must be qualified and certified to operate the drill rig. All drill rigs will be inspected prior to arrival on site and then daily throughout the project. Backup alarms must be operable on all equipment. High visibility vests, a hard hat, safety glasses with side shields, and steel-toed boots are required for anyone in close proximity of machinery (i.e., spotter). Drilling safety procedures are included as Appendix F.

4.5.10 Heavy Equipment

Consult and follow the procedures presented in the earth-moving equipment procedures SOP which is included as Appendix E. Minimize pedestrian exposure to heavy equipment by restricting access to non-essential personnel in areas where heavy equipment is being used. Always make eye contact with equipment operators prior to walking or placing yourself in the path of equipment operations. Never use cell phones while walking around working equipment. Workers should always devote their full attention to operating equipment. Backup alarms must be operable on all equipment. In addition, all operators of earth-moving equipment must be qualified, and operators will inspect all earth-moving equipment prior to first use and quarterly thereafter and the SSO will review the inspection form (see Earth-Moving Equipment Inspection form in Appendix A).

4.5.11 Rigging and Suspended Loads

All tasks resulting in suspended loads, such as the placement or movement of equipment will require preplanning and equipment inspection. Inspect all equipment prior to use. Verify that rigging equipment is approved for lifting, and that the rated capacity of the slings, wire rope, or chains is not exceeded for the load and the load angle. All rigging equipment must have permanently affixed durable identification stating the rated capacity. Hooks, links, or other attachments must have at least an equal rating. No makeshift links or fasteners are allowed. Verify a clear pathway when materials are moved, and check for overhead lines and other obstructions. Never allow personnel under a suspended load. Barricade work area to prevent unauthorized access.

4.5.12 Lone Worker

Workers should use of the buddy system or have a means of communication (e.g., cell phones, two-way radios, satellite phones) available to keep in contact with other workers and for emergency purposes (see Section 8.2 for additional lone worker procedures).

4.5.13 Materials Handling

Use proper lifting techniques when handling heavy materials. Ask for assistance or use hand trucks or carts as needed. A physically fit worker may lift a maximum of 50 pounds (35 pounds for repetitive tasks) under ideal conditions (i.e., no reaching or overextension). A team or mechanical equipment should be used to lift anything over 50 pounds. Teams should not manually lift more than 80 pounds. Avoid repetitive motions. Alternate workers if repetitive activities involving bending, reaching, or forceful motions are required.

Use the following proper lifting techniques when handling materials:

- Get a good footing
- Place feet shoulder width apart
- Bend knees to pick up load (do not bend from waist).
- Keep back straight
- Get a firm hold on the load

- Grasp opposite corners of the load, if possible
- Keep back as upright as possible and lift gradually by straightening the load
- Do not jerk the load and keep the weight as close to the body as possible
- When changing direction, turn the entire body, including the feet and do not twist the body
- Plan the lifting job ahead of time to balance and evenly distribute the load
- Wear gloves

4.5.14 Noise

Potential sources of noise will be identified prior to the start of field activities during the Project Safety Analysis (PSA). Workers should wear approved hearing protection when (1) working around equipment that produces sound levels at or above 85 decibels and (2) voices must be raised to be heard at a distance of three feet or less. All hearing protection must have a noise reduction rating that adequately reduces noise to below the PEL of 85 decibels based on an 8-hour time weighted average. Noise exposure, taking into account noise reduction from hearing protection, can be determined using the following formula:

Estimated Exposure (decibels) = Time Weighted Average (decibels) – (Noise Reduction Rating – 7 decibels)

4.5.15 Overhead Hazards

Before field activities start, all work areas and haul routes will be evaluated to identify any overhead obstructions (OHOs). OHOs include electrical and communications lines, piping, bridges, and crosswalks. Drill rigs and/or heavy equipment (e.g., excavators) will remain a safe distance (minimum of 20 feet) from any OHOs. All work areas will be cleared of unnecessary overhead hazards to the extent feasible. If field activities will be performed adjacent to OHOs, an OHO work plan must be developed.

4.5.16 Pinch Points

Pinch points include vehicle doors and tailgates, heavy equipment components, drill rig components, and hand tools. To reduce pinch point hazards, workers should be aware of limb or body position when near moving equipment. Appropriate hand protection should be worn to protect hands.

4.5.17 Portable Generator

A portable generator should be used only when necessary, and only to power essential equipment or appliances. When using a portable generator, use caution and the buddy system when unloading and loading the generator onto a vehicle. Be aware of pinch points. Do not operate the generator in a vehicle or in an enclosed space. Generators can produce high levels of carbon monoxide very quickly, which can be deadly. Portable generator-powered electrical circuits should be protected by a GFCI to help prevent electrocutions and electrical shock injuries. Do not overload the generator.

Make sure fuel for the generator is stored safely, in properly labeled containers, and away from fuel-burning appliances. Before re-fueling, turn the generator off and let it cool down. Make sure extension

cords used with generators are rated for the load, are free of cuts and worn insulation, and have three-pronged plugs.

4.5.18 Pressure Washing

Only low-pressure pressure washers (i.e., less than 3000 pounds per square inch, and with a wand length of at least 42 inches) should be used at the Site during field activities. When using the pressure washer, both hands must be on the control gun while in use. No portion of the body should ever be placed in front of the water jet. Never pass the control gun to another operator or place the control gun on the ground without disengaging the water spray.

4.5.19 Slip/Trip/Fall

To avoid slips/trips/falls, keep work areas free and clear of obstacles. Check work areas for potential slip/trip hazards and remove or mark these areas prior to starting field activities. Wear sturdy shoes/boots with adequate tread and rubber boots/boot covers for wet or slippery conditions. Maintain the work areas and equipment to minimize hazards. Use good housekeeping practices to prevent slip/trip/fall hazards. Place tools out of the way when not in use. Use caution when walking to prevent slip/trip/fall hazards caused by terrain. Use hand rails when walking down steps and use three points of contact when entering/existing equipment. Do not use a cell phone while walking.

4.5.20 Tools and Equipment

Inspect all hand tools before using to determine if they are the proper size, are in good condition, and are free of oil or grease. Use tools for the purpose for which they are designed (i.e., use the correct tool for the job).

4.5.21 Terrain

The Site terrain can be uneven in places. Be aware of any uneven ground and use walking paths when available. Be careful walking off roadways and walking paths. The Site will be cleared and leveled as necessary to accommodate equipment and supplies and provide a safe work environment.

4.5.22 Portable Electrical Equipment

Portable electrical tools and equipment should only be plugged into electrical circuits protected by a properly-functioning ground fault circuit interrupter (GFCI). All electrical cords and extension cords should be inspected prior to use. Tools with damaged or defective cords should not be used. Do not overload plugs.

4.5.23 Vehicle/Truck Traffic

Barricades, traffic cones, or other appropriate measures will be used at the Site to control vehicle traffic during field activities. All workers should remain alert of traffic while at the Site. Spotters will be used to backup trucks and equipment. Workers should wear high visibility vests at all times. Emergency flashers should be used when parking on the road shoulder.

4.5.24 Weather Hazards

Weather hazards at the Site may include torrential rain, lightning, flooding, excessive cold, heat stress, snow, or high winds. The SSO is responsible for being up-to-date on anticipated weather conditions and preparing workers. In the event of lighting or thunder, seek shelter in vehicles or other locations. Do not resume field activities for 30 minutes after lightning or thunder is seen or heard.

4.5.25 Working from Boats or Adjacent to Water

A variety of hazards are associated with working from a boat including the potential for falling overboard and drowning. A Boat Float and Rescue Plan will be prepared for each activity that involves riding on a boat operated by others (see Appendix G). Only trained professionals will operate boats or perform diving activities in accordance with separate HASP and policies/procedures.

The following procedures will be employed while working on boats to reduce the potential for falling overboard:

- Only certified and properly trained boat operators will operate boats;
- All boat safety equipment as specified in the SOP for Working from Boats must be present (see Appendix G);
- Watch footing while entering and exiting boats at the marina;
- Carefully balance and plan slow movements on the boat;
- No standing while the boat is under power;
- Avoid carrying or doing too much at once;
- Personal flotation devices that are U.S. Coast Guard approved (Type I, II, III, or IV) must be worn by each person on the boat at all times, even when entering and exiting boat;
- Avoid leaning body over the edge of boat; and
- Have a ring buoy with excess line available for rescue.

4.6 Biological Hazards

A variety of biological hazards such as those listed in this section could be present at the Site. Procedures to be used to monitor/reduce these biological hazards include the following:

4.6.1 Ticks

Ticks may be present at the Site. Use tick repellant and check your skin and clothing for ticks. Workers should perform a tick inspection at the end of the work day. If a tick is embedded (physically attached), report the incident to the SSO.

4.6.2 Poisonous Spiders

Poisonous spiders may be present at the Site. Workers should be able to recognize all poisonous spiders in the area (e.g., black widows). Use caution and gloves, especially when moving materials that have been stacked. Seek immediate medical attention if bit by a spider.

4.6.3 Rabid Animals

Avoid any animal acting in an uncharacteristic manner, particularly skunks, feral dogs and cats, coyotes, and raccoons. If bitten by any animal, report the incident to the SSO and transport the individual to the hospital immediately.

4.6.4 Mosquitoes

Mosquitoes may be present at the Site and may be carriers of malaria, yellow fever, encephalitis, West Nile Fever, and other diseases. Wear mosquito repellant as necessary, especially on areas not protected by clothing. Be aware of the mosquito-borne illnesses in the area.

4.6.5 Stinging Insects

If stung by a bee, carefully remove the stinger by gently scraping with a fingernail (do not squeeze). Wash the area with soapy water and apply a cold (ice) compress to decrease the absorption and spreading of the venom. If excessive swelling or redness appears, seek immediate medical attention. Allergic reactions to bee stings can be life threatening; therefore, be aware of workers who may be allergic to bees prior to field activities. All workers are encouraged to document medical conditions that be affected by work activities in the HASP Compliance Agreement and Field Emergency form in Appendix A.

4.6.6 Blood-borne Pathogens

Assume all blood and bodily fluids are infectious. Follow universal precautions whenever the potential exists for contact with blood or other bodily fluids. At a minimum, all workers should wear gloves if they are performing procedures in which human blood or other bodily fluids may be handled or contacted. All workers should wear masks and eye protection devices when splashes, splatters, droplets of blood or other potentially infectious materials can reasonably be anticipated to come in contact with a worker's eye, nose or mouth. Anyone assisting with blood or other bodily fluid issues should have a current first aid training certification.

SECTION 5: PERSONAL PROTECTIVE EQUIPMENT

5.1 Definition of Project-Specific PPE Levels

The levels of protection for tasks are defined as follows:

- Level A and B are not authorized without PM, HSM, and client approval and a HASP addendum.
- Level C:
  - Full-face respirator with organic vapor cartridge and high-efficiency particulate arrestance (HEPA) filter dust cartridge (respirator cartridges will be replaced daily after use)
  - Coveralls:
    - Minimum protection level of Tyvek® (or equivalent) if no splash hazards are present; or
    - Minimum protection level of TyChem® QC if there is potential for exposure to contaminated liquids.
  - High-visibility vest or shirt or equivalent
  - Steel-toed boots or steel-toed chemical-resistant boots if walking in wet, potentially-contaminated media (e.g., drilling mud or contaminated soils)
  - Hard hat
  - Thin-mil (e.g., 4-mil) Nitrile undergloves, and leather overgloves when mechanical protection is needed
  - Hearing protection as appropriate
- Modified Level D:
  - Safety glasses with side shields, and face shield when pressure washing
  - Coveralls:
    - Minimum protection level of Tyvek® (or equivalent) if no splash hazards are present; or
    - Minimum protection level of TyChem® QC if there is potential for exposure to contaminated liquids.
  - High-visibility vest or shirt or equivalent
  - Steel-toed boots or steel-toed chemical-resistant boots if walking in wet, potentially-contaminated media (e.g., drilling mud or contaminated soils)
  - Hardhat
  - Thin-mil (e.g., 4-mil) Nitrile or latex undergloves, leather overgloves when mechanical protection is needed, and thicker Nitrile overgloves ($\geq$ 8 mil) when pressure washing.
  - Hearing protection as appropriate
- Level D:
  - Safety glasses with side shields
  - Work clothing including pants and long-sleeve shirts
  - High-visibility vest or shirt or equivalent

- Steel-toed boots or steel-toed chemical-resistant boots if walking in wet, potentially-contaminated media (e.g., drilling mud or contaminated soils)
- Hardhat
- Thin-mil (e.g., 4-mil) Nitrile undergloves, and leather overgloves when mechanical protection is needed
- Hearing protection as appropriate

5.2 Task-Specific Personal Protection Levels

Each task will be initiated using the personal protection level(s) discussed below, or as modified during the PSA process (see Appendix C). The levels of PPE were selected by evaluating the potential hazards, the performance characteristics of the PPE, and the nature of field activities. An upgrade or downgrade to the specified level of protection will be based on constituent concentrations. The PM and HSM must approve any changes or adjustments to these personal protection levels.

If a significant COI concentration is suspected or detected above exposure criteria (see Table 1) or action levels (see Section 6), then the team must stop work, consult with the HSM, and reevaluate the hazard assessment, hazard controls, and PPE selection. In this situation, the HSM may require the hazard assessment be revised, and a project-specific HASP addendum be prepared to address the COI(s) and/or TEL, which may trigger an upgraded level of PPE.

Subsurface investigation and excavation activities proximate to historical OCC operations and releases (e.g., N-6 UST, Building 595 [see Figure 2]) will require the use of respirators (Level C PPE) due to elevated levels of chlorinated solvents in shallow groundwater. Chlorinated solvents have migrated on to the Site from the east-adjoining OCC site. For instance, tetrachloroethylene, trichloroethylene, and vinyl chloride concentrations in groundwater near Building 595 range up to 73,000 ug/L, 2,900 ug/L, and 1,200 ug/L, respectively (Crete and PGG. 2016).

Level D (at a minimum) will be the minimum PPE level for all work conducted at other areas of the Site. Modified Level D will be worn if there is a potential to contact potentially contaminated materials (e.g., splash hazards).

SECTION 6: WORKER MONITORING

6.1 Air Monitoring

6.1.1 Real-time Air Monitoring

Real-time vapor monitoring for volatile organic constituents (VOCs) will be performed during intrusive activities (e.g., soil boring, monitoring well installation) using a PID. The need for additional vapor monitoring will be evaluated during the pre-planning phases of projects (e.g., PSAs) and continually as conditions change. At a minimum, real-time vapor monitoring should be conducted using a PID equipped with a 10.6 eV lamp. If concentrations in the worker breathing zone exceeding the vapor action level (0.47 parts per million [ppm]; see Table 2) are detected, workers will stop work and reassess.

As stated in Section 5.2, subsurface investigation and excavation activities proximate to historical OCC operations and releases will require the use of respirators due to elevated levels of chlorinated solvents in shallow groundwater. Level C PPE will be used in other areas of the Site if airborne VOC concentrations in the breathing zone measured by the PID are equal to or greater than 0.47 ppm for a sustained period of greater than or equal to 15 minutes. In addition, the level of PPE may need to be upgraded to Level C if there are other indications of exposure (e.g., irritation, odor).

Maximum use VOC concentrations for level C PPE are determined for individual constituents as follows:

Maximum Use Concentration for Level C PPE (PPM) = PEL (ppm) x PID Response Correction Factor x 50 (Assigned protection factor for a full face respirator)

If maximum use VOC concentrations for level C PPE are exceeded, work will be stopped. Work will only commence following an exposure assessment demonstrating that exposure to workers are below acceptable levels and/or after upgrading to Level B or Level A PPE. Note that an upgrade to Level B or Level A will require an update to this HASP.

All monitoring equipment including PIDs will be calibrated prior to the first use each day in accordance with the manufacturer's instructions. Calibration date and results (e.g., calibration gas/flow rates) will be documented in the field log book and/or air monitoring data sheets. In addition, the procedures specified in the PID Standard Operating Procedures should be followed (PIONEER 2020).

Dust/Particulate Sampling

Minimal dust is expected to be generated during investigation activities based on existing exposure barriers (e.g., gravel, asphalt, and concrete) throughout the Site, and (2) the nature of investigation activities (e.g., subsurface soils encountered during drilling are usually at least moist). Prior to coring concrete, the surface will be wetted to eliminate any dust hazards. To the extent feasible, activities and workers will be positioned upwind of dust generating activities. Therefore, real-time dust/particulate

monitoring will not be performed for investigation activities. However, dust monitoring may be performed during to-be-determined IA activities.

6.2 Noise Monitoring

Noise monitoring is not required for this project. Noise levels are anticipated to be less than the OSHA action level of 85 decibels measured on the A scale (dBA) as a time weighted average for an 8-hour workday during project activities.

Hearing protection is required in any area where workers must raise their voices to communicate at a distance of three feet or less and any area where hearing protection is mandatory. In addition, hearing protection is required for activities with the potential to expose workers to noise in excess of the PEL (85 dBA). At a minimum, workers should wear hearing protection if near or operating heavy equipment. Potential noise sources and additional controls (if needed) should be identified during the PSA (i.e., prior to the start of field activities).

6.3 Heat/Cold Stress Monitoring

The SSO is responsible for monitoring heat and cold stress based on the forecasted weather for the day and actual conditions during the workday. The SSO will periodically monitor for physiological signs and symptoms of heat and cold stress during each workday and behavioral changes (e.g., disorientation and confusion or an unusual level of irritability). Based on the weather conditions and the results of heat and cold stress monitoring, the SSO will implement corrective action as necessary. In addition, the SSO will train workers how to identify signs and symptoms of heat and cold-related illnesses and empower workers to request work breaks (or other preventative measures) as conditions warrant. The SSO will qualitatively document the monitoring results in their field notes.

The following controls will be implemented by the SSO when outdoor temperatures are forecasted and/or exceed 80°F:

- Encourage and allow workers to take preventative cool-down rest periods;
- Provide shade, or other sufficient means for cooling down;
- Provide cool drinking water (at least a quart per hour); and
- Close observation for employees not acclimatized to the heat.

At or above 90°F, a 10-minute cool-down rest period every two hours and close observation to help identify employees showing signs and symptoms of heat-related illness.

At or above 100°F, the cool-down rest periods must be 15 minutes every hour.

6.4 Monitoring Equipment

PIDs equipped with 10.6 eV lamps will be used to collect real-time vapor levels during intrusive work activities (e.g., soil boring and monitoring well installation). All monitoring equipment will be calibrated and used in accordance with manufacturer recommendations. Personnel will be instructed on how to operate monitoring equipment prior to use.

SECTION 7: WORKER TRAINING AND MEDICAL SURVEILLANCE

All personnel involved in field activities will be required to participate in a health and safety training program that complies with criteria set forth by WISHA in accordance with WAC 296-843-200 and OSHA in 29 CFR Part 1910.120(e) (HAZWOPER). The H&S training program components are presented in this section.

7.1 HAZWOPER and Pre-Assignment Training

Prior to arrival on Site, PIONEER will confirm that all workers meet the applicable Hazardous Waste Operations and Emergency Response (HAZWOPER) training requirements, which include:

- 40-hour initial training
- 8-hour annual refresher
- 3 days of documented field experience under a qualified supervisor

All workers who use respirators are required to meet the following requirements:

- A pre-assignment physical examination in which it is documented that the worker is capable of wearing respiratory protection.
- A documented respirator fit test

7.2 Site Supervisor Training

Consistent with WAC 296-843-200, workers designated as SSs and SSOs require an additional eight hours of specialized management training (Certified HAZWOPER Supervisor) prior to arrival on Site.

7.3 Site Safety Officer Training

All SSOs must be knowledgeable in WISHA general industry and construction standards, and the contents of this HASP. In addition, individuals designated as SSO must have current certification (minimum of every three years) in First Aid and cardio pulmonary resuscitation (CPR).

7.4 Site Training

A site safety orientation, as well as HASP and JSA reviews, is required for all personnel performing work at the site. This training will be performed prior to commencing any work and will address hazards present at the site. Hazards that could be encountered will be discussed and reviewed at the site orientation and daily safety meeting.

7.5 Daily Briefings

Daily briefings will be conducted before each work shift by the SS and/or SSO at a location designated by the SSO. All workers will be required to attend this briefing in order to participate in field activities for

that day.[4] Attendance at the briefing will be documented in the Daily Work Permit form included in Appendix A.

7.6 Visitor Procedures

All Site visitors will be escorted onto the Site and will be required to review and comply with the provisions of this HASP. In addition, visitors will sign in and out of the Site logbook. Only visitors who meet the training and medical monitoring HAZWOPER requirements of 29 CFR 1910.120 will be allowed to enter exclusion zones or contamination reduction zones.

7.7 Medical Surveillance

Medical surveillance is required by WAC 296-155-17327 if one of the following situations occur:

- A worker is exposed to a hazardous substance at a concentration greater than a PEL for 30 or more days a year;
- A worker is subject to dermal exposure to methylenedianiline (MDA) for 15 or more days per year;
- A worker is exposed in an emergency situation;
- A worker whom the employer, based on results from compliance with WAC 296-155-17311(8) has reason to believe are being dermally exposed; or
- A worker is injured, becomes ill, or develops signs or symptoms from likely overexposure to hazardous substances.

Although not anticipated, if PIONEER and PIONEER subcontractors trigger the aforementioned medical surveillance requirements during field activities, a medical surveillance program will be implemented in accordance with WAC 296-155-17327. If a medical surveillance program becomes necessary for workers, each contractor will take responsibility for implementing the necessary medical surveillance program for their employees and will provide a medical clearance letter as requested.

7.7.1 Initial Medical Surveillance

Initial medical surveillance is available to employees who are occupationally exposed to any constituent at or above the action level. Initial medical surveillance is required for all non-temporary workers who are or may be occupationally exposed to COIs above action levels or PELs based on a TWA for more than 30 days in any consecutive 12 months. Work activities are not anticipated to exceed PELs. At a minimum, initial medical surveillance consists of a medical examination and shall include the following:

- A standard posterior-anterior chest x-ray;
- A nasal and skin examination; and
- Other examinations which the physician believes appropriate because of the employee exposure to inorganic arsenic or because of required respirator use.

[4] Workers who are unavailable for the initial tailgate briefing will be required to check-in with the SSO for a briefing prior to starting field activities.

A written opinion from the examining physician will be obtained. In accordance with 29 CFR Part 1910.1018(n) and WAC 296-155-17621, the opinion will include:

- The results of the medical examination;
- The physician's opinion as to whether the employee has any detected medical conditions which would place the employee at increased risk of material impairment of the employee's health from exposure to inorganic arsenic (or lead);
- Recommended limitations for an employee's potential exposure to lead or arsenic or use of PPE such as respirators; and
- A statement that that the employee has been informed by the physician of the results of the medical examination and any medical conditions which require further explanation or treatment.

The employer will instruct the physician to avoid revealing specific findings or diagnoses unrelated to occupational exposure in the written opinion.

7.7.2 Follow-up Medical Surveillance

Additional biological sampling will be performed every six months for workers who are occupationally exposed to any COI above action levels for more than 30 days per year. Medical examinations and additional biological sampling will be available at an increased frequency for any employee under the following situations:

- The employee exhibits signs or symptoms commonly associated with arsenic intoxication;
- The employee has demonstrated difficulty in breathing during a respirator fit test or use;
- The employee is pregnant; or
- The employee has requested medical advice concerning the effects of current or past exposure and the employee's ability to procreate a healthy child.

7.7.3 Medical Removal Protection

Medical removal protection (MRP) involves the temporary removal of an employee from a worksite due to a physician's opinion, to a place of significantly lower exposure without loss of earnings or seniority or other employment rights or benefits.

An employee is included in the MRP program when a medical determination indicates a medical condition that places the employee at "increased risk of material impairment to health" due to constituent exposure.

An employee removed from work because of a physician's recommendation may return to their former job status when the physician indicates it is safe to do so.

SECTION 8: SITE CONTROL AND ILLUMINATION

8.1 Site Control Measures

Site control measures include the following:

- As appropriate, the Site will have two zones where there is potential for exposure to Site-related chemicals and physical hazards, and where entrance is restricted: exclusion zones (hot) and contamination reduction zones (warm). The location of the exclusion and contamination reduction zones will vary during the project as investigation and remediation progresses. Zones will be clearly delineated using tape, barriers, fences, signs, or by other means appropriate for the Site.
- Workers will enter and exit exclusion zones only through contamination reduction zones. Decontamination will occur in designated areas and must occur prior to exiting contamination reduction zones.
- Only authorized workers at the discretion of the SS will be allowed to enter exclusion zones and contamination reduction zones.
- The SSO will draw a sketch of the work zones in the SSO logbook, and establish communication devices and protocols prior to beginning field activities.
- Appropriate containers will be used to temporarily store contaminated clothing and PPE. The SSO will ensure that waste containers are clearly dated and that the contents are identified and managed.
- In event of an emergency, the SSO will alert all workers to leave exclusion zone and wait for further instructions.

8.2 Lone Worker

A Lone Worker is defined as one whose assigned task will take him/her out of both direct visual and verbal contact with other workers. Working alone at the Site will be minimized to the extent feasible. Workers will use of the buddy system or have a way to communicate with others (i.e., cell phones, two-way radios, satellite phones) for emergency purposes while in the field. If working alone is necessary, an alternate method of maintaining contact with others must be used. If working alone is necessary, the following applies:

- Arrangements will be stated in a written plan (e.g., PSA, tailgate briefing log).
- The degree of contact required with a lone worker is directly proportional to the degree of hazard to which the worker is exposed.
- Contact may include contractors, security, or the SS. Contact will occur at intervals agreed upon in the written plan prior to the field activity.
- Workers selected for potential lone worker field activities will be competent to carry out tasks independently. The SS will involve the PM in decisions regarding whether or not the worker selected has sufficient training for and familiarity with the assignment to be able to perform the field activity with minimal guidance or oversight.

8.3 Illumination

Field activities will be performed during daylight hours only. Adequate artificial lighting will be provided as necessary for all outdoor and indoor activities.

SECTION 9: DECONTAMINATION

9.1 Worker Decontamination Procedures

Worker decontamination procedures include the following, as applicable, in the order presented:

1. Equipment drop
2. Boot wash
3. Boot rinse
4. Outer glove wash
5. Outer glove rinse
6. Boot removal
7. Outer glove removal
8. Suit removal
9. Respirator removal
10. Inner glove removal (if wearing)

When project requirements necessitate deviations from the listed steps, deviations will be noted in the field logbook. Worker decontamination will occur in contamination reduction zones.

9.2 Sampling Equipment Decontamination Procedures

Sampling equipment must be decontaminated before exiting exclusion zones and contamination reduction zones, prior to and following sample collection, and as needed to ensure good hygiene. The following steps should be used to decontaminate sampling equipment:

1. Brush equipment in a container or bucket containing a non-phosphate detergent and tap water solution;
2. Rinse equipment with tap water;
3. Give equipment a second rinse with tap water; and
4. Allow to air dry.

Water produced while decontaminating the sampling equipment should be containerized and handled, characterized, and disposed of in accordance with all applicable waste management regulations.

9.3 Heavy Equipment Decontamination Procedures

The effected portions of heavy equipment that will be re-used from location to location and could potentially be contaminated (e.g., drill rig components) must be decontaminated before exiting exclusion zones and contamination reduction zones. Procedures to decontaminate heavy equipment will include the following:

1. Brush the equipment to remove all visible soil; and
2. If needed, pressure wash the equipment until all visible soil or dust is removed. The pressure washer must have a 42-inch wand (minimum) and cannot generate a pressure more than 3,000 pounds per square inch.

Water produced from heavy equipment decontamination will be containerized and handled, characterized, and disposed of in accordance with all applicable waste management regulations.

9.4 Respirator Cleaning and Storing Procedures

Respirators are anticipated to be used for subsurface activities proximate to historical OCC operations and releases in this project. Workers will only use their own respirators. Each worker will be responsible for inspecting his/her respirator prior to use and cleaning the respirator after use. Respirators will be field cleaned in contamination reduction zones after each use. Respirator cleaning shall include the following:

1. Remove and discard used filters, cartridges, or any components recommended by the manufacturer.
2. Wash components in warm (43°C [110°F] maximum) water with a mild detergent or with a cleaner recommended by the manufacturer.
    a. A stiff bristle (not wire) brush may be used to help remove the dirt.
    b. If the detergent or cleaner does not contain a disinfecting agent, respirator components should be immersed for two minutes in one of the following:
        i. A bleach solution (concentration of 50 parts per million of chlorine). The bleach solution can be made by adding approximately one milliliter of laundry bleach to one liter of water at 43°C (110°F)
        ii. Other commercially available cleansers of equivalent disinfectant quality when used as directed, if their use is recommended or approved by the respirator manufacturer
3. Rinse components thoroughly in clean, warm (43°C [110°F] maximum), preferably, running water.

    *** The importance of thorough rinsing cannot be overemphasized. Detergents or disinfectants that dry on face pieces could cause dermatitis. In addition, some disinfectants may cause deterioration of rubber or corrosion of metal parts if not completely removed.*
4. Drain components.
5. Air-dry components or hand dry components with a clean, lint-free cloth.
6. Reassemble the face piece components.
7. Test the respirator to make sure all components work properly (conduct the seal checks).

The water produced from cleaning respirators will be containerized and handled, characterized, and disposed of in accordance with all applicable waste management regulations and procedures.

When not in use, respirators should be stored so they are protected from contamination (e.g., dust or damaging chemicals) and the following:

- Deformation of the face piece or exhalation valve;
- Sunlight or extreme temperatures; and
- Excessive moisture.

The SSO will periodically inspect respirators to verify that they are being properly cleaned and stored.

SECTION 10: SANITATION

Sanitation facilities will be provided as discussed below. The highest number of workers (PIONEER and contractors) anticipated on the Site at any time is 10.

10.1 Potable Water

☒ Provided by Site ☒ Provided by PIONEER ☒ Provided by Contractor

All potable drinking water will be clearly marked, kept tightly closed when not in use. PIONEER, PIONEER subcontractor, and/or the Remediation Contractor will provide workers with ample cool potable water in the field. Provisions will be made for sanitary storage and proper disposal of drinking vessels. The Site may be able to supply potable water for select remediation and decontamination activities.

10.2 Toilet Facilities

☒ Provided by Site ☒ Provided by PIONEER ☒ Provided by Contractor

The Site currently has at least one outdoor portable toilet, which will be suitable for activities that only involve a few investigation/remediation workers for less than two weeks. In those scenarios, the field team will carry deionized or potable water, hand soap, and paper towels for hand washing. For activities with more investigation/remediation workers and/or a longer duration, PIONEER, PIONEER subcontractor, and/or the Remediation Contractor will supply a portable toilet and handwashing facilities with wash water, hand soap, and individual hand towels. These facilities will be kept clean, regularly maintained, stocked with an adequate supply of toilet paper, and designed in a manner that will ensure privacy.

10.3 Washing/Showering

☐ Provided by Site ☒ Provided by PIONEER ☒ Provided by Contractor

Toilet and handwashing facilities will be provided and utilized as outlined in the previous section. In addition, self-contained emergency eyewash facilities will be provided by PIONEER, PIONEER subcontractor, and/or the Remediation Contractor if contact with corrosive, toxic, or strongly irritating chemicals is possible. These emergency eyewash facilities will be in accessible locations that require the worker can reach in no more than 10 seconds. The eyewash facility will be free of any items that may obstruct the operation. Self-contained emergency eyewashes will meet the requirements of American Nation Standards Institute (ANSI) Z358.1-1981 including:

- The eyewash will supply potable water at flow rates and time durations specified in the ANSI standard.
- The control valve will be designed so that the water flow remains on without requiring the use of the operator's hands, and so that the valve remains activated until intentionally shut off for all but hand-held drench hoses.
- Units will be maintained in accordance with the manufacturer's instructions.

Are showering facilities necessary? ☐ Yes ☒ No

10.4 Personal Hygiene

Are hand-washing facilities necessary? ☒ Yes ☐ No

☒ Provided by Site ☒ Provided by PIONEER ☒ Provided by Contractor

Prior to eating and drinking, workers must thoroughly wash their hands and face. The Site, PIONEER, PIONEER subcontractor, and/or Remediation Contractor will supply a portable toilet and handwashing facilities with wash water, hand soap, and individual hand towels. In addition, all field teams are required to carry deionized or potable water, hand soap, and paper towels for hand washing at each work location. Eating and drinking will only be allowed outside of exclusion zones and contamination reduction zones. See Section 9 for details on required decontamination procedures. Workers should also practice regular hand washing with soap and water for a full 20 seconds.

SECTION 11: EMERGENCY CONTINGENCY PLANNING

In the event of an emergency, the emergency procedures will be followed.

11.1 Pre-Planning

The evacuation route and assembly area/rally spot will be identified by the SSO prior to field activities and reviewed with all workers at the first tailgate meeting and will be documented accordingly.

Field teams will have a first aid kit, fire extinguisher, and OSHA-compliant emergency eyewash with them when conducting field activities.

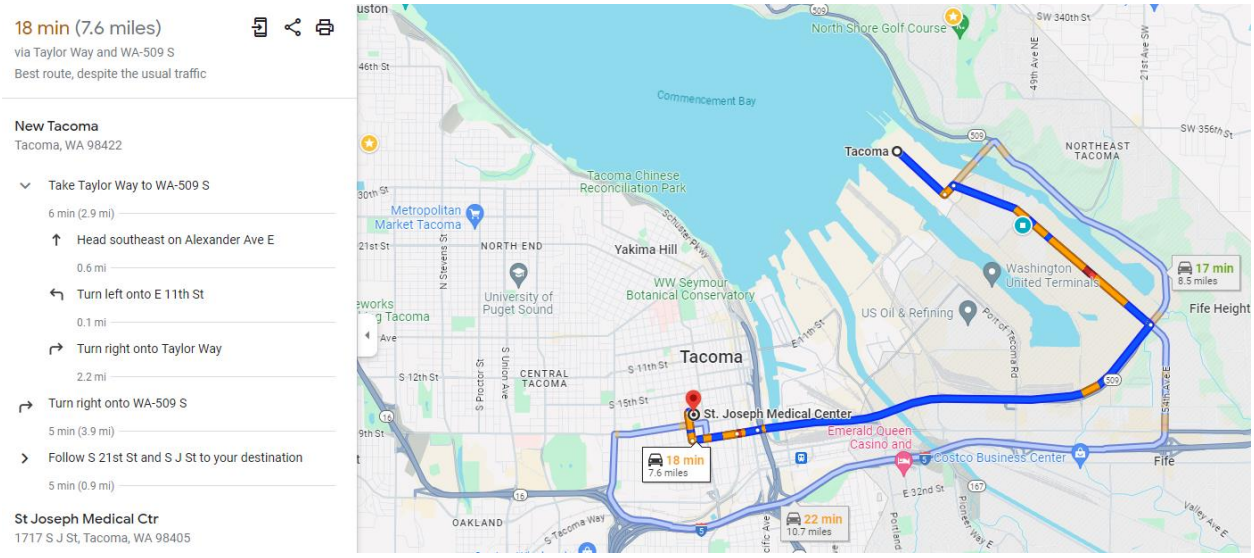
The SSO must have a current First Aid and CPR certification (minimum of every three years). Any incidents that require first aid or off-site transportation for emergency care must be reported to the SS.

11.2 Emergency Phone Numbers

Key emergency action information is summarized below.

Contact	Name	Number
Ambulance	Tacoma Fire Department	911
Fire	Tacoma Fire Department	911
Police	Tacoma Police Department	911
Hospital	St. Joseph Medical Center 1717 S J St, Tacoma, Washington	(253) 426-4101
PIONEER PM	Troy Bussey	Office: (360) 570-1700 Cell: 360-810-0640
PIONEER HSM	Kevin Gallagher	Office: (360) 570-1700 Cell: (206) 226-3623
Environmental Release Contact	Washington State Department of Ecology – 24-Hour Emergency Response	360-753-2355

Directions to the hospital are provided below.



Distance: 7.6 miles

Time: 18 minutes

11.3 Injury Response

In the event of event of an injury or illness, first aid will be administered only by on-site workers trained and qualified to do so. All emergency medical treatment, other than first aid, will be administered by the local paramedics. In all cases, critical injuries must be immediately referred for professional medical attention. Workers who are allergic to insect bites, bee stings, etc. should carry the appropriate medication and alert other workers to the condition prior to the start of work.

The following steps and rules will be followed in the event of an injury or illness:

1. Evaluate the extent of injuries or seriousness of illness.
2. Determine if the worker can be safely transported to a hospital.
3. If a worker requires urgent medical attention,
   a. Call for emergency assistance;
   b. Send a crew member to guide emergency personnel to the accident;
   c. Inform emergency personnel where the guide will meet them; and
   d. Administer first aid while awaiting an ambulance or paramedics.
4. All vehicles used to transport injured workers to the off-site medical facility will be given directions and a map to the medical facility.

11.4 Fire/Explosion Response

In the event of a fire or explosion:

1. Ensure that all equipment is shut off.
2. Phone **911** for emergency assistance.
3. Gather at the **designated rally spot** as pointed out at the Site orientation.

4. Take a head count.
5. Secure the area until emergency assistance arrives.
6. Meet emergency crew and advise fire chief of location and nature of the situation.

11.5 Spill/Release Response

In the event of a spill or leak:

1. Ensure that all equipment is shut off.
2. Phone Joel Hecker (PM) who will determine the need for a spill response crew, and contact the spill response crew, if needed.
3. Secure the area.
4. Locate and stop or contain the spill if it can be done safely (proper PPE must be worn).
5. As necessary, meet spill response crew and advise them of the location and material that has spilled.
6. Begin investigation.

11.6 Tornado/Earthquake Response

In the event of a tornado or earthquake:

1. Honk the vehicle horn to alert all site workers.
2. Gather at the designated rally spot.
3. Take a head count.

11.7 Emergency Equipment

The following emergency equipment must be adequate, accessible, and inspected:

- First-aid kit (in work area and readily available).
- Fire extinguisher (at a minimum, in work area and on each piece of heavy equipment).
- Emergency eyewash (decontamination station in the personnel contamination reduction zone). The eyewash must be able to:
  - Irrigates and flushes both eyes simultaneously while the user holds their eyes open.
  - Activate in one second or less and remains on without user assistance until intentionally turned off.
  - Deliver at least 0.4 gallons (1.5 liters) of water per minute for fifteen minutes or more.
- Spill kit (one mobile kit on-Site).
- Ring buoy and 50-feet of line for work on shoreline or on docks.

SECTION 12: REPORTING AND NOTIFICATIONS

Any unsafe acts or conditions that are observed must be reported to the SS and SSO, who will make efforts to correct the situation. The PM will be notified of the situation and will assist in the response and implementation of additional corrective actions, as needed.

In addition, the following incidents must be reported to the Washington State Department of L&I at 1-800-423-7233:

- A workplace fatality or in-patient hospitalization of any employee within eight (8) hours of the incident.
- A non-hospitalized amputation or loss of an eye(s) of any employee within twenty-four (24) hours of the incident

When reporting a fatality, in-patient hospitalization, amputation, or loss of an eye(s) you must provide:

- Your contact name and phone number.
- The name of the establishment/business.
- The location/address of the work-related incident.
- The date and time of the incident.
- How many employees suffered a fatality, in-patient hospitalization, amputation, or loss of an eye, and their name(s).
- A brief description of the work-related incident.

SECTION 13: REFERENCES

Crete and PGG. 2016. Final Remedial Investigation/Feasibility Study. Port of Tacoma – Earley Business Center (Agreed Order No. DE 9553). March 11.

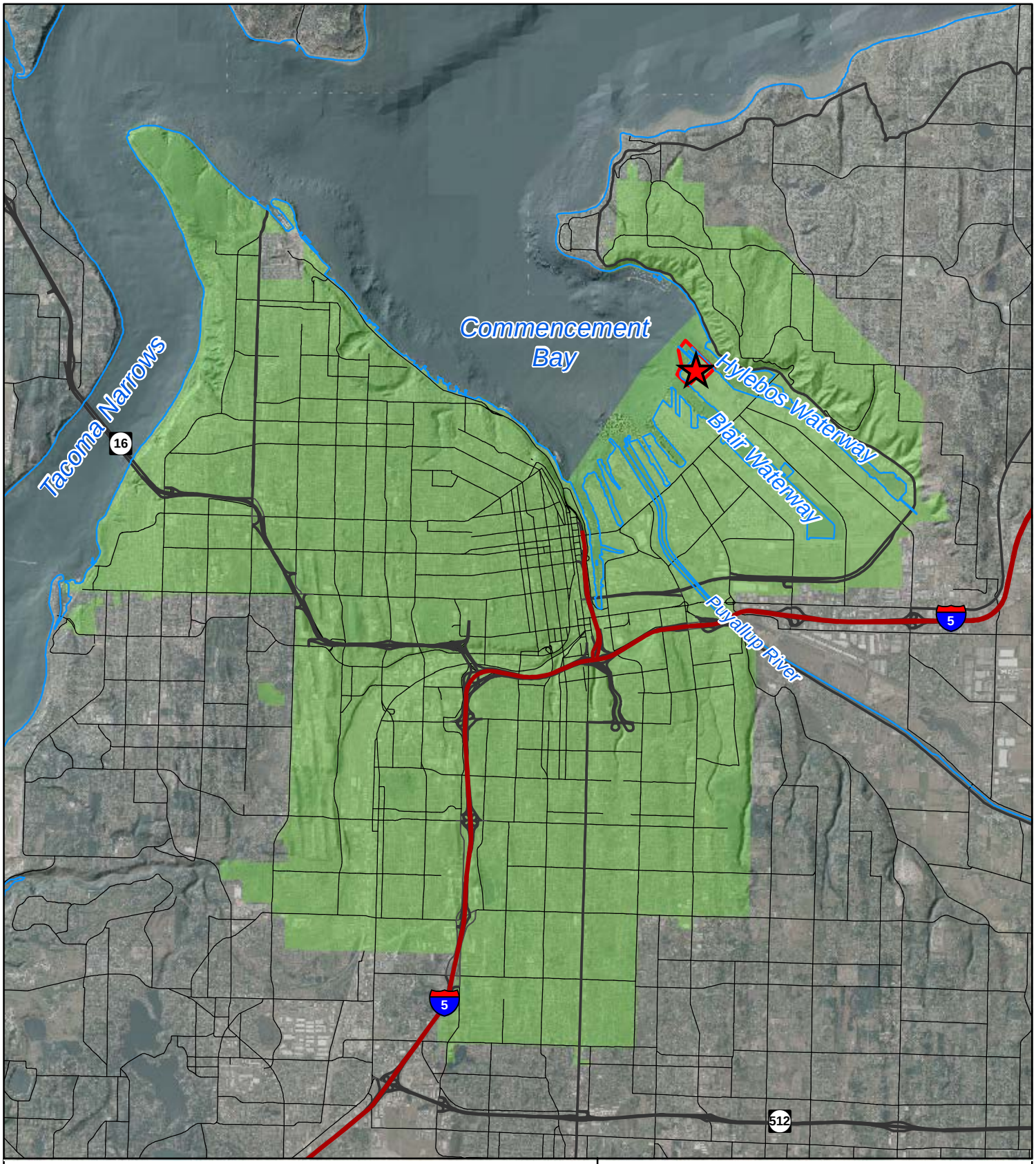
Ecology. 2017. Draft Cleanup Action Plan. Earley Business Center. Parcel 1B – Port of Tacoma. April 5.

PIONEER. 2023. Injury & Illness Prevention Plan & Accident Prevention Plan. November.

PIONEER. 2020. Standard Operating Procedure 7. Field Measurements Using a Photoionization Detector (PID). January.

RAE Systems. 2016. Technical Note TN-106: A Guideline for PID Instrument Response. January. Correction Factors, Ionization Energies, and Calibration Characteristics.

Figures



Earley Business Center

Port Parcel 1B

City of Tacoma

True North

Project North

0 Miles 2

Figure 1

Site Location Map

Port of Tacoma EBC RI/FS

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HYLEBOS WATERWAY

Pier 25

Former AK-WA Giannotti Shipyard Area

Pier 24

Pier 23 Soil & Groundwater Area

Pier 23

Sheet Pile Wall

Pier 23 Soil & GW Exploratory Area

Area with Petroleum Impacts Noted in Boring Logs

BLDG 592

BLDG 596

BLDG 595

Building 595 Exploratory Area

BLDG 511

N-6 UST

BLDG 532

BLDG 512

BLDG 529

BLDG 510

EP113 Exploratory Area

Southwest Debris Layer Area

BLDG 326

BLDG 407

BLDG 322

Blair Shoreline Soil and Groundwater Area

BLAIR WATERWAY

A

A'

B

B'

C

C'

True North

Project North

0 Feet 200

USGS Aerial Photo 2012

- RI Locations
- Pre 2014 Locations
- Previous Investigation Location Data Not Tabulated in this RI
- Air-Knife or Geophysical Investigation Area
- Cross Section Alignments
- Ordinary High Water Mark
- Confirmed Former & Current UST Locations
- Select Historical Building Outline
- Port Parcel 1B - EBC Boundary
- Southwest Debris Layer Area
- Blair Shoreline Soil and Groundwater Area
- Pier 23 Soil and Groundwater Area
- "Zinc Hotspot" Near Pier 24
- Former AK-WA Giannotti Shipyard Area
- Approximate Extent of White Aggregate Material

Figure 2

Site Layout and Investigation Locations

Port of Tacoma EBC RI/FS

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HYLEBOS WATERWAY

Pier 25

Pier 24

Pier 23

Sheet Pile Wall

AKWA-211

AKWA-210

Former AK-WA Giannotti Shipyard Area

BLDG 592

BLDG 596

BLDG 595

Building 595 Exploratory Area

595-212

595-213

595-214

Pier 23 Soil and Groundwater Area

P23-MW-109

P23-251

P23-MW-110

P23-209

P23-252

P23-250

P23-229

P23-208

P23-230

P23-207D

P23-MW-111

P23-207H

P23-207

P23-MW-108

P23-207C

P23-MW-112

P23-231

P23-207G

P23-207B

P23-MW-113

P23-207i

P23-232

P23-207J

HC08-EP103

P23-207F

P23-207E

SWD-253

SWD-206

SWD-256

SWD-MW-107

SWD-254

SWD-MW-106

SWD-257

SWD-MW-105

Southwest Debris Layer Area

SWD-255

SWD-258

SWD-MW-104

SWD-205

SWD-259

SWD-MW-103

SWD-204

SWD-260

Pier 23 Soil & GW Exploratory Area

Area with Petroleum Impacts Noted in Boring Logs

BLDG 511

N2324-215

N-6 UST

BLDG 532

N12342526-218

N12342526-110

EP-113-244

EP-113-221

EP-113-236

EP-113-239

EP-113-220

EP-113-249

N12342526-262

N12342526-261

N12342526-263

N12342526-226

N12342526-264

PofT-ESW

PofT-NSW

N12342526-265

PofT-Bottom

PofT-WSW

PofT-SSW

N12342526-227

N12342526-228

EP-113-243

EP-113-242

EP-113-241

EP-113-248

EP-113-222

EP-113-237

BLDG 529

BLDG 510

BLDG 512

EP113 Exploratory Area

BLDG 326

BLDG 407

Blair Shoreline Soil and Groundwater Area

N78-202

N78-201

BLDG 322

BSG-266

BSG-267

BSG-269

BSG-268

BSG-MW-102

BSG-MW-101

BSG-203

BSG-235

BSG-233

BSG-234

BSG-270

BSG-271

BLAIR WATERWAY

True North

Project North

0 Feet 200

USGS Aerial Photo 2012

RI Locations

- Result Exceeds Screening Level
- Non-Detect with Reporting Limit Above Screening Level
- All Results Below Screening Level
- Analyte Not Tested

Pre 2014 Location

- Result Exceeds Screening Level
- Non-Detect with Reporting Limit Above Screening Level
- All Results Below Screening Level
- Analyte Not Tested

- Previous Investigation Location Data Not Tabulated in this RI
- Air-Knife or Geophysical Investigation
- Ordinary High Water Mark
- Confirmed Former & Current UST Locations
- Select Historical Building Outline
- Port Parcel 1B - EBC Boundary
- Southwest Debris Layer
- Blair Shoreline Soil and Groundwater
- Pier 23 Soil and Groundwater
- "Zinc Hotspot" Near Pier 24
- Former AK-WA Giannotti Shipyard
- Approximate Extent of White Aggregate

Dot color indicates the highest concentration relative to screening levels for TPH, metals, PCBs or PAHs. Sample locations below 25 ft bgs excluded.

Figure 3

Summary of Soil Results

Port of Tacoma EBC RI/FS

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HYLEBOS WATERWAY

Pier 25

AKWA-211

AKWA-210

Former AK-WA Giannotti Shipyard Area

BLDG 592

BLDG 596

BLDG 595

Building 595 Exploratory Area

595-212

595-213

595-214

Pier 24

Pier 23 Soil and Groundwater Area

P23-MW-109

P23-251

P23-MW-110

P23-209

P23-252

P23-250

Area with Petroleum Impacts Noted in Boring Logs

P23-229

P23-208

Pier 23

Sheet Pile Wall

P23-207D

P23-230

P23-MW-111

P23-207H

P23-MW-108

P23-207

P23-207C

P23-MW-112

P23-231

P23-207G

P23-207B

P23-MW-113

P23-207i

P23-232

P23-207J

HC08-EP103

P23-207F

Pier 23 Soil & GW Exploratory Area

P23-207E

SWD-253

SWD-206

SWD-256

SWD-MW-107

SWD-254

SWD-MW-106

SWD-257

SWD-MW-105

Southwest Debris Layer Area

SWD-255

SWD-258

SWD-MW-104

SWD-205

SWD-259

SWD-MW-103

SWD-204

SWD-260

BLDG 511

N2324-215

N-6 UST

BLDG 512

BLDG 532

N12342526-218

N12342526-110

EP-113-244

EP-113-221

EP-113-236

EP-113-239

EP-113-220

N12342526-262

EP-113-249

N12342526-261

N12342526-263

N12342526-226

N12342526-264

N12342526-265

N12342526-227

BLDG 529

EP-113-243

EP-113-242

EP-113-241

BLDG 510

EP-113-248

EP-113-222

EP-113-237

N12342526-228

EP113 Exploratory Area

BLDG 326

BLDG 407

Blair Shoreline Soil and Groundwater Area

N78-202

BLDG 322

N78-201

BSG-266

BSG-267

BSG-MW-102

BSG-MW-101

BSG-269

BSG-203

BSG-235

BSG-233

BSG-234

BSG-268

BSG-270

BSG-271

BLAIR WATERWAY

True North

Project North

0 Feet 200

USGS Aerial Photo 2012

RI Locations

- Result Exceeds Screening Level
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- Analyte Not Tested

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- Pier 23 Soil and Groundwater
- "Zinc Hotspot" Near Pier 24
- Former AK-WA Giannotti Shipyard
- Approximate Extent of White Aggregate

Dot color indicates the highest concentration relative to screening levels for TPH, metals, PCBs or PAHs. Sample locations below 25 ft bgs excluded.

Figure 4

Summary of Groundwater Results

Port of Tacoma EBC RI/FS

CRETE CONSULTING, INC.

PGG

Tables

Table 1: Potential Chemical Hazards in Soil and Groundwater

Chemical Name [1] (Synonyms, trade name, CAS No.)	Exposure Limits [2]	Characteristics [3]	Route of Exposure	Symptoms of Exposure
VOCs (Benzene for example) (71-43-2)	PEL: 1 ppm TLV: 0.1 ppm STEL: 5 ppm CEILING: N/E IDLH: 500 ppm (Ca) Skin: No	Colorless to light-yellow liquid with an aromatic odor. MW: 78.1 BP: 176°F Sol: 0.07% Fl.P: 12°F IP: 9.24 eV Sp. Gr: 0.88 VP: 75 mmHg FREEZING POINT: 42°F LEL: 1.2% UEL: 7.8%	INH (Inhalation) ABS (Skin absorption) ING (Ingestion) CON (Skin and/or eye contact)	Symptoms include irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression. Potential occupational carcinogen.
Chlorinated VOCs (Tetrachloroethylene for example) (as Perchloroethylene) (127-18-4)	PEL: 25 ppm TLV: 25 ppm STEL: 38 ppm IDLH: 150 ppm (Ca) Skin: No Prop 65: Cancer	Colorless liquid with a mild, chloroform-like odor. MW: 165.8 BP: 250°F Sol: 0.02% FI.P: NA IP: 9.32 eV Sp.Gr. 1.62 VP: 14 mmHg FRZ: -2°F LEL: N/A UEL: N/A Noncombustible Liquid, but decomposes in a fire to hydrogen chloride and phosgene.	INH (Inhalation) ABS (Skin absorption) ING (Ingestion) CON (Skin and/or eye contact)	Symptoms include irritation of eyes, skin, nose, throat, and respiratory system; flushed face and neck; nausea; dizziness and incoordination; headache and drowsiness; skin erythema (skin redness); and liver damage. Potential occupational carcinogen.

Table 1: Potential Chemical Hazards in Soil and Groundwater

Chemical Name [1] (Synonyms, trade name, CAS No.)	Exposure Limits [2]	Characteristics [3]	Route of Exposure	Symptoms of Exposure
Chlorinated VOCs (Trichloroethylene for example) (79-01-6)	PEL: 50 ppm TLV: 10 ppm STEL: 200 ppm IDLH: 1000 ppm (Ca) Skin: No Prop 65: Cancer, Developmental Toxicity, Male Reproductive Toxicity	Colorless liquid (unless dyed blue) with a chloroform-like odor. MW: 131.4 BP: 189°F Sol: 0.1% Sp.Gr: 1.46 FRZ: -99°F IP: 9.45 eV VP: 58 mmHg Fl.P: UN LEL (77°F): 8% UEL (77°F): 10.5% Combustible Liquid, but burns with difficulty.	INH (Inhalation) ING (Ingestion) ABS (Skin Absorption) CON (Skin and/or eye contact)	Symptoms include irritation of eyes and skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury. Potential occupational carcinogen.
Chlorinated VOCs (Vinyl Chloride for example) (as Chloroethylene) (75-01-4)	PEL: 1 ppm TLV: 1 ppm STEL: 5 ppm IDLH: N.D. (Ca) Skin: Yes Prop 65: Cancer	Colorless gas or liquid (below 7°F) with a pleasant odor at high concentrations. [Note: Shipped as a liquefied compressed gas.] MW: 62.5 BP: 7°F Sol (77°F): 0.1% FRZ: -256°F IP: 9.99 eV VP: 3.3 atm Fl.P: N/A (Gas) LEL: 3.6% UEL: 33.0% Relative Gas Density: 2.21 Flammable Gas	INH (Inhalation) CON (Skin and/or eye contact) (Liquid)	Symptoms include lassitude (weakness, exhaustion); abdominal pain, gastrointestinal bleeding; enlarged liver; pallor or cyanosis of extremities; liquid: frostbite. Potential occupational carcinogen.

Table 1: Potential Chemical Hazards in Soil and Groundwater

Chemical Name [1] (Synonyms, trade name, CAS No.)	Exposure Limits [2]	Characteristics [3]	Route of Exposure	Symptoms of Exposure
SVOC/PAHs (Naphthalene for example) (91-20-3)	PEL: 10 ppm (50 mg/m^3) TLV: N/E STEL: 15 ppm CEILING: N/E IDLH: 250 ppm	Colorless to brown solid with an odor of mothballs. MW: 128.2 BP: 424°F MP: 176°F Sol: 0.003% Fl.P: 174°F IP: 8.12 eV Sp.Gr: 1.15 VP: 0.08 mmHg LEL: 0.9% UEL: 5.9%	INH (Inhalation) ABS (Skin absorption) ING (Ingestion) CON (Skin and/or eye contact)	Symptoms include irritation eyes; headache, confusion, excitement, malaise (vague feeling of discomfort); nausea, vomiting, abdominal pain; irritation bladder; profuse sweating; jaundice; hematuria (blood in the urine), renal shutdown; dermatitis, optical neuritis, corneal damage
PCBs (Aroclor 1242 for example) (53469-21-9)	PEL: 1 mg/m^3 TLV: None STEL: 3 mg/m^3 IDLH: 5 mg/m^3 (Ca) Skin: Yes Prop 65: Cancer, Developmental Toxicity	Colorless to light-colored, viscous liquid with a mild, hydrocarbon odor. MW: 258 BP: 617-691°F FRZ: -2°F Sol: Insoluble. Sp.G: 1.39 (77°F) VP: 0.001 mmHg UEL: N/A LEL: N/A Fl.P: N/A	INH (Inhalation) ABS (Skin absorption) ING (Ingestion) CON (Skin and/or eye contact)	Symptoms include irritation of eyes; chloracne; liver damage; reproductive effects. Potential occupational carcinogen.

Table 1: Potential Chemical Hazards in Soil and Groundwater

Chemical Name [1] (Synonyms, trade name, CAS No.)	Exposure Limits [2]	Characteristics [3]	Route of Exposure	Symptoms of Exposure
Dioxins/Furans (2,3,7,8-TCDD for example)	PEL: None TLV: None STEL: None IDLH: N.D. (Ca) Skin: Not Listed Prop 65: Cancer, Developmental Toxicity	Appears as white crystals or tan crystalline powder. MW: 322 BP: 932°F MLT: 581°F Sol: 0.00000002% VP: (77°F) 0.000002 mmHg Sp.G: N/A Fl.P: 39°F UEL: N/A LEL: N/A	INH (Inhalation) ABS (Skin absorption) ING (Ingestion) CON (Skin and/or eye contact)	Symptoms include irritation eyes; allergic dermatitis, chloracne; porphyria; gastrointestinal disturbance; possible reproductive, teratogenic effects; In Animals: liver, kidney damage; hemorrhage. Potential occupational carcinogen.
Organochlorine Pesticides (Dieldrin as example) (60-57-1)	PEL: 0.25 mg/m^3 TLV: 0.25 mg/m^3 TWA: 0.1 mg/m^3 STEL: 0.75 mg/m3 IDLH: 50 mg/m^3 Skin: Yes Prop 65: Cancer	Solid. MW: 380.91 BP: N/A Sol: 0.2 mg/L Fl.P: N/A IP: N/A Sp.Gr: 1.75 VP: 0.000001 kPa MLT: 347°F LEL: N/A UEL: N/A Noncombustible Solid in bulk form	INH (Inhalation) ING (Ingestion) CON (Skin and/or eye contact)	Convulsions. Headache. Dizziness. Nausea, vomiting. Burning pain and severe corrosive skin damage. Causes serious eye damage. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Permanent eye damage including blindness could result.

Table 1: Potential Chemical Hazards in Soil and Groundwater

Chemical Name [1] (Synonyms, trade name, CAS No.)	Exposure Limits [2]	Characteristics [3]	Route of Exposure	Symptoms of Exposure
Total Petroleum Hydrocarbons Gasoline Range Organics (TPH-G), Diesel Range Organics (TPH-D), and Oil Range Organics (TPH-HO) **Information presented is for TPH-G.	PEL: 900 mg/m^3 (300 ppm) TLV: None STEL: 1500 mg/m^3 (500 ppm) CEILING: N/E IDLH: N.D. (Ca) Skin: No	Clear liquid with a characteristic odor. MW: 110 (approx.) BP: 102°F Sol: Insoluble Fl.P: -45°F IP: UN Sp.Gr (60°F): 0.72-0.76 VP: 38-300 mmHg FRZ: UN LEL: 1.4% UEL: 7.6% Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.	INH (Inhalation) ABS (Skin absorption) ING (Ingestion) CON (Skin and/or eye contact)	Symptoms include irritation of eyes, skin, and mucous membrane; dermatitis; headache, lassitude (weakness, exhaustion), blurred vision, dizziness, slurred speech, confusion, and convulsions; chemical pneumonitis (aspiration liquid); possible liver and kidney damage. Potential occupational carcinogen.
Diesel Range Organics (as Diesel exhaust) (No CAS # Provided)	PEL: None TLV: None STEL: None IDLH: N.D. (Ca) Skin: Not Listed Prop 65: Cancer	Appearance and odor vary depending upon the specific diesel exhaust component. MW: Properties vary depending upon the specific diesel exhaust component.	INH (Inhalation) CON (Skin and/or eye contact)	Symptoms include eye irritation and pulmonary function changes. Potential occupational carcinogen.
Arsenic (inorganic 7440-38-2)	Action Level: 0.005 mg/m^3 PEL: 0.01 mg/m^3 TLV: 0.01 mg/m^3 STEL: N/E CEILING: N/E IDLH: 5 mg/m^3 (Ca) Skin: No	Metal: Silver-gray or tin-white, brittle, odorless solid. MW: 74.9 BP: Sublimes Sol: Insoluble Fl.P: N/A IP: N/A Sp. Gr: 5.73 (metal) VP: 0 mmHg (approx.) MLT: 1135°F (Sublimes) LEL: N/A UEL: N/A Metal: Noncombustible Solid in bulk form, but a slight explosion hazard in the form of dust when exposed to flame.	INH (Inhalation) ABS (Skin absorption) ING (Ingestion) CON (Skin and/or eye contact)	Symptoms include ulceration of nasal septum, dermatitis, gastrointestinal disturbances, respiratory irritation, and peripheral neuropathy, and hyperpigmentation of skin. Potential occupational carcinogen.

Table 1: Potential Chemical Hazards in Soil and Groundwater

Chemical Name [1] (Synonyms, trade name, CAS No.)	Exposure Limits [2]	Characteristics [3]	Route of Exposure	Symptoms of Exposure
Chromium (7440-47-3)	PEL: 0.5 mg/m^3 TLV: 0.5 mg/m^3 STEL: N/E CEILING: N/E IDLH: 25 mg/m^3 (Ca) Skin: No	Noncombustible Solid in bulk form, but finely divided dust burns rapidly if heated in a flame. MW: 52.0 BP: 4788°F Sol: Insoluble Fl.P: N/A IP: N/A Sp. Gr: 7.14 VP: 0 mmHg FREEZING POINT: N/A LEL: N/A UEL: N/A	INH (Inhalation) ABS (Skin absorption) ING (Ingestion) CON (Skin and/or eye contact)	Symptoms include irritation eyes, skin; lung fibrosis (histologic)
Lead (Elemental & inorganic as Pb) (7439-92-1)	Action Level: 0.03 mg/m^3 PEL: 0.05 mg/m^3 TLV: 0.05 mg/m^3 STEL: N/E IDLH: 100 mg/m^3 Skin: No Prop 65: Cancer, Developmental Toxicity, Male Reproductive Toxicity, Female Reproductive Toxicity	A heavy, gray, ductile, soft solid. MW: 207.2 BP: 3164°F Sol: Insoluble Fl.P: N/A IP: N/A Sp.Gr: 11.34 VP: 0 mmHg (approx.) MLT: 621°F LEL: N/A UEL: N/A Noncombustible Solid in bulk form	INH (Inhalation) ING (Ingestion) CON (Skin and/or eye contact)	Symptoms include lassitude (weakness, exhaustion) and insomnia; facial pallor; anorexia, weight loss, and malnutrition; constipation, abdominal pain, and colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation of the eyes; hypertension.

Table 1: Potential Chemical Hazards in Soil and Groundwater

Chemical Name [1] (Synonyms, trade name, CAS No.)	Exposure Limits [2]	Characteristics [3]	Route of Exposure	Symptoms of Exposure
Mercury (as Mercury Compounds) (7439-97-6 [metal])	PEL: 0.1 mg/m^3 TLV: 0.025 mg/m^3 STEL: 0.3 mg/m^3 IDLH: 10 mg/m^3 Skin: Yes Prop 65: Developmental Toxicity	Metal: Silver-white, heavy, odorless liquid. (Note: "Other" Hg compounds include all inorganic & aryl Hg compounds except [organo] alkyls.) MW: 200.6 BP: 674°F Sol: Insoluble FI.P: N/A IP: UN Sp.Gr: 13.6 (metal) VP: 0.0012 mmHg FRZ: -38°F LEL: N/A UEL: N/A Metal: Noncombustible Liquid	INH (Inhalation) ABS (Skin Absorption) ING (Ingestion) CON (Skin and/or eye contact)	Symptoms include irritation of the eyes and skin, cough, chest pain, dyspnea (breathing difficulty), bronchitis, and pneumonitis; tremor, insomnia, irritability, indecision, headache, and lassitude (weakness, exhaustion); stomatitis and salivation; gastrointestinal disturbance, anorexia, and weight loss; proteinuria.
Nickel (as Metal and Other Compounds) (7440-02-0 [metal])	PEL: 1 mg/m^3 TLV: 1.5 mg/m^3 STEL: 3 mg/m^3 IDLH: 10 mg/m^3 (Ca) Skin: No Prop 65: Cancer, Developmental Toxicity, Male Reproductive Toxicity, Female Reproductive Toxicity	Metal: Lustrous, silvery, odorless solid. MW: 58.7 BP: 5139°F Sol: Insoluble FI.P: N/A IP: N/A Sp.Gr: 8.90 (Metal) VP: 0 mmHg (approx.) MLT: 2831°F LEL: N/A UEL: N/A Metal: Combustible solid; nickel sponge catalyst may ignite SPONTANEOUSLY in air.	INH (Inhalation) ING (Ingestion) CON (Skin and/or eye contact)	Symptoms include sensitization dermatitis, allergic asthma, and pneumonitis. Potential occupational carcinogen.

Table 1: Potential Chemical Hazards in Soil and Groundwater

Chemical Name [1] (Synonyms, trade name, CAS No.)	Exposure Limits [2]	Characteristics [3]	Route of Exposure	Symptoms of Exposure
Cyanide (74-90-8 [hydrogen cyanide])	PEL: 5 mg/m^3 TLV-Ceiling: 5 mg/m^3 PEL TWA: 5 mg/m^3 IDLH: 25 mg/m^3 (as Cn)	Colorless or pale-blue liquid or gas (above 78°F) with a bitter, almond-like odor. MW: 27.0 BP: 78°F (96%) Sol: Depends on phase FI.P: 0°F (96%) IP: 13.60 eV Sp.Gr: 0.69 VP: 0 mmHg (approx.) MLT: 7°F LEL: 5.6% UEL: 40%	INH (Inhalation) ING (Ingestion) CON (Skin and/or eye contact)	Symptoms include chest pain/tightness, confusion, dizziness, eye pain/tearing, vomiting, weakness, wheezing, restlessness, excitement.

Notes:
[1] Source: OSHA
[2] **PEL**: Permissible exposure limit established by Chapter 296-841 WAC; **Ceiling**: The ceiling concentration to not be exceeded during any part of the working exposure established by Chapter 296-841 WAC; **TLV**: Threshold limit value for an eight-hour, time-weighted average established by the American Conference of Governmental Industrial Hygienists; **STEL**: Short-term exposure limit for a 15-minute, time-weighted average established by Chapter 296-841 WAC; **IDLH**: Immediately dangerous to life or health concentration established by National Institute for Occupational Safety and Health; **(Ca)**: Potential or confirmed human carcinogen; **Skin**: The potential contribution to the overall exposure by the cutaneous route, including mucous membranes and eye, either by airborne or, more particularly, by direct contact with the substance; **N/E**: Not established
[3] **LEL**: Lower explosive limit; **UEL**: Upper explosive limit; **IP**: Ionization potential; **VP**: Vapor pressure, **Fl.P**: Flashpoint; **N/A**: Not Applicable

Table 2: Determination of Vapor Action Level for Inhalation Exposures

Volatile Constituent [1]	PEL (ppm) [2]	PID Response Correction Factor [3]	PID Adjusted Action Level (ppm) [4]	Resulting Stand Down Level (ppm)
Benzene	1	0.47	0.47	0.47
Toluene	100	0.45	45	
Ethylbenzene	100	0.47	47	
Xylenes	100	0.39	39	
Tetrachloroethylene	25	0.57	14	
Trichloroethylene	50	0.54	27	
Vinyl Chloride	1	2.00	2.0	
Naphthalene	10	0.42	4.2	
Gasoline	300	1.00	300	

Notes:

[1] Expected COIs based on site usage and/or historical reports.

[2] PELs are Washington PELs for Time-weighted averages per WAC 296-841-20025; not federal OSHA PELs.

[3] Source: RAE Systems 2016. The PID Correction Factor applies to vapor monitoring conducted using a PID equipped with an 10.6 eV lamp.

[4] The PEL multiplied by the PID response correction factor.

Appendix A

Field Forms

DAILY SAFETY BRIEFING PROCESS

The Contractor Supervisor completes Work Permit for work to be performed that day. The SSO and the contractor supervisor discuss the work to be performed and any safety observations from the previous day's work. Once all parties are in agreement with the work, tasks and safety mitigation measures, the work permit is signed. The contractor supervisor begins tailgate meeting by discussing the day's activities and assigning tasks and then leads into an interactive discussion regarding the safety hazards of the day's work. With assistance from the SSO, the discussion should be started by asking open ended questions to solicit comments from field crew. Areas for improvement, positive observations, mitigation measures, key points regarding mitigation measures, etc., should be noted in the space below.

Date and Time of Meeting: _____

Discussion:

_____

_____

_____

_____

_____

Attendee's Name (Printed) Signature _____

Supervisor: _____

SSO: _____

WORK PERMIT

Date: _____ **Start Time:** _____ **Finish Time:** _____ **Project Name:**_____

Work Location: _____

Work Description: (Summary of Tasks): _____

_____

Special Procedures to Follow

Check all that apply	HASP	Section	Does the JHA Address the Hazards?	Special Permits Required	Required	Complete
Equipment Operation / Drill Rigs						
Biological Hazards						
Traffic Control						
Work Over or on Water						
Confined Space Entry Permit						
Explosive or Reactive Materials						
Heat / Cold Stress						
Overhead Obstruction Plan (OHOP)						
Truck Tarping and Lining (Site Specific)						
Rigging and or Crane Operations						
Scaffold Construction and Use						
Electrical Safety and GFCI Protection						
Elevated Work / Fall Protection						
Radiation, X-Ray, Microwave, or Laser Hazards						
Waste Management / Drum Handling						
Site Control and Communications						

	Yes	No
Field personnel aware of the hazards and required permits identified above?	□	□
Have all vehicles, equipment, and tools been inspected?	□	□
Has the work area been inspected?	□	□
Have there been any changes in work area conditions that require revision to the JHA or HASP?	□	□

PPE Level: (e.g., Level D) also add additional PPE (e.g., body harness): _____

In Case of Emergency:

Nearest designated rally point: _____

SSO emergency phone number: _____

Implement UO Notification Chain as written in the HASP: _____

Approved by: _____ Date: _____

Contractor Supervisor Signature: _____

WORK PERMIT

Work Must Not Start Until Permit is Signed and All Precautions Are Taken!

Check Topic(s)

Overhead utilities
- ☐ Power de-energization required
- ☐ Required clearance distance ft

Underground Utilities
- ☐ Review as-builts
- ☐ Sub-subsurface surveys
- ☐ Received excavation permit
- ☐ Required clearance distance _____ ft
- ☐ Safe work zone mark

Excavations
- ☐ Permits
- ☐ Inspected prior to entrance
- ☐ Proper Sloping/shoring
- ☐ Barricades provided
- ☐ Access/Egress provided
- ☐ Protection from accumulated water

Vehicle traffic or Heavy Equipment
- ☐ Traffic barricades
- ☐ Cones and/or Signs
- ☐ Flagmen
- ☐ Lanes closure
- ☐ Communication with equipment operator
- ☐ Spotters
- ☐ Equipment Inspection Forms

Hand & Power Tools
- ☐ Inspect general conditions
- ☐ GFCI in use
- ☐ Identified PPE required for each tool
- ☐ Reviewed safety requirements in operators Manual(s)
- ☐ Guarding OK

Manual Lifting:
- ☐ Reviewed proper lifting technique
- ☐ Identified material requiring lifting equipment
- ☐ Hand protection required

Scaffolds:
- ☐ Inspect general condition before use
- ☐ Tags in place
- ☐ Properly secured
- ☐ Toe boards used
- ☐ Footing adequate
- ☐ Material properly stored on scaffold

Pinch Points:
- ☐ List pinch points: _____

_____
- ☐ Working near equipment
- ☐ Hand/body position

Heat Stress
- ☐ Heat stress monitoring (<85F)
- ☐ Liquids available
- ☐ Cold down periods
- ☐ Sun Screen
- ☐ Exposure monitoring conducted

Equipment Operator
- ☐ Training documentation

Crane or other lifting equipment
- ☐ Signalman assigned
- ☐ Tag lines in use
- ☐ Lifting equipment inspected

Electrical
- ☐ Lock Out/Tag Out/Try Out
- ☐ Confirm that equipment is de-energized

Fire Hazard
- ☐ Hot work
- ☐ Fire extinguishers ( ) Fire Watch
- ☐ Adjacent area protected
- ☐ Unnecessary flammable material removed
- ☐ Grounding and bonding of fuel containers

Noise > 85dB
- ☐ Hearing Protection
- ☐ Ear Plug

List sharp tools, material, equipment
- ☐ 1.
- ☐ 2.
- ☐ 3.
- ☐ 4.
- ☐ PPE gloves, etc.
- ☐ Protected sharp edges as necessary

WORK PERMIT

Ladders:

- ☐ Inspect ladder prior to use
- ☐ Ladder tied off or held
- ☐ Proper angle and placement
- ☐ Review ladder safety

Slips, Trips, Falls:

- ☐ Inspect for trip hazards
- ☐ Hazards Marked
- ☐ Tool and material properly stored
- ☐ Extension cords properly secured
- ☐ Work zone free of debris

Barricades/covers:

- ☐ Caution tape required
- ☐ Danger barricade tape required
- ☐ Rigid barricade
- ☐ Covers over opening ()
- ☐ Warning sign required

Cold Stress

- ☐ Proper clothing (i.e., gloves, coat,
- ☐ coveralls) Wind chill <32F,
- ☐ Reviewed cold stress symptoms
- ☐ Warm up period

Environmental:

- ☐ Are Spill kit available?
- ☐ Are container labels

HEALTH AND SAFETY PLAN COMPLIANCE AGREEMENT

Project Name: _____ **Project Number:** _____

I have read, understood, and agree with the health and safety protocols presented in the Health and Safety Plan (HASP) and the information discussed in the health and safety briefing. I also understand that noncompliance with the HASP may result in dismissal from the site.

Printed Name	Organization	Signature	Date

Personnel Health and Safety briefing conducted by:

Name	Signature	Date

Appendix B

Field Audit and Example Walk-Around

Safety Inspection Form

Field Audit Report

Date:

Site:

Audit Team:

Audit Focus (based on past audits, areas of concern, and/or interest):

Activities Audited:

Number of Personnel Audited:

Field Team Contact Name:

---

1. Positive Observations *within* Audit Focus

2. Improvement Observations *within* Audit Focus
   (include recommended corrective action, responsible person, and timing for completion)

3. Positive Observations *outside of* Audit Focus

4. Improvement Observations *outside of* Audit Focus
   (include recommended corrective action, responsible person, and timing for completion)

5. Environmental Observations

6. Unsafe Acts

7. Unsafe Conditions

8. Next Audit Suggestions (include discrepancies or findings of this audit)

Workplace Inspection Checklist

Inspected by: _____ Date:_____

Item	Condition	Follow-up needed?
Emergency & First Aid		
☐ Fire alarm stations clearly marked and readily accessible		
☐ Fire alarms free from visible damage		
☐ Lights above emergency exits have all bulbs lit		
☐ No obstructions in path to exits		
☐ "Crash bar" operates easily		
☐ Signs showing locations of fire extinguishers clearly visible		
☐ Fire extinguishers fully charged		
☐ Fire extinguishers have current inspection documented		
☐ Signs showing locations of first aid stations clearly visible		
☐ First aid kits readily accessible		
☐ First aid kit contents match inventory sheets		
☐ Signs showing locations of emergency eyewash stations clearly visible		
☐ Emergency eyewash stations fully accessible		
☐ Emergency eyewash stations check for operation		

Note: *This checklist does not address all possible workplace hazards. To learn how to identify hazards in your workplace, see* [*http://www.lni.wa.gov/safety/GettingStarted/HazardsTasks/*](http://www.lni.wa.gov/safety/GettingStarted/HazardsTasks/)

Employee Information Bookcase & Bulletin Board ☐ Sufficient copies of "Accident, Incident & Injury Report forms available ☐ APP, MSDS file & Safety Committee meeting minutes up to date ☐ Required L&I posters in separated location ☐ List of Safety Committee members current		
Walking, Working Surfaces ☐ Walkway markings through plant in good condition ☐ Walkways unobstructed; clear of equipment & materials ☐ Walkways clear on oil, grease, loose material and other slipping hazards ☐ Stair treads & handrails in good condition ☐ Walkway & stair illuminating light fixtures at proper levels ☐ Nothing stored underneath stairs		

Ladders ☐ Rungs & side rails securely fastened & free from visible damage ☐ Non-skid feet fully intact and swivel freely ☐ Ladders in use are used appropriately o No one standing on top rungs or platform o Tools/equipment not left on platform o Step ladders not used as straight ladders o People climbing ladders have "3 point contact"		
Machinery, equipment and power tools ☐ All guards in place and fully operational ☐ Safety placards in place and legible ☐ Lock-Out/Tag-Out kits in place and complete ☐ Wiring insulation intact – no cuts or breaks ☐ Operator's area free from debris and scrap		
Vehicles ☐ All lights, horns, signaling devices (including back-up alarms) fully functional. ☐ Seat belts show evidence of being in use during operation ☐ Fire extinguisher & first aid kit (on road vehicles) in place ☐ Tires in good condition; sufficient tread ☐ ROPS structure on forklifts checked for structural integrity ☐ Area where forklifts operate checked for damage that would indicate operator error		

Personal Protective Equipment ☐ All eye protection worn in plant marked as meeting ANSI Z-87 ☐ Eye protection has clear vision; no excessive scratches or pits on lenses ☐ All grinders have face shields available ☐ All workers in designated areas wear safety footwear ☐ Hearing protection worn while working with tools/machines listed in Hearing Conservation Plan		
Sanitation ☐ Bathrooms and employee break room are clean and free from litter ☐ All electrical outlets are GFCI protected ☐ Sufficient soap and paper towels are available ☐ Refrigerator has been cleaned out recently; no odor of spoiled food		

Hazardous Chemicals ☐ All solvents, cleaning supplies, lubricants, etc that have warning labels also have MSDS on file ☐ Ventilation fans tested for proper air movement in areas where solvents are used		
☐ List checked against previous two months to detect recurrent hazards/conditions		

Appendix C

Task-Specific Hazard Evaluation / Project Safety Analysis

PROJECT SAFETY ANALYSIS SOP
EHS.04

PURPOSE

To ensure that a Project Safety Analysis (PSA) is conducted before field activities are initiated so that the following can be achieved:

- Likely hazards associated with the work are identified.
- Consensus is reached as to how the hazards will be eliminated or mitigated.
- Work is performed safely in compliance with applicable EHS regulations.

ROLES AND RESPONSIBILITIES

Project Director

- Ensures during the bidding process that PSAs are funded adequately
- Verifies that a PSA is conducted for all CRG-funded projects
- Ensures that a Plan of Action Discussion (POAD) is held prior to the PSA Meeting
- Ensures that PSA recommendations are documented and implemented as agreed to by the PSA Team
- If applicable, ensures that a High-Risk Analysis (HRA) alert is initiated on the EHS SharePoint site

Project Manager

- Schedules and participates in the PSA, including the POAD and PSA Meeting
- Assembles a PSA Team that includes key project personnel as listed in the Key Terms section of this SOP
- Ensures that the completed Hazards Checklist is retained in the project file

PSA Leader

- Leads the POAD and review of the Hazards Checklists
- Verifies that the information generated during the PSA Meeting is documented adequately

Health and Safety Resource

- Participates in the POAD and PSA, serving as a resource to ensure the adequacy of the hazard identification and mitigation process
- Ensures that approved controls are in place to address a HRA
- Initiates the HRA alert on the EHS SharePoint site

Scribe

- Takes thorough notes and completes the Hazard Checklists

PSA Team

- Understands the scope of work
- Participates in the PSA Meeting
- Agrees to the hazard mitigation techniques discussed

PROCEDURE METHODOLOGY

PSAs must be conducted for all CRG-funded field projects regardless of project complexity, duration, or scope of work and must be initiated during project development after the scope of work has been determined. *NOTE: Although PSAs are not required for general services that do not involve fieldwork*

(e.g., plumbing for an office restroom, snow removal, light bulb or outlet replacements), the likely hazards associated with these activities must be addressed via EHS.05, Job Safety Analysis, Work Permit, and Tailgate Briefing SOP.

Accomplishing the PSA is a multiple step process that involves scheduling and holding the POAD, scheduling the PSA Meeting and gathering the PSA Team, holding the PSA Meeting, filing the PSA Form, and updating the Hazard Checklists, as described below.

Scheduling and Holding the POAD

1. The Project Manager, in communication with the Project Director, determines the appropriate timing for the POAD based on the project life cycle. S/He schedules the POAD any time after the contract is awarded, allowing for sufficient time to address any items that require further research or follow-up.
2. The PSA Leader leads the POAD using the Preproject Implementation Checklist (see Attachment A) and the Hazard Checklists (see Attachment B) as guides.
    - » The implementation of specific tasks is discussed so that the hazards associated with the tasks can be identified. The contractor's Job Safety Analysis for the identified tasks and hazards should be discussed at this meeting if applicable.
    - » The anticipated hazards are reviewed, and control measures are discussed.
    - » The most significant hazards associated with the work, which may or may not be HRAs, are identified.
3. If HRAs are identified, a control plan must be agreed upon.
    - » The Scribe documents the control plan in the Background Information section on the Hazards Checklists (see Attachment B).

Scheduling the PSA Meeting and Gathering the PSA Team

1. The Project Manager, in communication with the Project Director, determines the appropriate timing for the PSA based on the project life cycle and schedules the PSA Meeting at least one week prior to field mobilization.
    - » Approximately two hours should be allotted for this meeting.
    - » Based on the project and the thoroughness of the POAD, PSA Meetings may take more time or less time as appropriate.
2. The Project Manager assembles a PSA Team that **must** include the following key personnel: the Project Manager, a Health and Safety Resource, the CSR or field supervisor responsible for field operations, and at least one contractor representative (preferably the contractor field team and safety representative or manager). If these participants are not available, the PSA **must** be postponed.
    - » The Project Director must be invited to the PSA Meeting, but is not required to attend.
    - » Optional attendees can include individuals not working on the project with relevant expertise.

Holding the PSA Meeting

Although the Hazard Checklists are completed as part of the POAD, a discussion of the hazards is an important part of the PSA Meeting. The PSA Team should not simply read the checklists or skip this discussion.

1. At the beginning of the PSA Meeting, the PSA Leader reviews the scope of work, the major hazards identified during the POAD, and HRAs identified. If feasible, photographs of key hazards should be included to facilitate the discussion.
2. The PSA Team discusses the outcomes of the POAD, including the hazards identified and control measures anticipated to be implemented.
    - » The PSA Team discusses "what if" scenarios. The duration of the discussion for potential hazards should be commensurate to the potential severity or frequency of the hazard posed (i.e., a worker injury in the "south forty," what is the worst thing that could happen while doing this work?)
    - » This discussion should be an open exchange of information and ideas.
3. The PSA Leader reviews the Hazard Checklists that were initially completed during the POAD.
    - » The Hazards Checklists in Attachment B were developed to stimulate thought. Not all of the hazards listed in the checklists may apply, and some hazards may apply that are not included on the checklists. It is expected that those hazards posing the greatest risk will generate the most discussion and planning. The identification of hazards is intended to be an interactive process (i.e., a dialogue, not a monologue).
    - » Hazards previously discussed should be passed over in favor of items that have not already been addressed.
4. The PSA Team identifies a specific hazard and determines a means of controlling or eliminating the hazard. To the extent feasible, a hierarchy of controls approach should be used (listed in order of preference): Elimination/Substitution, Engineering Controls, Administrative Controls, and Personal Protective Equipment.
5. The Scribe captures the discussion of the hazards and the associated control measures within the Hazard Checklists. Accurate notes are critical.
6. If a HRA is identified during the meeting, the Health and Safety Resource ensures that approved controls are in place to address the HRA.
7. The Health and Safety Resource documents the presence or absence of HRAs on the EHS SharePoint site.
8. If additional research is necessary for a hazard or control measure, the PSA Team identifies one of its members to follow up on the item and provide the information for inclusion into the draft Hazards Checklists.

Filing the Hazards Checklists

The final Hazards Checklists must be filed (electronically or hard copy) with the project files.

Updating the PSA Form

For ongoing projects or projects that are periodic in nature (e.g., semi-annual groundwater monitoring), the project team must review and update the completed Hazards Checklists as necessary to reflect changing conditions (i.e., seasonal differences). This review and any changes must be documented, and the updated Hazards Checklists must be filed. A new POAD/PSA call may be required depending on the scope of changes and risk level of the work. The Project Director will determine if scheduling a call is necessary or if updating existing documentation is adequate.

TRAINING

All personnel must be trained on this procedure. Refresher training must follow the initial training by no more than three years.

KEY TERMS

Key Term	Definition
Hazards Checklists	A series of checklists to assist in identifying physical, chemical, and other hazards that may be encountered during field activities.
High-Risk Activity (HRA)	An activity that, if not anticipated or controlled, has the potential to cause serious injury or death.
Plan of Action Discussion (POAD)	A discussion held in advance of the PSA Meeting involving the Project Manager, a Health and Safety Resource, and the contractor performing the work in which the following is addressed: proposed scope of work, methods, tools, roles and responsibilities of the field team, and the major hazards and controls associated with the work.
Preproject Implementation Checklists	A planning tool designed to help determine the roles and responsibilities of project team members, identify required field documents (e.g., Health and Safety Plan, Waste Management Plan), understand site access requirements, and outline other premobilization planning steps.
Project Safety Analysis (PSA)	A process designed to identify the (1) field-related safety and health hazards that may be known or anticipated and (2) associated control measures to be implemented. This two-step process includes the POAD and PSA Meeting.
PSA Meeting	A meeting held with the larger project team and Chemours Site Representative (if applicable) in which the POAD documentation is reviewed and the proposed control measures are discussed and agreed upon.
PSA Team	A group of people who are directly involved with the project or have expertise in a given area that is unique to the project. The PSA Team **must** include the Project Manager, a Health and Safety Resource, the CSR or field supervisor responsible for field operations, a plant representative (if applicable), and at least one contractor representative (preferably the contractor field team and safety representative or manager).

ATTACHMENT A
PREPROJECT IMPLEMENTATION CHECKLISTS

Preproject Implementation Checklists

Instructions: The following checklists are to be completed by the Project Manager working with the project team during the POAD. Information must be recorded in the space provided.

Scope of Work	
Project Tasks	
Contractor's Approach	
Fieldwork Start Date	
Roles and Responsibilities	Project Director: Project Manager: Chemours Site Representative: Contractor Site Supervisor: Health and Safety Resource: Contractor Representatives: Field Team Members: Plant or Site Representatives:

Are there any short service employees (SSEs) who will be working on this project? A SSE is a contractor with less than six months of experience in the same job type with his/her present employer. If so, list the names of SSEs below.

Who is serving as the field mentor for those individuals? (List names below.)

Preproject Implementation Checklists

FIELD DOCUMENTS (HASP, WMP)		
Is there a current HASP or HASP addendum for the scope of work? Provide date and title of HASP or addendum.		
Has a copy of the pertinent document(s) been made available to the project team?		
Is the WMP current for activities? If yes, list date and title of WMP.		
Has the WMP been reviewed by a member of the Waste Management Network and the field team? If yes, list the names of the individuals.		

VARIANCE
Supply justification below for **not** completing geophysical survey for underground obstructions.
Justification:
Project Director Signature:
Project Manager Signature:
Date:

SITE ACCESS REQUIREMENTS		
Are there any special security requirements for work at the site (i.e., Homeland Security)?		
Is Maritime Security Act training required?		
Are security background checks required for site entry?		
Is substance abuse testing required?		
Is local Area Safety Council Training required?		

Preproject Implementation Checklists

PM / CSR REVIEW	
Review project goals and objectives with CSR and how current scope fits in with overall project	
Permit requirements related to the work (e.g. federal, state, local, E&S, plant, internal)	
Technical Specifications/Drawings/Work Plan	
Contract-type (lump sum, unit price, or T&M) and how they relate to field management responsibilities	
Contract administration (responsibility as a "Receiver" in the **B**uy/**R**elease, **R**eceive, **P**ay process, Cost Tracking, Progress Meetings, Meeting Minutes, etc.	
Fieldwork Documentation Requirements	
Communication	1. Describe lines of communication within project team (e.g., CRG, plant, site, contractor, subcontractors) 2. Describe how to address community issues, visits, and/or questions. 3. Describe how to address regulatory visits and/or questions.

ATTACHMENT B
HAZARDS CHECKLISTS

Hazards Checklists

BACKGROUND INFORMATION	
PSA Date:	
Site Name:	
Project Name:	
List names below of those present at PSA meeting	

Name	Organization

Hazards Checklists

BACKGROUND INFORMATION
Brief Summary of the Scope of Work (as documented in POAD):

Hazards Checklists

BACKGROUND INFORMATION

What does the project team believe to be the most significant hazard(s)? Note: These hazards may or may not be HRAs as identified in Checklist A.

1.

Control Measure

2.

Control Measure

3.

Control Measure

Hazards Checklists

Checklist A
High-Risk Activities

In the process of accomplishing the agreed upon scope of work, is it anticipated that there may be exposure to any of the following HRAs? The definition of these HRAs can be found in the corresponding standard.

1. *Working with potential for electrical shock/arc (S31G)*
2. *Working at elevation or from heights (S5H)*
3. *Using high pressure water (P*ressures greater than 3,626 psig) *(S43G)*
4. *Performing hot work (S31F)*
5. *Operating powered industrial trucks (S32G)*
6. *Working on or near suspended loads (S30G, S33G)*
7. *Working with potential for body entrapment - machine, excavation (S44G, SC12E)*
8. *Entering confined spaces (S16G)*
9. *Performing line breaks to hazardous processes or systems (S27G)*
10. *Working in oxygen deficient atmospheres (S16G, S41G)*
11. *Working with highly toxic materials (S23A)*
12. *Unguarded Rotating equipment*
13. *Working over/near water*
14. *Underground (high energy) utilities*
15. *High hazard underground contaminants*
16. *Unexploded ordnance / reactive materials*
17. *Line of fire*
18. *High hazard topography/terrain*

If the answer is yes, information about the control measures must be detailed on the significant hazard page.

Are these plans in place: YES NO

Who logged the HRA alert into the EHS SharePoint?

Hazards Checklists

Checklist B Physical Hazards (Note: Asterisk denotes HRA)			
Item	**Subject**	**No**	**Yes (add comments below)**
A	Hazardous Terrain, Topography		
B	Overhead obstructions		
B1	If yes, has an OHOP been prepared?		
C	Underground obstructions (e.g. electric, water, gas, cable)		
C1	Will intrusive activities be performed?		
C2*	Will an intrusive activity be performed within 15 feet of an identified electrical, gas or buried process line		
C3	If yes, review Underground Obstructions SOP and complete flow chart.		
C4	If Geophysics will not be accomplished, the Project Director must complete the variance process by signing the variance in Preproject Implementation Checklist.		
D*	Is elevated work (over 5 feet) to be performed?		
D1	Has a fall protection plan been developed?		
D2	Has a rescue plan been developed?		
E	Excavation, Trenches		
E1*	If yes, will it be necessary to enter an excavation >4' deep?		
E2	Who is the competent person?		
E3	How will the excavation be sloped/shored/barricaded?		
F	Will heavy equipment be used?		
F1	Equipment should be inspected under both static and loaded conditions.		
G	Traffic (flow and congestion)		
G1	If yes, has this been discussed with the contractor?		
G2	What requirements will there be for spotters?		

Hazards Checklists

Checklist B Physical Hazards			
Item	**Subject**	**No**	**Yes (add comments below)**
H	Slip, Trip, or Fall Potential		
I	Weather (heat, ice and rain)		
I1	Has heat stress or cold stress been identified?		
J*	Rigging, Suspended Loads		
J1	If yes, who is the qualified rigger?		
K*	Confined Space Activity		
K1	If yes, who will develop the CSE entry requirements (e.g., LOTO, air monitoring) and complete the CSE permit?		
K2	If yes, has a rescue team been trained and notified?		
L	Heat/ignition sources (powered tools, torches, lamps)		
L1*	Will it be necessary to perform Hot Work?		
M	Explosion potential (static, vapor, storage)		
N	Is there a potential for a fire?		
O	Rotating Equipment/Moving Parts		
O1*	Will personnel be exposed to unguarded rotating/moving parts?		
O2	What additional guards can be installed to minimize exposure?		
P	Pinch Points		
Q	Drill Rigs		
Q1	If a drill rig will be used, does the potential exist to encounter flammable/combustible gases (methane, etc.?)		
Q2	If the answer to Q2 is “yes” specify what type of Combustible Gas Indicator will be used, how often and where the monitoring will take place, and the action limit.		
R	Will there be work over / adjacent to water?		

Hazards Checklists

Checklist B Physical Hazards			
Item	**Subject**	**No**	**Yes (add comments below)**
R1*	Will the work require the use of a boat?		
S	Will drum handling be performed?		
T	Are there any noise sources?		
U*	Will there be any use of high pressure water (>3626 PSI) or steam?		
V*	Will there be work performed on electrical systems?		
V1	If yes, has a Lock-out/Tag-out procedure been developed?		
W	Will it be necessary accomplish a line break?		
W2*	If yes, what material is in the pipe or line? Is it defined as a "Hazardous Process"?		
X	What hand safety concerns are associated with the scope of work?		
X1	What hand PPE is required?		
X2	Is there special tool(s) to be used to reduce the hand safety hazard?		
X3	Are additional precautions, techniques, etc. to be used?		
Y	What ergonomic concerns are associated with the scope of work (i.e., lifting, repetitive motion, materials handling)?		
Z	What hand or power tools will be used?		
Z1	Who will perform initial inspection of hand tools?		
Z2	Who will perform initial inspection of power cords and GFCIs?		
ZZ	What is the audit requirement for this project based on project duration (< or > 2 weeks)? Note: A minimum of one audit is required for EVERY project regardless of project length.		☐ Self Audit ☐ Scheduled Audits
ZZ1	Who will develop the required audit schedule?		

Hazards Checklists

Checklist C Chemical Hazards			
Item	**Subject**	**No**	**Yes (add comments below)**
A	Are contaminants present (most recent data)?		
B	What are the concentration levels?		
C	Do routes of exposure include inhalation, ingestion, and dermal absorption?		
D	Are there PPE requirements or is PPE required for a specific task to be conducted (e.g., mixing materials that could cause exposure to dust or a splash hazard)? If yes, what are the levels of protection? (Specify Levels A, B, C, D, or modified D.)		
E	Are there air monitoring requirements?		
F	Is there a potential that respirator use will be required to complete this work?		
F1	If so, list the names of the individuals who will wear respirators and be prepared to provide documentation of fit tests and medical clearances.		
G	Are there hazardous products to be used in the execution of the work?		
G1	Are Safety Data Sheets available and have they been reviewed?		
G2	Will chemical addition or treatment be performed?		
G3	Will the use of any products or materials result in heat generation or off-gassing?		
H	Will sample preservatives be prepared in the field?		
I	Will mixtures (e.g., grout, chemical addition) be prepared in the field?		
J	Is there proximity to Site Chemical Operations? If yes, specify the hazards if exposed to these operations.		
K	Are plant area orientations required?		
L	Are additional permits/notifications required?		

Hazards Checklists

Checklist D Other Hazards or Concerns				
Category	**Item**	**Subject**	**No**	**Yes (add comments below)**
Biological Hazards	**A**	Are there biological hazards present (e.g., poisonous plants, vectors, wild animals, snakes, ticks, bees)?		
Communications	**B**	Have adequate means of communication been established (cell phones, plant radios, etc.)?		
	B1	Means of communication with facility?		
	B2	Means of communication between field team members?		
	B3	Have cell phone numbers been exchanged as appropriate?		
	B4	Is there an emergency communications plan in the event of a UO with injury? How will help be notified? Who will be notified?		
	B5	How will site on-site and/or outside emergency responders know where you are located in the field?		
	B6	How will you determine if the injured party can be transported by you or if you should wait for emergency responders?		
	B7	Has a copy of a stand-alone emergency contact information sheet been prepared to be placed in each site vehicle?		
Lone Worker	**C**	If there are circumstances where individuals must work alone?		
	C1	Has a buddy system been developed for the work?		

Hazards Checklists

Checklist D Other Hazards or Concerns				
Category	**Item**	**Subject**	**No**	**Yes (add comments below)**
Lone Worker	C2	Have adequate provisions regarding check in and communication been made to assure individual safety?		
Other Hazards	**D**	Are there any other hazards applicable to the fieldwork being performed?		
Management of Change	**E**	Do all parties understand the importance of and the process to identify and/or manage changing field conditions?		
Unexpected Occurrences	**F**	Do all parties understand the definition of an Unexpected Occurrence and are they familiar with the expected reporting and investigation process?		

Appendix D

PIONEER IIPP APP

Text, Tables, and Figures Only

(Appendices available upon request)

Injury & Illness Prevention Plan & Accident Prevention Plan

Health and Safety Plan

Prepared by:

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List of Acronyms

Acronym	Explanation
APP	Accident Prevention Plan
CCR	California Code of Regulation
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
H&S	Health and Safety
IIPP	Injury & Illness Prevention Plan
JSA	Job Safety Analysis
L&I	Labor and Industries
Near-Miss	An accident that did not, but could have, resulted in a serious injury to an employee
OSHA	Occupational Safety & Health Administration
PIONEER	PIONEER Technologies Corporation
PM	Project Manager
PPE	Personal Protective Equipment
PSA	Project Safety Analysis
SHE	Safety, Health, and Environmental
SOP	Standard Operating Procedure
SSO	Site Safety Officer
WAC	Washington Administrative Code
WISHA	Washington Industrial Safety and Health Act

SECTION 1: INTRODUCTION

1.1 Purpose

The PIONEER Technologies Corporation (PIONEER) Injury and Illness Prevention Plan/Accident Prevention Plan (IIPP/APP) is a part of the PIONEER Health and Safety (H&S) Program. The purpose of this IIPP/APP is to document the PIONEER corporate plans for preventing accidents, illnesses, and injuries. The IIPP/APP was developed to meet the requirements of an Injury and Illness Prevention Plan (California) and Accident Prevention Plan (Washington) in compliance with the following regulations:

- California Occupational Safety and Health Act mandated by Title 8 of the California Code of Regulations (CCR) Section 3203; and
- Washington Industrial Safety and Health Act (WISHA) regulations Washington Administrative Code (WAC) 296-800-140.

The H&S program for field work is regulated in Washington State under the following:

- WAC 296-155 Safety Standards for Construction Work
- WAC 296-800-160 Personal Protective Equipment
- WAC 296-842 Respirators
- WAC 296-843 Hazardous Waste Operations

The H&S program for office work is regulated in Washington under WAC 296-800 Core Rules and includes the following principles:

- Provide a workplace free from recognized hazards.
- Provide and apply the tools for a safe workplace.
- Prohibit employees from entering or working in an unsafe workplace.
- Construct a safe workplace.
- Prohibit alcohol and narcotics from the workplace.
- Prohibit employees from using tools and equipment that are not safe.
- Establish, supervise, and enforce rules effective in practice that lead to a safe and healthy work environment.
- Control chemical agents.
- Protect employees from biological agents.
- Discuss employee participation in any WISHA related practices.
- Acknowledge employee refusal options to perform dangerous tasks without fear of discrimination (e.g., dismissal, demotion, loss of seniority, denial of a promotion, harassment). See WAC 296-360, Discrimination pursuant to RCW 49.17.160, for a complete description of discrimination and the responsibility to protect employees.

1.2 PIONEER Corporate Commitment to Safety

PIONEER values employee safety and developed this program as a tool for injury, illness, and accident prevention. Safety is a core value at PIONEER. This is demonstrated by a commitment to ensure employee safety through training, planning, and continually evaluating and improving safety procedures. In addition, PIONEER focuses on safety for all projects regardless of the size or scope of the

work and prioritizes safety over production and schedule. PIONEER will continually strive to engage management and employees in identifying and eliminating hazards that may develop during work activities.

PIONEER is committed to employee safety and injury/accident prevention. All employees must comply with the PIONEER corporate safety, health, and environmental (SHE) policies, which are provided in Appendix A and are summarized in the following table.

Policy Name	Summary	Applicability		
		PIONEER Office	Field Work	Travel
PTC-SHE-1: Disciplinary Policy	Outlines basic safety rules and provide appropriate consequences for failure to follow safety rules.	X	X	X
PTC-SHE-2: Electrical Safety Awareness, Ground Fault Protection, and Lockout/Tagout Policy	Identifies the procedures for electrical safety awareness, ground fault protection, and lockout/tagout.	X	X	
PTC-SHE-3: Fatigue Management Policy	Identifies the procedures intended to reduce the risk of fatigue-related incidents in the workplace.	X	X	X
PTC-SHE-4: Fire Protection and Extinguishers Policy	Identifies how PIONEER manages fire risks during work activities.	X	X	X
PTC-SHE-5: First Aid Policy	Identifies the rules and guidelines for providing quick and effective first aid to employees.	X	X	X
PTC-SHE-6: Fit for Duty Policy	Identifies PIONEER's Fitness-For-Duty requirements.	X	X	X
PTC-SHE-7: Waste Management Policy	Establishes systems for managing and documenting all wastes generated during field activities at jobsites where PIONEER is responsible for waste management.		X	
PTC-SHE-8: Hand and Power Tools Policy	Identifies the practices and requirements for the safe operation and maintenance of hand and portable tools.	X	X	
PTC-SHE-9: Hazard Communication Policy	Ensures that employees are aware of the dangers posed by the use of hazardous chemicals that may be encountered during investigations and/or remediation activities.		X	
PTC-SHE-10: Hazardous Waste Operations and Emergency Response Policy	Establishes work place policies, practices and procedures that employees must follow while working at hazardous waste sites.		X	
PTC-SHE-11: Ladder Safety Policy	Provides the minimum safety requirements for protecting employees from potential injuries associated with the use of portable and fixed ladders.	X	X	
PTC-SHE-12: Noise Exposure and Hearing Conservation Policy	Provides the minimum safety requirements for protecting employees from the potential effects of excessive noise exposure, and complies with WISHA Hearing Loss Prevention Rule WAC 296-817.	X	X	
PTC-SHE-13: Personal Protective Equipment Policy	Establishes policies to protect employees from exposure to work place hazards through the use of personal protective equipment (PPE) during field work activities at PIONEER jobsites.		X	
PTC-SHE-14: Bloodborne Pathogens Policy	Outlines the control measures used to prevent bloodborne infections and diseases by eliminating or minimizing employee exposures.	X	X	X

Policy Name	Summary	Applicability		
		PIONEER Office	Field Work	Travel
PTC-SHE-15: Spill Prevention/Emergency Response Policy	Identifies the practices and requirements associated with spill prevention and emergency response.		X	
PTC-SHE-16: Subcontractor Management Policy	Establishes the systems and methods by which PIONEER will assure the production of quality deliverables and services from each of its subcontractors.		X	
PTC-SHE-17: Trenching/Shoring/Excavations Policy	Identifies the requirements and safe practices necessary to ensure the safety of PIONEER employees who work around trenching and excavation activities.		X	
PTC-SHE-18: Drug and Alcohol Testing Policy	Identifies prohibited substances, requirements and procedures, safeguards, and disciplinary action.	X	X	X
PTC-SHE-19: Lone Workers Policy	Identifies the practices and requirements for employees working alone during field activities.		X	X
PTC-SHE-20: Driving and Travel Management Safety Policy	Specifies the licensing, driver training, and vehicle collision data collection requirements for PIONEER employees who drive motor vehicles for company business.		X	X
PTC-SHE-21: Behavioral Based Safety Policy	Identifies behavioral based safety practices and requirements to increase safety awareness and encourage people to focus their attentions and actions on safety in order to avoid hazards.	X	X	X
PTC-SHE-22: Confined Space Entry Policy	Provides requirements and guidance to protect employees from hazards associated with Confined Space and Permit-Required Confined Space entry.		X	
PTC-SHE-23: Fall Protection Policy	Provides guidance and requirements for protecting employees from falls and fall-related hazards when working at heights.	X	X	
PTC-SHE-24: DOT HAZMAT Awareness Policy	Provides guidance and requirements to protect human health and the environment from hazards associated with shipping Hazardous Materials.		X	
PTC-SHE-25: Manual Lifting Techniques Policy	Provides guidance and requirements to protect employees from the hazards of improper lifting techniques and overexertion during manual material handling.	X	X	
PTC-SHE-26: Remote Work	Identifies the best practices for a healthy remote work environment to maximize productivity and efficiency, reduce risk of fatigue and discomfort, and maintain work-life balance.	X		
PTC-SHE-27: Wildfire Smoke Response Plan	Provides guidance and requirements for protecting employees from wildfire smoke and air pollution hazards when working outdoors.		X	
PTC-SHE-28: Outdoor Heat	Provides guidance and requirements for protecting employees working outside in elevated outdoor temperatures.		X	

1.3 Health and Safety Goals

PIONEER is committed to achieving zero injuries and strives for safety, health, and environmental excellence. The following are H&S goals for 2023:

- Conduct an emergency training drill at the office to cover potential emergency situations.

- Perform ergonomic evaluations for all work spaces at the PIONEER office.
- Conduct quarterly safety meetings with the PIONEER field team to share learnings from completed field events, coordinate and prepare for upcoming fieldwork, and discuss emerging topics.

SECTION 2: ROLES, RESPONSIBILITIES, AND PROGRAM IMPLEMENTATION

2.1 Roles and Responsibilities

The following safety guidelines apply to all PIONEER work activities:

- Never perform a task that may endanger your own safety and health; the safety and health of coworkers, subcontractors, or the public; or damage the environment.
- Management and employees are expected to work together as a team to keep the workplace safe and healthy.
- Tasks should not be performed which violate safety rules or risk injury/illness to complete a job.
- Employees are required to comply with company safety rules and participate in safe workplace accommodations.
- Management will devote the necessary resources to develop a system for identifying and correcting hazards.
- Employees are subject to random drug and alcohol testing in accordance with the PIONEER Drug and Alcohol Testing Policy (PTC-SHE-18; see Appendix A).
- Management will plan for any foreseeable emergencies and provide initial and ongoing employee training.
- Management will acknowledge employees that identify safety hazards, stop work to address a changed condition, add value to the safety program, or contribute to safety audits. Acknowledgements may include rewards given to employees to communicate management's commitment to employee safety, reinforce H&S importance, and provide incentives for active employee participation in H&S.

2.1.1 Administrator

Kevin Gallagher is the IIPP/APP Administrator and has the authority and responsibility to implement the provisions of this program.

2.1.2 Management

Managers, supervisors, and lead personnel must implement and maintain the IIPP/APP in the work area and answer any questions that employees may have about the H&S Program. Management is responsible for ensuring that all safety and health policies and procedures are clearly communicated and understood by all employees.

Other management H&S responsibilities include:

- Ensuring sufficient employee time and funding for safety equipment, training, and safety program implementation.
- Informing employees of the IIPP/APP provisions during the Health and Safety Plan (HASP) review.
- Evaluating employee safety performance.
- Recognizing and acknowledging safe and healthful employee work practices.

- Ensuring incident or near-miss investigation and corrective action to prevent reoccurrence of hazardous conditions or behaviors.
- Providing injury and illness record maintenance and post incidents.
- Following established safety rules and attend required training.
- Ensuring H&S program audits are conducted to verify H&S effectiveness.
- Answering worker questions about the IIPP/APP.
- Enforcing safety rules fairly and uniformly.

2.1.3 Employee

All employees are responsible for using safe work practices, for following all directives, policies and procedures, and for assisting in maintaining a safe work environment.

Employee H&S responsibilities include:

- Taking personal responsibility for individual and co-worker health and safety.
- Participating, developing, and reviewing fieldwork HASPs and Project Safety Analyses (PSAs).
- Stopping work and evaluating unplanned events and changed conditions such as:
  - Introduction of new substances, processes, procedures, or equipment that present potential new hazards in the workplace.
  - Recognition of new or previously unidentified hazards.
  - Occurrence of occupational injuries and illnesses.
  - Evaluation of hazards, processes, operations, or tasks not previously conducted by permanent or intermittent employees.
- Following program safety rules and documenting safety training.
- Reporting unsafe conditions or actions to management promptly.
- Reporting all injuries to management promptly regardless of level of seriousness.
- Reporting all near-miss incidents to management promptly.
- Maintaining PPE in good working condition.
- Encouraging co-workers by words and examples to use safe work practices on the job.
- Suggesting to management any changes for employee safety improvements.

2.1.4 Site Safety Officer

Site Safety Officers (SSOs) are responsible for overseeing the safety of daily field operations and implementing IIPP/APP provisions in the field. SSOs are qualified individuals designated by management and approved by the IIPP/APP Administrator. All SSOs must have Occupational Safety and Health Administration (OSHA) 29 CFR 1910.120(e)(4) 8-hour supervisor training and be first aid and CPR certified. All SSOs must be knowledgeable in general industry and construction standards and have a fundamental understanding of project-specific HASPs and this IIPP/APP.

2.2 Fit for Duty

PIONEER is committed to providing a drug-free, healthy, and safe workplace. To achieve this goal, employees are required to report to work fit to perform their jobs in a satisfactory manner.

2.3 Health and Safety Implementation and Compliance

The IIPP/APP is intended to improve workplace health and safety by encouraging good management and employee involvement. Managers and lead personnel are expected to enforce safety rules fairly and uniformly. Employees are responsible for safe work practices, directive, policy and procedure implementation, and safe work environment maintenance. The following system is in place to ensure employee compliance and maintain a safe work environment:

- Inform employees of the IIPP/APP provisions and read and sign the IIPP/APP Form 1-Compliance Agreement (see Appendix B).
- Evaluate employee safety performance.
- Recognize employee performance of safe and healthful work practices.
- Discipline employee non-compliance of safe and healthful work practices.
- Conduct and assess field audits of workplace compliance.

The PIONEER Administrator or SSO is responsible for implementing the IIPP/APP provisions in the office and in the field. Managers and personnel are responsible for maintaining the IIPP/APP in personal work areas and field work sites to ensure safe work practices and maintain a safe work environment. PIONEER will provide employees with the proper safety and health policies and procedures to ensure a safe work environment. The Standard Operating Procedures (SOPs) for fieldwork are implemented on a site-specific basis.

2.4 Health and Safety Committee

PIONEER management and personnel meet monthly to discuss health and safety topics. PIONEER management and employees collaborate to identify safety problems and develop solutions using the following guidelines:

- Discuss identified safety issues.
- Encourage safe work practices among co-workers.
- Conduct regularly scheduled monthly safety meetings.

A safety topic is selected by each employee and presented during monthly safety meetings. This ensures active participation of all PIONEER employees.

The PIONEER Safety Committee meets quarterly to discuss the H&S Program effectiveness and improvements. The 2023 PIONEER Safety Committee consists of the following people:

- Corporate Management Representative - Brad Grimsted
- Corporate H&S Manager and IIPP/APP Administrator – Kevin Gallagher
- Project Management Representative – Joel Hecker
- Project Management Representative – Eric Grimsted
- Employee Representative – Melisa Kegans
- Employee Representative – Stephanie Herrera
- Employee Representative – Ruth Stevenson
- Employee Representative – Thom Barrett

- Employee Representative – James Witt

SECTION 3: SAFETY COMMUNICATIONS

The PIONEER approach to safety-related communication is intended to facilitate a continuous flow of health and safety information between all affected personnel. The following communication system is designed to facilitate two-way communication between management and employees:

- New worker safety orientation to include site-specific H&S policies and procedures.
- HASP review and task-specific PSA for every project.
- Monthly safety awareness meetings.
- Investigational review of accidents, injuries, and exposures to hazardous substances.
- Stop work authority is issued to all employees in the event of changed conditions, injury, illness, or safety protocol violations.
- SSO daily site walks to ensure effectiveness.
- Daily tailgate meetings to discuss specific health and safety procedures.
- Non-English speaking site workers will be provided an effective translation of communication of H&S concerns between workers and supervisors.
- Site workers with workplace hazard concerns are encouraged to contact Kevin Gallagher via phone (360.570.1700) or email (gallagherk@uspioneer.com).

Employees must follow these basic safety rules:

- Never do anything unsafe in order to get the job done. If a job is unsafe, stop working and report it to the SSO.
- Use the appropriate PPE when required.
- Obey all safety warning signs.
- Clean up spills immediately to prevent accidents.
- Use evacuation map route to exit the workplace in an emergency.
- Know designated emergency assembly location outside of the building.
- Know the location of fire extinguishers, first aid kit, and emergency phone numbers.
- Follow earthquake emergency guidelines to drop, cover, and hold.

The IIPP/APP Administrator will provide or coordinate safety orientations for all employees. In the event of field work, a PSA leader will provide or coordinate job-specific safety orientations for all employees.

3.1 Reporting Injuries and Unsafe Conditions

All personal injuries that occur on the job must be reported as soon as possible to the IIPP/APP Administrator and Project Manager (PM). The SSO will provide employees with the location of the first aid kit. Emergency contact information is located in the site-specific HASP. Report an unsafe working condition and/or practice to the SSO in the field, immediately.

Any unsafe acts or conditions that are observed must be reported to the IIPP/APP Administrator and SSO, who will make efforts to correct the situation. The PM will be notified of the situation and will assist in the response and implementation of additional corrective actions, as needed.

3.2 Safety Meetings

Safety awareness is discussed daily during field work. Topics include H&S issues and practices to maintain a safe work environment. Meeting minutes and a list of participants will be recorded to document that the meetings occurred (see Appendix C). The PIONEER Safety Committee meets monthly to discuss the H&S Program effectiveness and improvements (see Section 2.4).

SECTION 4: HAZARD ASSESSMENT & CONTROL

4.1 Hazard Assessment

A hazard is any condition in the workplace that can potentially cause occupational injury, death, or disease. PIONEER is committed to identifying hazards, assessing risks, and eliminating/controlling exposures. Therefore, each field project will include the following:

- A comprehensive HASP that describes PIONEER policies and procedures for identifying and eliminating exposure to hazards. Each HASP will meet the requirements of OSHA's Hazardous Waste Operations and Emergency Response (HAZWOPER) Standard, 29 CFR 1910.120.
- A comprehensive written assessment of task-specific and process-specific hazards (henceforth referred to as hazard assessment) will be completed prior to the start of work. Hazard assessment will typically be accomplished through the completion of a PSA and may be replaced and/or supplemented through the addition of Job Safety Analyses (JSAs; also known as job hazard analyses) at the discretion of the IIPP/APP Administrator. The PSA will serve as a vehicle to identify, discuss, and propose controls for potential hazards (see Appendix D). Key personnel involved in the project will be required to participate in the PSA in an attempt to comprehensively identify and control hazards. At a minimum, all individuals involved in a field effort, including subcontractors, will be required to review the PSA prior to the start of work.

The hazard assessment process (i.e., PSA and/or JSA) will also fulfill the WAC requirement to identify hazards and determine if PPE is necessary on the job (WAC 296-800-16005). Additional hazard assessments will be completed when new substances, processes, procedures, personnel, or equipment are introduced into the workplace.

4.2 Hazard Prevention Control

Site hazards and risks are controlled using one or more of the control measures listed below (in order of preference):

1. Elimination involves physically removing a hazard. It is the most effective method of control.
2. Substitution involves replacing something that causes a hazard with something that does not.
3. Engineering Controls involve isolating workers from hazards. It does not eliminate a hazard.
4. Administrative Controls involve changes to work practices (e.g., employee training).
5. PPE involves workers wearing protective equipment. PPE is the least effective method of hazard control because if the equipment fails workers are exposed to the hazard.

4.2.1 Identify and Control Workplace Hazards

PIONEER is committed to eliminating or controlling workplace hazards that could cause injury or illness to our employees. Potential hazards to PIONEER employees would primarily be encountered during work at hazardous waste sites; however, employees may experience ergonomic-related injuries of improperly appointed computer workstations. An initial workstation ergonomic assessment and

overview of good working positions will be provided during new employee orientation. Employees are encouraged to communicate ergonomic concerns to management.

A project-specific HASP will be developed that identifies all potential hazards and control procedures to be implemented during work at hazardous waste sites. The HASP will include work procedures that effectively prevent employee exposure to a hazard when eliminating the hazard (which is the preferred procedure) or engineering controls are not possible. Where work procedures alone are not fully effective, employees will be required to use PPE (e.g., safety glasses, hearing protection, and foot protection). PIONEER employees will be required to read and sign the HASP before performing any site work.

Daily safety tailgate meetings will be conducted during site work and PIONEER employee attendance will be required. Employees arriving late will be briefed on the contents of the meeting before beginning work. Facilities and equipment will be designed to eliminate employee exposure to hazards.

PIONEER will evaluate employee computer workstations and provide the necessary equipment (e.g., chair, foot rest, wrist support) to prevent ergonomic-related injuries. Employees will be encouraged to report any work station related discomfort to management or safety committee member to remedy a possible work-related injury.

4.2.2 Basic Safety Rules

The following basic safety rules have been established to make PIONEER a safe and efficient workplace. Failure to comply with these rules will result in disciplinary action. The basic safety rules are in addition to hazardous waste site safety rules and include the following:

- Never do anything that is unsafe in order to get the job done. If a job is unsafe, report it to management or a safety committee representative. We will find a safer way to do the job.
- Never operate a piece of equipment unless trained and authorized to do so.
- Use PPE whenever it is required.
- Never work under the influence of alcohol or illegal drugs as using them at work is prohibited.
- Do not bring firearms, explosives, or weapons onto company property.
- Smoking is only permitted outside the building away from any entry or ventilation intake.
- Good housekeeping helps prevent injuries.

4.2.3 Identify and Manage Field Changes

A field change is a change to the project scope of work, schedule, workforce, control measures, and/or work activities (including tools and equipment) identified during pre-project planning. When a project is being implemented and the site is full of activity, it may be difficult to notice field changes.

Good observation techniques are based on looking at things from every perspective, and comparing what you see with what you expect to see. The 20-20-20 Rule is an important observation technique that is designed to help employee's notice field changes by reminding them to focus on safety:

- Every 20 minutes,

- Take 20 seconds, and
- Look 20 feet around you in every direction.

When a field change is identified, immediate action must be taken to stop work and report the changed condition to the IIPP/APP Administrator and SSO. See Section 3 of the IIPP/APP for information on stop work authority and reporting unsafe conditions.

4.2.4 Personal Protective Equipment

Some tasks require an employee to use PPE to protect against injury. The project-specific HASP will outline the PPE requirements and the directions for proper use and maintenance.

PIONEER employees may occasionally participate in work at sites where the use of respirators is required. This is expected to be an infrequent occurrence; however, all employees who are required to use a respirator at any time must be familiar with and comply with the provisions of the PIONEER Respiratory Protection Program (see Appendix E). Where respirator use is required, PIONEER will provide the proper respirator(s), training, fit testing, and medical monitoring at no cost to the employee.

Working in extreme hot or cold temperatures for a long period of time can cause severe health damage, such as heat exhaustion and hypothermia. PIONEER employees who conduct work outside must be familiar with the provisions included in the Outdoor Heat Policy and the Wildfire Smoke Response Plan (PTC-SHE-27 and PTC-SHE-28; see Appendix A).

4.2.5 Heat and Cold Stress Management

4.2.5.1 Heat Stress

Employees working in extreme hot temperatures or with semipermeable or impermeable protective clothing for long periods of time may be at risk of heat stress, which can result in occupational illnesses and injuries such as heat exhaustion. Heat exhaustion is a condition that results from the body being less able to cool itself efficiently. Symptoms of heat exhaustion may include dizziness, nausea, headache, muscle cramps, and cool/moist skin. If left untreated, heat exhaustion can lead to heat stroke, which is the most serious heat related condition and occurs when the body's temperature regulation fails and body temperature rises to critical levels. Symptoms of heat stroke may include, confusion, irritability, fainting, and red and dry skin. Untreated heatstroke can quickly damage the brain, heart, kidneys and muscles.

Best Practices for Preventing Heat Stress

- Stay hydrated by regularly drinking plenty of cold fluids.
- Follow a work/rest regimen that includes an available shelter to cool off as needed.
- Wear appropriate protective clothing made up of materials that are lightweight or wick sweat.
- Keep skin covered as much as possible and apply sunscreen of SPF 30 or greater.
- Use cooling vests or headbands.

4.2.5.2 Cold Stress

Employees working in cold or windy environments for long periods of time may be at risk of cold stress, which can result in occupational illnesses and injuries such as hypothermia. Hypothermia is a condition that occurs when the body is no longer able to produce heat and body temperature falls to critical levels. Symptoms of hypothermia may include shivering, fatigue, confusion, and blue skin. Prolonged exposure to cold may also result in frostbite. Frostbite is an injury to the body that is caused by freezing, and most often affects the nose, ears, cheeks, chin, fingers, or toes. Symptoms of frostbite may include tingling, numbness, and bluish or pale skin.

When this prolonged exposure is combined with a wet environment, employees may also be at risk of trench foot. Trench foot, also known as immersion foot, is an injury that occurs when the feet are wet for long periods of time, and results in the death of surface tissue. Symptoms of trench foot may include reddened skin, numbness, swelling, tingling, and blisters.

Best Practices for Preventing Cold Stress

- Minimize activities that reduce circulation for prolonged periods of time (e.g., sitting or standing).
- Stay hydrated by regularly drinking plenty of warm fluids.
- Follow a work/rest regimen that includes an available shelter to warm up as needed.
- Wear appropriate protective clothing with a minimum of three layers to assist in retaining body heat and adapting to changes in weather and level of physical exertion.
    - An outer layer to break the wind and allow some ventilation (e.g., nylon or Gore-Tex).
    - A middle layer to absorb sweat and retain insulating properties when wet (e.g., wool or synthetic pile).
    - An inner layer to allow ventilation and escape of perspiration
- Protect exposed skin and body parts such as ears, face, hands, and feet (e.g., hats, gloves, and insulated boots).

4.2.6 Lone Workers

Field personnel will implement the use of the buddy system or have a means of communication (i.e., cell phones, two-way radios, satellite phones) available to maintain contact with other personnel for emergency purposes. Working alone at field sites will be minimized to the extent feasible. If working alone is necessary, an alternate method of maintaining contact with others must be used. If working alone is necessary, the following applies:

Arrangements will be stated in written plan (i.e., this HASP, PSA).

- The degree of contact required with a lone worker is directly proportional to the degree of hazard to which the worker is exposed.
- Points of contact may include contractors, security, or other reliable individuals. Contact will occur at intervals agreed upon prior to the field activity.
- Employees selected for potential lone worker assignments will be competent to carry out tasks independently. The SSO will involve the PM in decisions regarding whether it is believed that

the employees selected have sufficient training for and familiarity with the assignment to be able to work with minimal guidance or oversight.

4.2.7 Safety Inspection Procedures

PIONEER is committed to identifying hazardous conditions and practices likely to result in employee injury or illness. Prompt action will be taken to eliminate potential hazards. In addition to reviewing injury records and incident investigation causes, management and the safety committee will regularly check work place hazards. In addition, hazardous waste site work audits will be conducted at least once during site work lasting for more than one week in duration. A walk through safety audit of the worksite will occur. The auditor will complete IIPP/APP Form 5 – Safety Audit Form to document and verify work is conducted in accordance with the site-specific HASP (see Appendix B). The audit results will be used to eliminate or control obvious hazards.

4.3 Record Keeping and Review

Employees are required to report any injury or work-related illness to their immediate supervisor regardless of how serious. The employee must use IIPP/APP-Form 2 – Employee Injury or Illness Report Form. All incident and accident forms pertaining to personal injury and illness are presented in Appendix B.

The Safety Committee will:

- Investigate a serious injury or illness using procedures in Section 4.2 - Serious Incidents.
- Complete an IIPP/APP Form 3 – Accident Investigation Report (see Appendix B).
- Submit the Injury/Illness/Near-Miss Report and the Incident Investigation Report to management.

Management will:

- Determine from the employee's report, Incident Investigation Report, and any workmen's compensation claim form associated with the incident, whether the incident must be recorded on the OSHA Injury and Illness Log and Summary (OSHA Form 300A; see Appendix F).
- Enter a recordable incident within six days of company awareness.
- Enter non-recorded OSHA incidents into a separate incident log, used to record non-OSHA recordable injuries and near-misses.

Management will post a signed OSHA Form 300A for the previous year on the safety bulletin board each February 1 through April 30. The log will be kept on file for at least five years. Upon request, an employee can view an OSHA log any time during the year.

SECTION 5: ACCIDENT & EXPOSURE INVESTIGATIONS

5.1 Accident or Exposure Investigations

Investigation of workplace accidents, hazardous substance exposures, and near-accidents will be completed by the IIPP/APP Administrator, SSO, and/or PSA leader. The investigation procedure will include a site visit, an interview of affected workers and witnesses, an examination of workplace factors associated with the accident/exposure/near-accident, and corrective actions to eliminate reoccurrence and improve overall business operations. This process will provide the critical information to prevent and control hazards and potential accidents in the workplace. Accident and exposure investigations will be documented on IIPP/APP Form 3 – Accident Investigation Report. Near-miss incidents will be documented on IIPP/APP Form 4 – Unexpected Occurrence and Near-Miss Report (see Appendix B).[1,2]

5.2 Serious Incidents

An incident is considered serious if an employee dies while working or is not expected to survive, or if any employee is in-patient hospitalized as a result of a work-related incident. In the event of a serious incident in Washington State, management will contact the Department of Labor and Industries (L&I) within 8 hours after becoming aware of the incident. The toll-free notification number is (800) 423-7233. Fax and answering machine notifications are not acceptable. Management will report the employer name, incident location and time, number of involved employees, a brief incident description, and the name and phone number of a contact person.

When a serious incident occurs, an investigation will be conducted by an investigation team consisting of management, a safety committee member, and any other person whose expertise would help the investigation.

The investigation team will take written statements from witnesses, and photograph the incident scene and equipment involved. As soon as possible after the incident, the team will document the condition of equipment and any relevant information in the work area. The team will provide a written "Incident Investigation Report" of the findings. The report will include sequential events prior to the incident, conclusions about the incident and any recommendations to prevent future incidents. The report will be reviewed by the safety committee at the next regularly scheduled meeting.

5.3 Non-Serious Incidents and Near-Miss Incidents

When management becomes aware of an employee incident not serious enough to warrant a team investigation as described above, management will complete IIPP/APP Form 3 – Accident Investigation

[1] The DuPont CRG SHE-0-11 Unexpected Occurrence Reporting procedure will also be completed if an accident or unexpected occurrence takes place at a DuPont site.

[2] The Chemours EHS.03 Unexpected Occurrence Reporting SOP will also be completed if an accident or unexpected occurrence takes place at a Chemours site.

Report. The employee will complete IIPP/APP Form 2 – Employee Injury or Illness Report (see Appendix B). Both reports will be placed in the PIONEER Corporate Health and Safety files.

An incident that did not, but could have, resulted in a serious injury to an employee (a near-miss) will be investigated by management or the safety committee depending on the seriousness of the injury that would have occurred. The investigation findings will be summarized in the IIPP/APP Form 4 – Unexpected Occurrence or Near-Miss Report (see Appendix B). The report will be forwarded to the IIPP/APP Administrator for review.

SECTION 6: EMERGENCY PLAN

An evacuation map for the PIONEER office building is posted on the corporate H&S information board in the kitchen and presented in Figure 1. The map shows the exit locations, fire extinguishers, first aid kits, and the emergency employee gathering area outside the building. Project-specific emergency plans for work at field locations are provided in project-specific HASPs.

6.1 In Case of Fire

All employees will receive fire extinguisher use training in the initial orientation. If a fire occurs, follow the guidelines below:

- Tell all adjacent employees immediately.
- Extinguish a small fire (e.g., waste basket fire with minimal smoke) with a fire extinguisher.
- Do not continue to fight the fire if the fire grows or has thick smoke. Call 911.
- Tell other employees in the area to evacuate.
- Meet in the designated gathering area (e.g., designated walkway by mail boxes) outside the building in the center of the parking lot.
- Account for all employees. If an employee is missing, do not re-enter the building! Notify the responding fire personnel that an employee is missing and may be in the building.

6.2 In Case of Earthquake

Follow the guidelines below if an earthquake occurs while in the building:

- Drop under a desk or table, cover head and hold on. Stay away from windows, heavy cabinets, bookcases or glass dividers.
- Check for damage and available evacuation routes, then evacuate to the employee gathering area when the shaking stops.
- Evacuate quickly before aftershocks occur.
- Account for all employees.
- Administer first aid and help evacuate injured employees. Do not attempt to move seriously injured persons unless potential immediate danger could cause further injury.
- Do not re-enter the building once evacuation is complete.
- Do not approach or touch downed power lines or objects touched by downed power lines.
- Do not use the phone except for emergency use.
- Turn on a radio and listen for public safety instructions.
- When outside during an earthquake, employees must move away from the buildings, trees, telephone lines, and electric lines to keep safe.

If on the road during an earthquake, drive away from underpasses/overpasses, stop in a safe area, and stay in the vehicle.

6.3 If an Injury Occurs

Only certified employees shall provide first aid/CPR assistance to injured persons. Current first aid and CPR certified employees are listed on the safety bulletin board, located in the PIONEER office kitchen. Follow the rules and guidelines for providing quick and effective first aid in the PIONEER First Aid Policy (PTC-SHE-5; see Appendix A).

Should an injury occur:

- Do not move injured person unless absolutely necessary.
- Transport the injured person to the nearest health care facility as identified in the project-specific HASP, in the event of a minor injury.
- Call 911, in the event of a major injury.
- Promptly report the incident to management.

It should be assumed that all blood is infectious; refer to the PIONEER Bloodborne Pathogens Policy for more information on bloodborne diseases (PTC-SHE-14; see Appendix A).

Should a bleeding injury occur:

- Wear gloves to prevent exposure to blood or other potentially infectious materials. Gloves are available in the first aid kits.
- Have the injured person help (if able) by applying pressure to the wound.
- Wash immediately with soap and water and report the incident to a supervisor, if exposed to blood while giving first aid.
- Follow the appropriate follow-up procedures initiated by management, including a medical evaluation, counseling, Hepatitis B vaccine, and possible blood testing of the source person. For further information, refer to WAC 296-62-08001(6).

In the event that the eyes or body of any person is exposed to corrosive materials, utilize eyewash facilities to quickly drench or flush the eyes and/or body.

SECTION 7: HEALTH AND SAFETY TRAINING

PIONEER acknowledges the importance of H&S training. All employees will benefit from H&S training through fewer work-related injuries and illnesses, increased productivity, lower costs, and a more cohesive and dependable workforce. All workers will receive training on general and job-specific health and safety practices. Training will occur for all new workers and prior to new job assignments. Training will be performed by the IIPP/APP Administrator or SSO, and will include an explanation of the IIPP/APP, emergency action plans and procedures, project-specific PSA, and PPE requirements.

7.1 Safety Training

Training is essential to ensuring a safe work place at PIONEER. All training records will be maintained in the PIONEER H&S files. The following training courses will ensure proper employee training requirements before beginning work tasks:

Training	Frequency	Who Must Attend
Basic Orientation, including review of IIPP/APP and SHE Policies	Initial/Annual	All Employees
40-hour HAZWOPER	Initial	Employees who will work at hazardous waste sites
8-hour HAZWOPER Refresher	Annual	Employees who will work at hazardous waste sites
8-hour HAZWOPER Supervisor	Initial	Employees who will serve as supervisors at hazardous waste sites
3 days of documented field experience under a qualified supervisor	Initial	Employees who will work at hazardous waste sites
Fire Extinguisher Safety	Initial/Annual	All Employees
Respirator training including annual fit test	Annual	Employees required to use respirators at hazardous waste sites
First Aid/CPR	Biennial	Employees who will serve as SSOs or work at hazardous waste sites
SHE Policy-Specific Training		
Electrical Awareness (PTC-SHE-2)	As necessary	Employees that perform tasks involving electrical work
Fatigue Management (PTC-SHE-3)	Initial/Annual	All Employees
Fire Evaluation Drill (PTC-SHE-4)	Annual	Employees who will work at the PIONEER office
DOT HAZMAT (PTC-SHE-7/PTC-SHE-24)	Every 3 years	Employees who work at hazardous waste sites
Specific training for assigned tasks (PTC-SHE-6)	As necessary	All Employees
Additional on-the-job training (PTC-SHE-8)	As necessary	Employees that are not thoroughly familiar with the equipment and/or written procedures at hazardous waste sites
HazCom training and orientation (PTC-SHE-9)	Initial	Employees who will work at hazardous waste sites
General Lead Awareness Training (PTC-SHE-9)	Initial/Annual	Employees who will work at hazardous waste sites
General Asbestos Awareness Training (PTC-SHE-9)	Initial/Annual	Employees who will work at hazardous waste sites
General Benzene Awareness Training (PTC-SHE-9)	Initial/Annual	Employees who will work at hazardous waste sites
Ladder Safety (PTC-SHE-11)	Annual	All Employees
Noise Exposure Hazard Awareness (PTC-SHE-12)	Annual	All Employees

Training	Frequency	Who Must Attend
Non-Typical PPE (PTC-SHE-13)	As necessary	Employees who will work at hazardous waste sites
Bloodborne Pathogens Policy (PTC-SHE-14)	Annual	All Employees
Site-Specific Emergency Response Plans (PTC-SHE-15)	Initial	Employees who will work at hazardous waste sites
Behavioral Based Safety (PTC-SHE-21)	Annual	All Employees
Fall Protection (PTC-SHE-23)	As necessary, biennial	Employees who may be exposed to fall hazards
Manual Lifting Techniques Policy (PTC-SHE-25)	As necessary	All Employees
Remote Work (PTC-SHE-26)	Initial	All Employees
Wildfire Smoke Response Plan (PTC-SHE-27)	Annual	Employees who will conduct outdoor field work
Outdoor Heat (PTC-SHE-28)	Annual	Employees who will conduct outdoor field work

7.2 Medical Monitoring

Washington (WAC 296-843-210) and California (Title 8 CCR Section 5192) require medical monitoring for individuals who:

- Are exposed to hazardous substances at concentrations exceeding a permissible exposure limit for more than 30 days per year;
- Wear an approved respirator for 30 or more days per year;
- Become injured, ill, or develop signs or symptoms from likely overexposure to hazardous substances; or
- Is a member of a HAZMAT team.

PIONEER does not have a medical monitoring program for employees working at hazardous waste sites because employees have never met any of these criteria. If any of these situations occur, PIONEER will implement an appropriate program and this IIPP/APP will be amended to reflect the change.

7.3 Respiratory Protection Program

A Respiratory Protection Program is required in California (Title 8 CCR Section 5144) and Washington State (WAC 296-842-120) when employees are required to wear respirators. All employees who must wear respirators must review, sign, and follow the procedures in the Respiratory Protection Plan (see Appendix E).

7.4 Disciplinary Policy

Employees are expected to use good judgment and follow established safety rules when working. PIONEER has a disciplinary policy to motivate employees to make corrections to unacceptable behavior, and provide appropriate consequences for the failure to follow safety rules (PTC-SHE-1; see Appendix A). The following consequences apply to the violation of the same rule or the same unacceptable behavior:

- First Instance – verbal warning, notation in employee file, and instruction on proper actions.
- Second Instance – one week suspension, written reprimand, and instruction on proper actions or termination of employment.
- Third Instance – termination of employment.

An employee may be subject to immediate termination when a safety violation places the employee or co-workers at risk of permanent disability or death.

Discipline for drug and alcohol use will be implemented according to the PIONEER Drug and Alcohol Testing Policy (PTC-SHE-18; see Appendix A).

SECTION 8: RECORDKEEPING & DOCUMENTATION REQUIREMENTS

PIONEER is a company with ten or more employees and will implement and maintain the IIPP/APP. Records of scheduled and periodic inspections including the person conducting the inspection, the workplace hazards, and the actions to correct the identified unsafe conditions and work practices will be recorded on IIPP/APP Form 5 - Safety Audit Form (see Appendix B). The inspection forms will be maintained for at least one year.

Documentation of safety and health training for each worker, including the worker's name, training dates, types of training, and training providers will be maintained for at least one year.

Other recordkeeping and documentation provisions will be performed according to task-specific and project-specific plans (e.g., HASPs, PIONEER Respiratory Protection Plan, etc.).

Figures

EXIT

Class A,B,C
Fire Extinguisher

Kitchen 1

Server Room 1

Conference Room

Class B,C
Fire Extinguisher

Attic
Access

Women

Server Room 2

Men

Storage

Changing Room

EXIT

Kitchen 2

EXIT

Class A,B,C
Fire Extinguisher

Class A,B,C
Fire Extinguisher

EXIT

Parking Lot

Storage

Men

Women

EXIT

Class A,B,C
Fire Extinguisher

Reception

EXIT

Emergency
Employee
Gathering
Area

Mailboxes

Parking Lot

Figure 1 - PIONEER Office Evacuation Map

Appendix E

B-5.1
Excavations

1.0 Scope

This procedure describes the safety precautions and protective systems that help protect workers from excavation hazards.

2.0 Definitions

Bell-bottom Pier Hole – A type of shaft or footing excavation in which the bottom is made larger than the cross section above to form a belled shape.

Benching – A system that protects employees from excavation cave-ins by cutting the sides of an excavation to form horizontal levels or steps, with vertical or nearly vertical surfaces between the levels.

Competent Person – For the purposes of this procedure, one who has specific training in soil analysis and the use of protective systems; knows the requirements of OSHA 29 CFR 1926, Subpart P; can identify and predict hazards or working conditions that are unsanitary, hazardous, or dangerous to employees; and is authorized to take prompt corrective measures to eliminate them.

Concrete Breaking – Work performed with hand tools such as jackhammers or mechanical equipment to break or chip concrete floors or walls. This work requires an excavation permit.

Drilling – Work performed above grade with small tools in order to make holes on any "blind" surface above grade.

Excavation – Any manmade cut, cavity, trench, or depression in an earth surface that is formed by earth removal. Work below grade or enclosed line within a floor or wall that could possibly cause contact with piping, conduit, or other obstructions resulting in injury or equipment damage. This work requires an excavation permit.

Hazardous Atmosphere – An atmosphere that is explosive, flammable, poisonous, corrosive, oxidizing, irritating, oxygen-deficient, toxic, or otherwise harmful and may cause death, illness, or injury.

Protective System – For the purposes of this procedure, a method of protecting employees from excavation cave-ins, material that could fall or roll from an excavation face or into an excavation, or the collapse of adjacent structures. Protective systems include support systems, sloping and benching systems, shield systems, and other systems that provide the necessary protection.

Ramp – An inclined walking or working surface made from earth or structural materials such as steel or wood.

Registered Professional Engineer – A person who is registered as a professional engineer in the state where the work is to be performed. For the purposes of this procedure, a professional engineer registered in any state is considered a "registered professional engineer" when approving either designs for manufactured protective systems or tabulated data for interstate commerce.

Shielding – A system that protects employees from excavation cave-ins by erecting a structure that can withstand the forces imposed on it during a cave-in. Shields can be either permanent structures or portable structures that are moved as the work progresses. They can be either premanufactured or job-built in accordance with OSHA 29 CFR 1926.652, Section (c)(3) or (c)(4). Shields used in trenches are usually referred to as "trench boxes" or "trench shields."

Shoring – A metal hydraulic, mechanical, or timber structure that supports the sides of an excavation and is designed to prevent cave-ins.

Sloping – A system that protects employees from excavation cave-ins by forming sides of an excavation that are inclined at an angle away from center. The angle of the incline required to prevent a cave-in varies with differences in soil type, environmental conditions of exposure, and the application of additional weight on the walls from external sources, such as stored excavated materials, operating equipment, or traffic.

Soil Classification – A method of classifying soil and rock deposits as stable rock, Type A, Type B, or Type C (in decreasing order of stability). Categories are based on the properties and performance characteristics of the deposits and on environmental exposure conditions.

Structural Ramp – A ramp built of steel or wood, usually used for vehicle access. Ramps made of soil or rock are not considered structural ramps.

Tabulated Data – Tables and charts from OSHA 29 CFR 1926, Subpart P and Appendices A through E, or tables and charts approved by a registered professional engineer and used to design and construct a protective system.

Trench – A narrow excavation (in relation to its length) made below the surface of the ground. The width of a trench is less than 15 feet (4.6 meters), and the depth is generally greater than its width.

3.0 General

Many excavation accidents are the direct result of inadequate initial planning. The construction engineer is responsible for planning the job. He or she must involve the site's competent person in planning and in all phases of the work. Every effort should be made during the design stage of the excavation to ensure safety by providing the necessary soil classifications and protective systems.

Some state OSHA programs require that the competent person be physically located at the work location when personnel are in an excavation. The construction engineer at each site should be aware of specific requirements in that site's jurisdiction.

3.1 Planning

3.1.1 Site Conditions – Before an excavation begins, the construction engineer must consider specific site conditions such as the following:

- presence of a competent person
- traffic
- vibrations in the vicinity of the worksite
- proximity of structures and their conditions
- soil
- surface water and groundwater
- chemical contamination of soil or water
- water table
- overhead and underground utilities
- weather

If desired, the construction engineer can use the attached sample safety checklist (see Attachment B-5.1-1) to help plan excavation safety.

3.1.2 Minimum Precautions – Before beginning the job, the construction engineer or a designee must initiate an excavation permit. (For a sample permit, see Attachment B-5.1-2.) The permit must be signed by a competent person. Its purpose is to ensure that all interferences that might be encountered during underground digging are identified and located before the work begins. The use of detection equipment is the preferred method for locating underground interferences. One company that provides this service, using the Soft Dig® method, is Underground Services, Inc. (For the company's address and phone number, see section 4.3.)

Where underground electrical interferences are anticipated and all means of positive locating and de-energization have been exhausted, consider additional precautions such as the following:

- Use a fiberglass-handled, round-point shovel for hand digging. The person digging should have adequately rated and currently inspected lineman's gloves and/or must stand on a rubber blanket.
- Provide a Nomex® suit with a hood for the person digging.
- Equip powered tools or equipment (e.g., backhoes or jackhammers) with a ground installed by a qualified electrician.
- Use an additional ground person ("spotter") to watch for and signal the backhoe operator.

3.1.3 Minimum Precautions – Before beginning an excavation, the construction engineer or designee must take the following additional minimal precautions:

- Provide warning vests for employees exposed to vehicular traffic.
- Remove or stabilize all surface encumbrances that create hazards to employees such as trees, spoil dirt, or boulders.
- Erect either warning barricades or rigid, protective barricades to avoid leaving an excavation hazard

unprotected. If warning barricades are used, place them a minimum of 5 feet (1.5 meters) from the excavation edge. A spoil pile at least 3 feet (1 meter) high can be used as a barricade on one side of the excavation. Barricades must be marked with battery-powered flashing warning lights if they are in or near walkways or roadways.

- Provide warning systems such as barricades, hand or mechanical signals, or stop logs to alert operators of mobile equipment that they are approaching the edge of excavations.
- Keep spoil dirt and any material or equipment that may fall into an excavation at least 3 feet (1 meter) from the edge.
- Remove loose rock or soil that could fall from the face of an excavation.
- Protect, support, or remove underground installations (e.g., electrical duct banks, water lines, sewer lines, or fire lines) as necessary to protect employees and the environment.
- Prohibit employees from working or passing under the loads of lifting or digging equipment.
- Provide support systems such as shoring, bracing, or underpinning to ensure the stability of adjoining buildings, walls, or other structures endangered by excavation operations.
- Ensure that a competent person performs inspections of excavations, adjacent areas, and protective systems for evidence of a situation that could result in possible cave-ins, failure of protective systems, hazardous atmospheres, or other hazardous conditions. These inspections must be performed at least daily, and more frequently if conditions warrant. For a sample daily inspection report form, see Attachment B-5.1-3.

3.2 Protective Systems (Sloping, Benching, Shoring, and Shielding)

3.2.1 Choosing Appropriate Protective Systems – For soil depths up to 20 feet (6 meters), soil classification determines the sloping, shoring, and shielding requirements, as explained in sections 3.2.2 and 3.2.3. Soil classification must be performed by a competent person.

Protective systems for excavations deeper than 20 feet (6 meters) must be designed by a registered professional engineer.

Protective systems are not required in the following situations:

- when an excavation is made entirely in stable rock
- when an excavation is less than 5 feet (1.5 meters) deep, and a competent person has examined the ground and found no potential for a cave-in

The competent person must document, on the excavation permit, the basis for any decision not to provide a protective system (see Attachment B-5.1-2, part 6).

3.2.2 Sloping and Benching – When excavating in an area where the soil has been classified, sloping is based on the following three types of soil classification:

- Type A soil includes cohesive soils with unconfined compressive strength of 1.5 tons per square foot (126 kilograms per square meter) or greater (unless the soil is fissured subject to vibration, or has been previously disturbed or subject to other factors that would require it to be classified as a less stable material). When excavating in Type A soil, the maximum allowable slope is 3/4 horizontal to 1 vertical (53°).
- Type B soil includes cohesive soil with an unconfined compressive strength greater than 0.5 tons per square foot (42 kilograms per square meter) but less than 1.5 tons per square foot (126 kilograms per square meter). When excavating in Type B soil, the maximum allowable slope is 1 horizontal to 1 vertical (45°).
- Type C soil includes cohesive soil with an unconfined compressive strength of 0.5 tons or less per square foot (42 kilograms per square meter). When excavating in Type C soil, the maximum allowable slope is 1-1/2 horizontal to 1 vertical (34°).

When sloping and benching protective systems are not based on the soil classifications for Type A, B, or C soils, they must be designed by a registered professional engineer or sloped at an angle no steeper than 1-1/2 horizontal to 1 vertical.

Designs of sloping or benching systems using tabulated data must be in written form, must be approved by a registered professional engineer, and must be maintained at the job site during construction of the protective system.

3.2.3 Shoring and Shielding – For information on timber shoring, refer to OSHA 29 CFR 1926.650. When using hydraulic shoring, trench jacks, air shores, and shields, follow all of the manufacturer specifications, recommendations, and limitations.

All tabulated data must be maintained at the job site during the construction of protective systems. The design of support systems, shield systems, or protective systems (other than a manufacturer's design) must be approved by a registered professional engineer.

When shoring and shielding systems are not based on the soil classifications for Type A, B, or C soils, they must be designed by a registered professional engineer.

3.3 Ensuring the Stability of Adjacent Structures

When the stability of adjoining buildings, walls, sidewalks and pavements, or other structures is endangered by excavation operations, use support systems or other protective measures such as shoring, bracing, or underpinning to ensure their stability and to protect employees.

Do not excavate below the level of the base or footing of any foundation or retaining wall unless the excavation is in stable rock, or unless one of the following precautions has been taken:

- A support system, such as underpinning, is provided to ensure the safety of employees and the stability of the structure.
- A registered professional engineer has determined that the structure is far enough away from the excavation so as not to be affected by the excavation activity.
- A registered professional engineer has determined that such excavation work will not pose a hazard to employees.

3.4 Installing and Removing Protective Systems

Install protective support systems from the top down, and securely connect all components of the support system.

When temporary removal of individual members is necessary, install other structural members to carry loads imposed on the support system.

As soon as the work is completed, dismantle the protective systems, working slowly from the bottom up. Backfilling and removal of support systems must progress together.

NOTE: ***Do not use plywood as a structural member.*** *Use it only for the prevention of local raveling (sloughing of trench faces) between shores.*

3.5 Materials and Equipment

To minimize employee exposure to hazards, follow the manufacturer's recommendations for using and maintaining manufactured materials and equipment.

A competent person must examine all materials and equipment to ensure that they are adequately maintained, free from defects, and suitable for continued use.

3.6 Water Accumulation

Do not work in excavations where water has accumulated or is accumulating unless adequate precautions have been taken to protect employees against the hazards posed by water accumulation.

The competent person must inspect excavations subject to run-offs from heavy rains and monitor for proper use of water-removal equipment.

Use diversion ditches, dikes, or other suitable means to prevent surface water from entering an excavation and provide adequate drainage of adjacent areas.

3.7 Hazardous Atmospheres

Hazards associated with confined space entry apply to many excavations. For more information on confined space entry, see FCSM B-24.1.

A qualified person must test the atmosphere in excavations deeper than 4 feet (1.2 meters) where oxygen deficiency or a hazardous atmosphere could be expected to exist, such as a landfill area or areas where hazardous substances are stored or manufactured, or when the work could create a hazardous atmosphere.

Consider the appropriateness of using respiratory protection, ventilation, and emergency rescue equipment. For more information about respiratory protection, see FCSM E-8.1.

Each employee working in bell-bottom pier holes or

similar deep and confined footing excavations must wear a full-body harness with a securely attached lifeline, and must be attended at all times by a standby who can carry out rescue if necessary. A method of communication must be ensured, and in most cases a mechanical lifting device must be used.

3.8 Access and Egress

Provide safe access and egress for all excavations.

For excavations 4 feet (1.2 meters) deep or more, ladders, steps, or ramps for safe access and egress must be provided within 25 feet (7.6 meters) of lateral travel.

Structural ramps used only for the access or egress of people must be designed by a competent person. Structural ramps for the access or egress of equipment must be designed by a competent person qualified in structural design and must be constructed according to the design. (The competent person mentioned in this paragraph may not necessarily be the excavation competent person.)

When employees or equipment are required or permitted to cross over excavations, walkways or bridges with standard guardrails must be provided. For more information on standard guardrails, see FCSM B-6.1.

3.9 Cathodic Protection Systems

These systems are used to prevent corrosion of certain underground piping. Special cathodes and/or anodes are used to circumvent corrosive damage to the pipeline by use of electrical currents. If these systems are in the vicinity of an excavation, they must be de-energized.

4.0 References

4.1 FCSM B-6.1, *Perimeter and Opening Protection – Floors, Walls, and Roof Edges*

FCSM B-24.1, *Vessel and Confined Space Entry*

FCSM E-8.1, *Respiratory Protection*

4.2 OSHA 29 CFR 1926.650, Subpart P, *Excavations*

4.3 Underground Services, Inc.
P.O. Box 39
West Chester, PA 19381
(215) 696-9220

5.0 For Further Information

5.1 *Construction Standards for Excavations*, The Associated General Contractors of America

ATTACHMENT B-5.1-1

Excavation Safety Checklist

Job Site

	YES	NO	N/A
Prior to starting the job, were utilities notified and underground services located?	☐	☐	☐
Were overhead transmission lines noted and precautions taken to ensure that equipment does not come in contact with them?	☐	☐	☐
Have adequate signs been posted and barricades provided?	☐	☐	☐
Are the workers wearing reflective vests if necessary?	☐	☐	☐
Are vehicles, equipment, and spoil piles correctly placed to allow for the safe passage of traffic and the progress of construction?	☐	☐	☐
Has traffic control (fire departments, etc.) been notified?	☐	☐	☐
Is the appropriate safety gear on site?	☐	☐	☐

Excavation, Concrete Breaking, Drilling

	YES	NO	N/A
Have the supervisors and workers been trained in excavation safety laws and procedures?	☐	☐	☐
Have buildings, utility poles, trees, and any other surface encumbrances or destabilizing forces been taken into consideration?	☐	☐	☐
Has soil classification been done?	☐	☐	☐
Has the appropriate means of safeguarding the excavation by OSHA requirements been determined?	☐	☐	☐
For excavations 4 feet (1.2 meters) deep or more, are ladders, steps, or ramps available within 25 feet (7.6 meters) of lateral travel?	☐	☐	☐
Are spoil piles at least three feet (one meter) from the edge of the excavation and properly sloped?	☐	☐	☐
Have confined-space atmospheric hazards been considered? (For more information on confined-space entry, see FCSM B-24.1.)	☐	☐	☐
Have undermined structures been shored, braced, or underpinned, or has a registered professional engineer determined that such measures are not necessary?	☐	☐	☐
Do bridges and walkways have standard guardrails?	☐	☐	☐
Are utilities crossing the excavation supported from above, and does protection from falling material exist?	☐	☐	☐
Have means been provided to remove water from the excavation?	☐	☐	☐
Are all open pits or shafts either covered or barricaded?	☐	☐	☐
Is a competent person available to make at least daily inspections?	☐	☐	☐

NOTE: *Shoring and shielding must be removed in a manner that ensures the safety of workers, and excavations must be backfilled as soon as work is completed.*

ATTACHMENT B-5.1-2

Excavation Permit

Part 1: Initiator completes this section.

Work Performed By: _____ Reference Drawing: _____

Location of Excavation: _____
(Use coordinates outside buildings or column lines inside buildings)

Reason for Excavation: _____

Start Date: _____ Permit Expiration Date: _____

Initiator Name: _____ Date: _____ Phone: _____

Part 2: Construction engineer completes this section.

Utilities	Present in Excavation Area	Comments
Power Service Lines:		
– Water	☐	
– Sewer	☐	
– Gas	☐	
Electrical Lines	☐	
Fire Lines	☐	
Process Lines	☐	
Equipment	☐	

Reference Drawing: _____

Special Precautions and Safety Requirements (check those required on the excavation site):

☐ Electrical Observer	☐ Barricades	☐ Grounding of Tools
☐ Explosion Testing	☐ Testing for Fume or Gas	☐ Special Clothing
☐ Standby Person	☐ Competent Person (See Reverse Side)	☐ Other (Specify)

Comments: _____

_____

_____

Part 3: Construction engineer is responsible for obtaining the relevant approval signatures in this section.

Site Engineering	Construction Maintenance
Operating Supervision	Construction Engineer
Power Services Supervision	Contractor Superintendent
Electrical Supervision	Pipe Superintendent
Fire Protection Supervision	Electrical Superintendent
	Excavation Competent Person

Continued on back

Part 4: Competent person completes this section before excavation.

Soil Classification (check one): ☐ Stable Rock ☐ Type A ☐ Type B ☐ Type C

	YES	NO	N/A
Have all FCSM B-5.1 requirements been met and the required data documented?	☐	☐	☐
Is the excavation close to utilities, buildings, footings, pilings, or sources of vibration?	☐	☐	☐
Have the owners of utility, service, and transmission piping been contacted?	☐	☐	☐
Has detection equipment been used to locate all underground and/or above ground interferences?	☐	☐	☐
Has a check been made for previously disturbed ground?	☐	☐	☐
Has the adequacy and availability of all equipment been checked, including personal protective equipment, shoring material, signs, barricades, and machinery?	☐	☐	☐
Has a check been made for other obstructions (e.g., footing concrete encasements)?	☐	☐	☐

If other obstructions have been found, list them. _____

_____

Allowable slope: _____

Comments: _____

_____

Part 5: Competent person completes this section during excavation.

Size of Excavation: depth _____ width _____ length _____

	YES	NO	N/A
Have changing ground conditions been checked, particularly after rainfall?	☐	☐	☐
Has monitoring been performed to check for possible oxygen deficiency or gaseous conditions?	☐	☐	☐
Has the adequacy of shoring and/or sloping been checked as work progresses?	☐	☐	☐
Do vehicular and machinery operation patterns need to be changed?	☐	☐	☐
Are water removal operations or equipment needed?	☐	☐	☐
Has the adequacy of portable trench boxes or trench shields been checked?	☐	☐	☐

Entrance and exit facilities: ☐ stairway ☐ ladders ☐ ramp

If the depth of the excavation is 5 feet (1.5 meters) or more, check the applicable OSHA appendix below:

- ☐ B - Sloping and Benching
- ☐ C - Timber Shoring for Trenches
- ☐ D - Aluminum Hydraulic Shoring for Trenching
- ☐ E - Alternatives to Timber Shoring
- ☐ F - Selection of Protective Systems

NOTE: *Sloping or benching for excavations deeper than 20 feet (6 meters) deep must be designed by a registered professional engineer.*

Part 6: Competent person completes this section if no protective system is needed.

The excavation requires no protective systems for the following reasons (list): _____

_____

_____

Competent Person: _____ Date: _____

ATTACHMENT B-5.1-3

Daily Excavation Inspection Report

Site _____

Location of Excavation _____

Depth _____

Soil Type _____

ITEMS	CONDITION good	rejected	n/a	REMARKS
Slope Ratio				
Shoring				
Shielding				
Barricades				
Water Removal				
Traffic Control				
Spoil Pile				

Atmosphere	O_2	Time	Explosimeter
	_____%	_____	_____%
	_____%	_____	_____%
	_____%	_____	_____%
	_____%	_____	_____%
	_____%	_____	_____%
	_____%	_____	_____%
	_____%	_____	_____%
	_____%	_____	_____%
	_____%	_____	_____%
	_____%	_____	_____%

Competent Person: _____

Date: _____ Time: _____

C-5.2
Earth-Moving Equipment

1.0 Scope

This procedure provides minimum requirements for inspecting and operating earth-moving equipment. This procedure covers equipment such as dump trucks, front-end loaders, bulldozers, graders, backhoes, mixers and compactors.

2.0 Definitions

Earth-Moving Equipment – All rubber-tired, self-propelled scrapers, rubber-tired front-end loaders, rubber-tired dozers, wheel-type agricultural and industrial tractors, crawler tractors, crawler-type loaders, motor graders, with or without attachments, mixers and graders that are used in construction work.

Engineer – The person who requests the work and is responsible for the safety, quality, and timing of the work requested.

Qualified Inspector – An experienced craftsperson or engineer (Chemours or contractor) who has demonstrated his or her ability or competency to inspect equipment to the site manager and/or the Chemours Fleet Operations designee.

Qualified Operator – An experienced craftsperson who has received training and demonstrated competency to operate a specific piece of equipment.

Site Engineering Manager – The highest level Engineering employee responsible for work conducted on the site.

3.0 General

Equipment must be used that is appropriate for the job. Choices between equipment types that may be applicable must be made by those able to judge the difference in safety, cost, and efficiency between types using their experience and knowledge. Job site conditions will greatly influence equipment choices. Chemours Fleet Operations can assist if necessary.

3.1 Inspection of Earth-Moving Equipment

A qualified inspector must inspect all contractor-owned or company-owned earth-moving equipment before its use and at least quarterly thereafter. (Rental equipment is considered contractor-owned.) The inspector should use an Earth-Moving Equipment Inspection form (Attachment C-5.2-1) or equivalent. The designated operator should perform a before-shift safety and operational check and deficiencies must be resolved before operations commence.

3.2 Qualification of Operators

Only qualified operators may operate earth-moving equipment.

Before an operator uses earth-moving equipment, the operator's employer must furnish to the site manager a description of how the operator has been qualified. In addition, the operator's employer must submit an Equipment Operator Qualification form (Attachment C-5.2-2) or equivalent to the site manager and/or designee.

3.3 Equipment Maintenance

Equipment must be maintained per the manufacturer’s published maintenance specifications using parts and fluids that meet equivalent requirements. Maintenance frequency must meet manufacturer's recommendations.

3.4 Operation

- Operate earth-moving equipment according to posted safe speed limit.
- Equipment operated on public roadways must meet requirements of the local governing body.
- Earth-moving equipment may carry only as many people as there are factory-installed seat belts. If equipment is not equipped with factory-installed seat belts, and local, state, or

government regulations allow this equipment to be operated without seat belts, then only the operator should be allowed to ride the equipment depending on site rules and regulations.

- During refueling of this equipment the engine must be shut off and a fire extinguisher must be present.
- Any earth-moving equipment operated after dark and/or under limited lighting must be equipped with factory-installed lighting or equivalent lighting subject to the qualified inspector's or site manager's approval.
- Flammable and explosive environmental classifications must be considered before using earth-moving equipment in any operating area. For more information on classifications, contact the site safety office.
- Personnel must not occupy excavators or loader buckets during the operation of the equipment.
- When using continuous-tracked equipment, place protection on paved road surfaces to prevent damage.

3.5 Hydraulic Lines

Even “minor” hydraulic leaks are considered serious and must be handled according to site, local, state, and governmental regulations. Hydraulic lines must be maintained to prevent leakage. If catastrophic failure of a hydraulic system occurs, the site Environmental Officer must be notified immediately, and the spill cleaned up according to site, local, state, and governmental regulations. Sites have written procedures to respond to this type of spill. A damp spot on a hose or fitting is not considered a leak, however a drip to the ground is. Dampness on hoses or fittings should be considered a potential leak and drips must be repaired immediately.

3.6 Backhoes

“Walking” and/or straddling a backhoe across an open trench should be avoided. If walking or straddling is necessary, the engineer must plan the job.

Backhoes must not be used for any operations exceeding the manufacturer’s recommendations or the capability of the equipment (e.g., unloading a truck with a backhoe boom instead of a crane). If the manufacturer permits the use of a backhoe as a “crane,” rigging must be according to the site standards and must be attached to the bucket according to the manufacturer's recommendations. Load charts showing load and radius capacities must be in the backhoe. Operation of a backhoe as a crane must comply with all requirements of PH84.

3.7 Trucks with Dumping Beds

If the cab of a dump truck is equipped with vertical and horizontal protection (designed to withstand the impact of the material being loaded), personnel may remain in the cab of the dump truck during the loading of the dump bed with materials less than 3 inches (7.5 centimeters) in diameter. If the cab has insufficient protection and/or the materials are larger than 3 inches (7.5 centimeters) in diameter, then personnel must leave the truck during loading and must wear all required site-specific safety equipment (i.e., hard hats and safety glasses) when they are outside the vehicle.

Personnel must not be transported in the bed of any dump truck.

When dumping a load, follow the manufacturer's recommendation on ground conditions. These recommendations give the “acceptable” slope of the terrain when operating the dump bed.

Dumping operations must be performed on stable, compacted areas. When dumping loads on the elevated edges of “new fill” areas, the engineer should develop a plan to prevent the dump truck from entering the area of unstable material.

Before and during the operation of a dump truck with the bed in the “up” position, the operator must verify and check the overhead clearances during forward and backward movements. The engineer must be sure that the dumping operation does not conflict with the requirements of CCSM B-1.18 and CCSM C-10.1.

Use a positive bed lock when any work is required under the dumping bed when the bed is in the “up” position.

3.8 Rollover Protection Systems

All earth-moving equipment except dump trucks and hydraulic excavators requires rollover protection. All backhoes require rollover protection except a backhoe attachment mounted on a tractor of less than 20 horsepower.

3.9 Equipment Modification

Do not modify equipment unless the manufacturer agrees in writing to the proposed change and until the agreement is received at the site. A copy of the manufacturer's written consent shall be kept on file for review. Any modifications must first be approved by the Site Manager, the Site Safety Office, and Chemours Fleet Operations in writing and kept on file with the equipment.

4.0 References

CCSM B-1.18, *Use of Mobile Equipment Near Exposed Electric Lines*

CCSM C-10.1, *Mobile Equipment Work Near Hazardous/Critical Pipe Lines*

Attachment C-5.2-1

Earth-Moving Equipment Inspection

Check equipment to be inspected: Dump Truck _____ Front-End Loader _____
Backhoe _____ Bulldozer _____ Motor Grader _____ Other _____
Equipment identification number _____

ITEMS	CONDITION			REMARKS
	Good	Rejected	N/A	
1. Access & Egress*				
2. Backup Alarms*				
3. Body				
4 Excess slack in boom*				
5. Boom Pins*				
6. Brakes*				
7. Bulk Head Partition*				
8. Clutch*				
9. Cotter Pins/Hardened Pins*				
10. Cover				
11. Fire Extinguisher				
12. Frame				
13. Fuel Systems*				
14. Glass*				
15. Guards*				
16. Horn*				
17. Hydraulic System* (no leaks)				
18. Operator Controls Labeled				
19. Lights				
20. Lugs				
21. Muffler & Exhaust Pipe*				
22. Muffler Guards*				
23. Outriggers*				
24. Parking Brakes*				
25. Platform Decking				
26. Positive Dump Bed Latch*				
27. Rear View Mirror				
28. Rollover Protection*				
29. Seat Belts*				
30. Side Mirrors (Both)*				
31. Steering Mechanism*				
32. Tracks, Tires, Wheels*				
33. Turn Signals				
34. Windshield Wipers				
35. Steps and Grabs				

* If any of these are rejected, the equipment shall not be used.

_____ _____
Inspected by Date

Attachment C-5.2-2

Equipment Operator Qualification

Check off appropriate equipment:

Backhoe _____

Bulldozer _____

Dump Truck _____

Front-end Loader _____

Grader _____

Hydraulic Excavator _____

Other _____

_____ employed by
(Operator's Name)

_____ is authorized to
(Employee's Name)

operate this equipment_____
(Equipment Make/Model)

and for the specific equipment to be operated:

- Has the required physical and mental abilities required to operate it.
- Has read the manufacturer's operating manual.
- Has received and successfully completed specific written and/or oral training and instructions.
- Has demonstrated proficiency in the safe operation of it.

Verified by _____ _____
(Employer Representative) Date

_____ _____
Employee's Signature Date

UNDERGROUND OBSTRUCTION EVALUATION SOP
EHS.07

PURPOSE

To ensure that individuals performing subsurface work for or on behalf of the CRG evaluate the need to accomplish a subsurface utility investigation (geophysics).

ROLES AND RESPONSIBILITIES

Project Director

- » Ensures that underground obstructions are considered during work plan and health and safety plan (HASP) development
- » Verifies that appropriate methods for identifying underground utilities are used
- » If a geophysical investigation is not necessary based on Decision Flow Chart results (see Attachment A), signs the variance on the Project Safety Analysis (PSA) Form to document the decision
- » Signs the Subsurface Clearance Evaluation Checklist (see Attachment B) prior to initiating work

Project Manager

- » Ensures that an underground obstruction evaluation is included in the project budget and implemented as agreed upon
- » If an underground obstruction evaluation is not necessary, obtains a variance from the Project Director
- » Signs the Subsurface Clearance Evaluation Checklist (see Attachment B) prior to initiating work

Chemours Site Representative (CSR)

- » Ensures that an underground obstruction evaluation is completed per this SOP
- » Audits the underground obstruction evaluation to determine whether site conditions match the assumptions used in the evaluation
- » Coordinates with the Field Team to review a site map and physically walks the areas of concern with the plant contact, the excavation permit issuer, and the person and/or team performing the survey
- » Signs the Subsurface Clearance Evaluation Checklist (see Attachment B) prior to initiating work

Field Team

- » Before the geophysical investigation, provides a map of the areas of concern and physically walks the areas with the plant contact, permit issuer, and survey worker(s)
- » Reviews the geophysical investigation data with the plant contact or permit writer and, based on these discussions, determines if subsurface work can proceed or if additional evaluation is necessary
- » When subsurface work can proceed, requests a permit for the work and begins field activities

PROCEDURE METHODOLOGY

Personnel working for or on behalf of the CRG must evaluate underground obstructions and obtain an Excavation Permit prior to all subsurface work. A decision flow chart (see Attachment A) and Subsurface Clearance Evaluation Checklist (see Attachment B) must be used prior to initiating subsurface work.

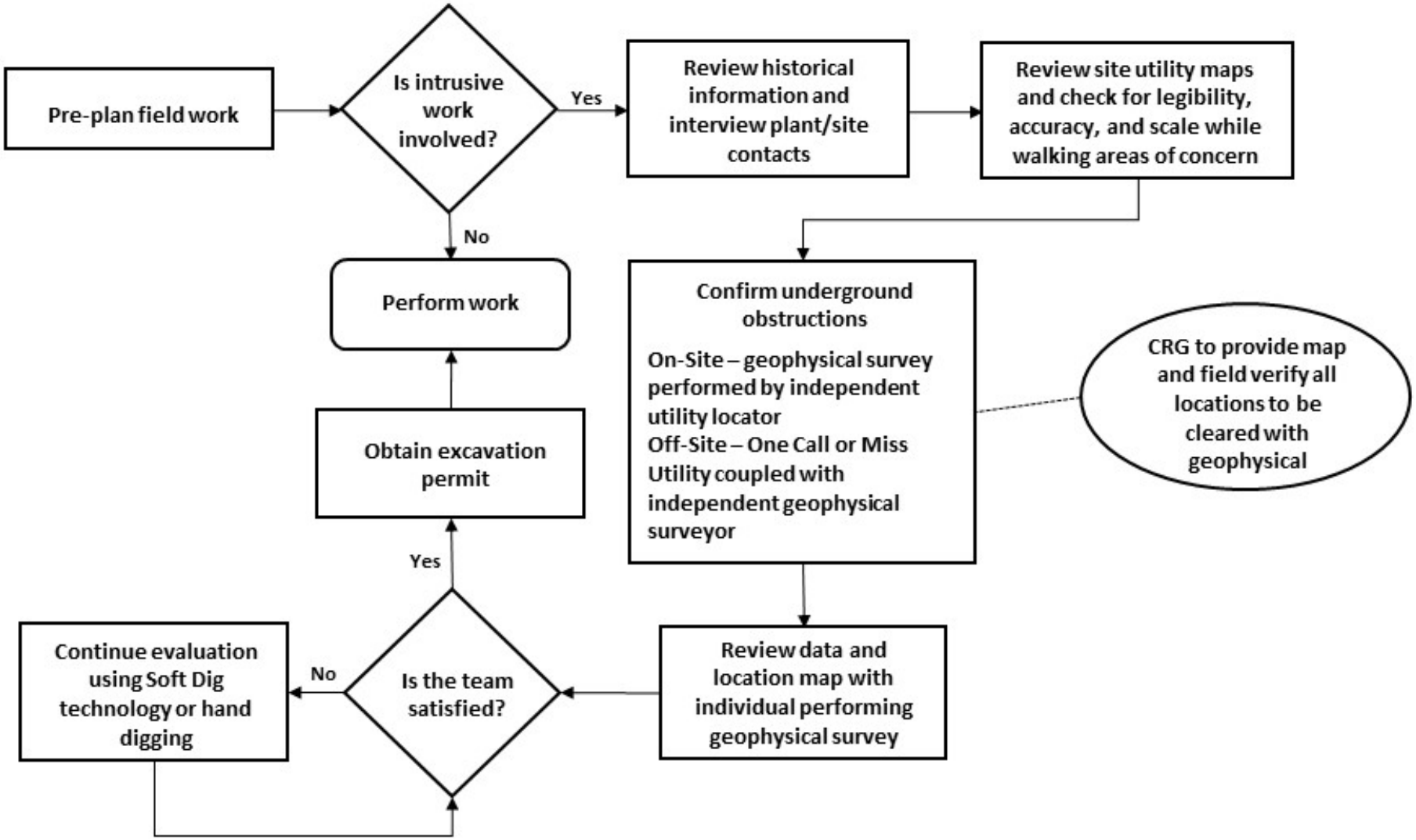
1. When a project authorization is submitted, the Project Director determines if subsurface work will be involved.
2. If subsurface work is involved, the Project Manager (working with the project team) must use Attachment A to determine if a geophysical investigation is necessary.
3. After reviewing Attachment A, if the Project Director does not believe it is necessary to perform a geophysical investigation, s/he must sign the variance section on the Hazards Checklists to document the decision.
4. If a geophysical investigation is deemed necessary, the Field Team must complete the checklist provided in Attachment B.
5. The survey is initiated; a plant utility group can perform the work if their capabilities include a full geophysical investigation (vs. strictly electrical lines under current).
6. Three of the following approaches must be included as part of the survey to ensure the accurate location and type of subsurface utilities:
    - » Review of site drawings, figures, utility maps and diagrams provided by the local utility or municipality
    - » Subsurface clearance using nondestructive above grade location methods (e.g., ground penetrating radar, magnetic imaging)
    - » Interviews with staff who are knowledgeable about previous site activities and utilities
    - » Visual survey and inspection for indications of subsurface utilities (e.g., soil disturbance, transformers, manholes, scarred asphalt, utility meters)
7. Upon completion of the survey, the Field Team requests an Excavation Permit for the work and begins field activities.
8. If additional evaluation is necessary, Soft Dig technology or hand digging is used to identify underground obstructions.

KEY TERMS

Key Term	Definition
Excavation Permit	Written authorization to perform subsurface work.
Geophysical Survey	A survey using any number of tools that use techniques such as magnetic fields and radio transmitters/receivers to locate underground obstructions.
Heavy Equipment	Large construction equipment (e.g., drill rigs, excavators, cone penetrometers, geoprobes) used to perform subsurface work.
Project Safety Analysis (PSA)	A review of the project with project participants (including contractors when appropriate) designed to identify key safety hazards and develop a control plan before field work begins.
Soft Dig	A soil removal technique that uses high pressure air to loosen soil combined with a vacuum to remove soil without damaging underground obstructions.
Underground Utilities	Lines (e.g., electric, communication, pipe, sewer) that are buried below the surface.

ATTACHMENT A
UNDERGROUND OBSTRUCTION EVALUATION DECISION FLOW CHART

Underground Obstruction Evaluation
Decision Flow Chart



ATTACHMENT B
SUBSURFACE CLEARANCE CHECKLIST

Subsurface Clearance Checklist

Background Information

Site Name:			
Job Number:			
Site Phone No.:			
Site Address:			
County:			
Project Manager Name:			
Project Manager Phone:			
Site Manager Contacted By and Date:			
Site Drawings (circle one):	Yes (attach)	No	N/A
Third Party Construction/ Redevelopment Plans (circle one):	Yes (attach figure w/proposed boring locations)	No	N/A
Subcontractor Company Name:			
Subcontractor Contact Name:			
Subcontractor Contact Phone No.:			
Meeting Start Date:			
Meeting Time:			

Utility Protection Services (e.g., One Call, Miss Utility)

Date and Time Called:		
Person Who Called:		
Reference No.:		
Proposed Excavation/Drilling Locations Premarked for Locating Service (circle one):	Yes	No
Locating Service Performed (circle one):	Yes	No
Date and Time Called:		
Person Who Called:		
Locating Service Company Name:		
Locating Service Contact Phone No.:		

Subsurface Clearance Checklist

Type of Sensing Equipment Used:		
Proposed Excavation/Drilling Locations Premarked (circle one):	Yes	No

Site Walk

Site Walk Performed with Site Representative (circle one):	Yes	No
Site Representative Name:		
Cleared (circle one):	Yes	No
Building Utility Service Line Connections Identified (circle one):	Yes (hand sketch on map w/proposed boring locations)	No

Subsurface Clearance Checklist

Utility Inventory

Utility Type	Name	Depth (feet) (if available)	Marked?	
Electric			Y	N
			Y	N
Telephone			Y	N
			Y	N
Cable			Y	N
			Y	N
Gas			Y	N
			Y	N
Water			Y	N
			Y	N
UST System			Y	N
			Y	N
Storm			Y	N
			Y	N
Sanitary			Y	N
			Y	N
Steam			Y	N
			Y	N
Other			Y	N
			Y	N

Subsurface Clearance Checklist

Approval

Excavation/Drilling Locations Approved by Project Manager (circle one):	Yes	No

Signatures

Excavation/Drilling Contractor Site Manager Name (please print)	Excavation/Drilling Contractor Site Manager Signature
CSR Name (please print)	CSR Signature
Project Manager Name (please print)	Project Manager Signature
Project Director Name (please print)	Project Director Signature

Appendix F

DRILLING SAFETY HANDBOOK

1.0 PRE-FIELD WORK

It is very difficult to predict all problems that may occur during drilling fieldwork activities. However, if pre-fieldwork preparations are completed thoroughly, the job will likely proceed more safely and smoothly (i.e., with less down time). This section lists some important safety items that should be performed/considered prior to initiation of actual fieldwork. The Project's Project Manager (PM) should review the following list and determine if other pre-fieldwork activities are necessary. At a minimum the following should be completed:

- Ensure that all items are completed on the Pre-fieldwork Checklist.
- Create and have available a map showing underground equipment, lines, and/or hazards.
- Check with utility one-call service before excavating or drilling.
- Visually inspect each location in the field for underground utilities.
- Site maps should be checked for utilities not found in the field.
- Review a site map with a person familiar with layout of underground hazards.
- Determine if surveying is needed to locate underground hazards.
- Markers, flags, or painted lines, etc., should be used to identify excavation boundaries and locations, or hazards beyond which excavation must not exceed.
- All dimensions, elevations, and coordinates should be viewed as approximate locations of buried equipment, lines, etc. Elevations may change due to erosion or the addition of fill. Buried cables have been found three to five feet on either side of buried protective boards and markers.
- If buried equipment, lines, etc., exist within 10 feet on either side of the excavation, these should be considered in the excavation area.
- A conscious decision should be made on whether or not to de-energize underground cables within 10 feet (overhead cables within 20 feet) of the excavation prior to excavation.
- If the location of a utility line is unclear, the local utility company should be contacted for clarification of line location.
- If the location of a utility line is unclear, probing or hand augering to a depth of five feet is recommended. Probing and hand augering should be performed such that the area to be excavated is within the radius of the investigation.
- Excavating around process lines requires extreme caution. If any unusual odors or other signs indicating leakage are observed, the job should be shut down immediately and area supervision notified. Air quality checks must be performed to ensure adequate personnel protection is provided. Whenever possible, process lines should be depressurized before excavating.

2.0 MOBILIZATION

The following are safe guidelines related to on- and off-road movement of drilling equipment. Prior to mobilizing or demobilizing drilling equipment, responsible individuals should consider the following:

- Inspect the rig, using the Drilling Equipment Checklist.
- Before moving any equipment, first walk the route of travel with driller, inspecting for depressions, slumps, gullies, ruts, and similar obstacles. The drill site also should be inspected for debris, plant, and animal hazards. It also should be determined if the ground is suitable for heavy equipment travel.
- Make sure bystanders and passengers are clear of equipment.
- After equipment has been moved to a new drilling site, set all brakes and/or locks. When grades are steep, block the wheels.
- Use caution when traveling on steep grades. Conservatively evaluate side-hill capability of equipment movement. Arbitrary addition of drilling tools may raise the center of mass. When possible, travel directly uphill or downhill.
- When moving up a steep grade or slope, anchor a winch line from the vehicle to a suitable object at the top of the slope.
- Attempt to cross obstacles such as small logs and small erosion channel or ditches squarely, not at an angle.
- Use the assistance of someone on the ground as a guide when lateral or overhead clearance is restricted, or when setting the drill rig on location.
- Never travel with the mast (derrick) of the drill rig in the raised or partially raised position.
- Do not raise the mast or operate the drill rig if this distance to overhead powerlines is less than 20 feet. In general, distance between the overhead power line and boom should be no less than the height of the boom. Remember to “Look Up and Live.”
- Keep in mind that both hoist lines and overhead powerlines can be moved toward each other by the wind. If strong winds are present, consider having the utility company (or plant) cover the overhead power lines.
- Prior to drilling, adequate site cleaning and leveling should be performed to accommodate the drilling rig and equipment. This provides a safe, obstacle-free working area. Drilling should not commence when tree limbs, protruding objects, unstable ground, site obstructions, or debris may cause unsafe work conditions and/or limited, awkward work spaces. An area clear of obstructions or debris should be maintained around the drilling or support activities at all times.
- Never leave equipment idling and unattended, especially on any incline or on loose material; the vibration may put the machine in motion.

3.0 EQUIPMENT DECONTAMINATION

Due to the presence of water, heat, pressure, and heavy equipment, decontamination activities can be very dangerous. The following are safety items to be considered during equipment decontamination:

- Follow equipment decontamination procedures outlined in the Health and Safety Plan (HASP) or Project Work Plan.
- Chock wheels of equipment/supply trailer prior to beginning work.
- Use face shield, *Tyvek*®, and gloves, boots, etc., to prevent physical contact with potential contaminants and debris.
- Check hose for possible weakness or potential break points prior to use.
- Do not point wand toward body when in use.
- Use anti-freeze (windshield washer type) in cold weather to prevent water from freezing inside equipment.
- Regarding access/egress, safe footing, lifting hazards, slipping on plastic should be considered as potential hazards, especially inside the decontamination area.
- Beware of burrs and sharp edges when moving augers and drilling equipment.
- Practice good housekeeping at all times.
- Be aware of heat and hot water from steam cleaner.

4.0 SET-UP AND START-UP

4.1 Set-up

This information should be reviewed prior to set-up activities at each drilling location:

- If required, a barricade should be set up after defining the exclusion zone.
- When drilling near suspected underground electrical hazards, the rig should be grounded with a ground wire attached to a ground rod.
- All brakes must be set before drilling begins. If the rig is positioned on a steep grade and leveling of ground is impossible or impractical, the wheel of the transport vehicle should be blocked and other means employed to prevent the rig from moving or tipping over (e.g., level jacks on rig).
- Use sufficient blocking under rig jacks to prevent sinking.
- Inspect pulley sheaves for wear and cable/rope positioning.
- Work to be done above three feet on the mast requires the use of a safety harness, or the mast must be lowered.
- Before lifting a relatively heavy object, approach the object by bending at the knees, keeping your back vertical and unarched while obtaining a firm footing. Grasp the object firmly with both hands and stand slowly and squarely while keeping your back vertical and unarched. In other words, perform lifting with muscles in your legs, not muscles in your lower back. If the object is in excess of 50 pounds, request assistance.

4.2 Start-up

After drill set-up, the following safety items should be observed:

- All personnel should know location and use of kill switch.
- Identify potential pinch points and hazards which could injure fingers and toes.
- All drilling rig personnel and visitors should be instructed to “stand clear” of the drilling rig immediately prior to and during starting of an engine.
- Make sure all gear boxes are in neutral, all hoist levers are disengaged, all hydraulic levers are in the correct non-actuating positions, and the cathead rope is not on the cathead before starting a drilling rig engine.
- Raise the derrick a few inches in order to check the brakes and always check for overhead power lines.
- Secure and/or lock the mast in upright position if required, according to the drilling manufacturer's recommendations.
- Place the fire extinguisher in an easily accessible location away from the drilling rig.

5.0 DRILLING

This section concerns rotating equipment, catheads, wire ropes, and hoists (the part of the drilling rig which may cause serious injuries), and drilling techniques most commonly used during auger and rotary drilling:

- Only personnel necessary to achieve drilling objectives should remain within the exclusion zone. All others should remain outside the exclusion zone.
- Drilling personnel should not wear clothing that may be awkward or loose and get caught in rotating equipment.
- Wear protective gloves when handling augers, cable, rods, or any sharp or splintery materials.
- Proper gloves (see HASP) should always be worn when handling materials which can irritate or contaminate skin.
- When appropriate, noise protection must be worn by employees who are working when drilling equipment is operating.
- Effective communication (hand signals, etc.), especially under high noise conditions, is essential to safety. Clarify use of hand signals.
- Use tools only for the job for which they were intended.
- Do not perform maintenance or refueling while equipment is running.
- Stay clear of cables while lifting equipment or while drilling rig is under heavy strain.
- Do not operate the drilling rig in an electrical (lightening) storm. If drilling when a storm approaches, stop drilling and lower the mast, if possible. Do not stay near drilling rig if the mast cannot be lowered.
- When removing drilling string from borehole, the rod string should not exceed 1.5 times the height of the mast.
- Do not ride on hook, ropes, or other traveling lines of the rig.
- Do not climb the rig mast while equipment is running. Shut down equipment and use safety harness if climbing mast, is necessary.
- When moving or hoisting stabilizers or drill collars, tag lines should always be used. A helper should not use his hands to hold or control heavy equipment. Instead, he should loop a rope around it and hold onto both ends of the rope.
- The operator of a drilling rig should only operate the rig from the position of the controls. The operator should shut down the drilling engine before leaving the vicinity of the drilling rig.
- All hydraulic lines should be inspected periodically for integrity, and replaced as needed.
- Drilling should always proceed cautiously, especially at depths less than ten feet.
- Operation of drilling equipment should be limited to qualified personnel.

5.1 Auger Drilling

Auger drilling uses direct power to rotate (screw) flighted augers into the ground. Be aware of the following hazards which may be unique to this type of drilling:

- Only use the manufacturer's recommended method of securing the auger to the drill drive coupling. Do not touch the coupling or the auger with your hands, a wrench, or any other tools during rotation.
- Whenever possible, use tool hoists to handle auger sections.

- Never place hands or fingers under the bottom of an auger section when hoisting the auger over the top of the auger section in the ground, or over other hard surfaces such as the drilling rig platform.
- Never allow feet to get under the auger section that is being hoisted.
- When rotating augers, stay clear of the rotating augers and other rotating components of the drilling rig. Never reach behind or around a rotating auger for any reason whatsoever.
- Never place your hands between the drill rig and an auger, even when attempting to free damaged or bound sampling equipment from the auger.
- Never use your hands or feet to move cuttings away from the auger.
- Augers should be cleaned only when the drill rig is in neutral and the augers have stopped rotating.
- Care should be taken to ensure augers are properly stored and secured when not in use and during transport.

5.2 Rotary Drilling

Mud rotary is direct rotary drilling using mud slurry circulation to remove cuttings and keep the borehole wall stabilized. Be aware of the following hazards which may be unique to this type of drilling:

- Lifting heavy equipment (i.e., drill rods, etc.);
- Rotating equipment/parts; and
- Slippery or dangerous work areas caused by messy mud pits or troughs (could fall in); keep area clear.

Air rotary is direct rotary drilling using high pressure air circulation to remove cuttings and keep the bit cool. Be aware of the following hazards which may be unique to this type of drilling:

- Rotating/lifting equipment;
- High pressure air lines;
- Air discharge of cuttings at high velocity; use a cover to control discharge of cuttings;
- Heavy drill rods being lifted;
- Very loud; wear hearing protection;
- Large drill rig and support vehicle (space limitations); and
- Dust generation in dry formations; move upwind and use a cover for dust control.

Listed below are general rotary (air and mud) drilling hazards:

- Drill rods should not be braked during lowering into the hole with drill rod chuck jaws.
- Drill rods should not be held or lowered into the hole with pipe wrenches.
- If a string of drill rods is accidentally or inadvertently released into the hole, do not attempt to grab the falling rods with your hands or a wrench.
- In the event of a plugged bit or other circulation blockage, high pressure in the piping and hose between the pump and the obstruction should be relieved or bled down before breaking the first tool joint.
- When drill rods are hoisted from the hole, they should be cleaned for safe handling with a rubber or other suitable rod wiper. Do not use your unprotected hands to clean drilling fluids from drill rods.

- If work must progress over a portable drilling fluids (mud) pit, do not attempt to stand on narrow sides or cross members. The mud pit should be equipped with a rough surface and/or cover panels of adequate strength to hold drilling rig personnel.
- Drill rods should not be lifted and leaned unsecured against the mast. Provide some method of securing the upper ends of the drill rod sections for safe vertical storage or lay down the rods.

5.3 Cathead

Listed below are guidelines regarding cathead operation:

- Only drilling personnel familiar with cathead operation should be allowed to operate equipment. Keep the cathead clean and free of rust and oil and/or grease. The cathead should be cleaned with a wire brush if it becomes rusty.
- The cathead operator must operate the cathead while standing on a level surface with good, firm footing conditions, without distraction or disturbance.
- Always use a clean, dry, sound rope. A wet or oily rope may "grab" the cathead and cause drill tools or other items to be rapidly hoisted to the top of the mast. Do not operate the cathead in rain.
- Never wrap the rope from the cathead (or any other rope, wire rope, or cable on the drilling rig) around a hand, wrist, arm, foot, ankle, leg, or any other part of your body.
- Always maintain a minimum of 18 inches (driving spoon length) clearance between the operating hand and the cathead drum when driving samplers, casing, or other tools with the cathead.
- Do not use a rope that is longer than necessary. A rope that is too long can form a ground loop or otherwise become entangled with the operator's legs.
- Do not use more rope wraps than are required to hoist a load.
- Do not leave a cathead unattended with the rope wrapped on the drum.
- Position all other hoist lines to prevent contact with the operating cathead rope.
- When using the cathead and rope for driving or back-driving, make sure that all threaded pipe connections are tight and stay as far as possible from the hammer impact point.
- When stuck tools or similar loads cannot be raised with a hoist, disconnect the hoist line and connect the stuck tools directly to the feed mechanism of the drill. Do not use hydraulic leveling jacks for added pull to the hoist line or the feed mechanism of the drill.
- Should the rope "grab" the cathead or otherwise become tangled in the drum, do not attempt to release the rope. Instead, sound an appropriate alarm for all personnel to rapidly back away and stay clear. The operator should also back away and stay clear. If the rope "grabs" the cathead, and tools are hoisted to the sheaves at the top of the most, the rope often will break, releasing the tools. If the rope does not break, stay clear of the drilling rig until the operator cautiously returns to turn off the drilling rig engine and appropriate action is taken to release the tools. The operator should keep careful watch on the suspended tools and should quickly back away after turning off the engine.

5.4 Wire Ropes and Hoists

Listed below are guidelines regarding wire ropes and hoists:

- Replace damaged safety latches on safety hooks before using.
- Always wear the appropriate gloves when handling wire ropes.
- Minimize shock loading on wire rope; apply loads smoothly and steadily.
- Protect wire rope from sharp corners or edges.
- Do not guide wire ropes onto cable drum with your hands.
- Never leave a load suspended in the air when the hoist is unattended.
- Keep your hands away from hoist, wire rope, hoisting hooks, sheaves, and pinch points as slack is being taken up and when the load is being hoisted.
- Never hoist the load over the head, body, or feet of any person.

6.0 WELL CONSTRUCTION AND GENERAL HOUSEKEEPING

This section presents safety items around well construction, and general housekeeping. The following safety items should be observed:

- Before lifting a relatively heavy object, approach the object by bending at the knees, keeping your back vertical and unarched while obtaining a firm footing. Grasp the object firmly with both hands and stand slowly and squarely while keeping your back vertical and unarched. In other words, perform lifting with muscles in your legs, not muscles in your lower back. If the object is in excess of 50 pounds, request assistance.
- Wastewater and drilling fluids must be properly contained and labeled. Refer to the project Waste Management Plan.
- Suitable storage locations should be provided for all tools, materials, and supplies so that they can be conveniently and safely handled without falling on a member of the drill crew or a visitor, without creating tripping hazards, and without protruding at eye or head level.
- Avoid storing or transporting tools, materials, or supplies within or on the mast (derrick) of the drill rig.
- Pipe, drill rods, bit casings, augers, and similar drilling tools should be stacked in an orderly manner on racks or sills to prevent spreading, rolling, or sliding and should be secured prior to moving equipment.
- Work areas, platforms, walkways, scaffolding, and other accesses should be kept free of materials, obstructions, and substances such as ice, water, mud, excess grease, or oil that could cause a surface to become slick or otherwise hazardous. The use of additional footing safeguards (mats) should be evaluated on a case-by-case basis.
- Keep all controls, control linkages, warning, and operation lights and lenses free of oil, grease, or other substances which would decrease safe handling.
- Do not store gasoline in any portable container other than that specifically designed for the intended purpose.
- Welding gas cylinders should be stored in an upright and secured position. Protective caps should be in place when the cylinders are not in use.
- All unattended boreholes must be adequately covered or otherwise protected to prevent personnel, site visitors, or animals from falling into the hole. All open boreholes should be covered, protected, or back filled adequately and according to local and state regulations upon completion of the drilling project.
- Do not tolerate unprofessional conduct ("horse play") on the job site.

WELL DRILLING EQUIPMENT CHECKLIST*

Contractor: _____

Company Name: _____

Equipment Identification Number: _____

ITEMS	CONDITION	REMARKS
1. Backup Alarms		
2. Brakes		
3. Clutch		
4. Control Buttons & Levers Labeled		
5. Fuel, Fluid, & Hyd. Sys. (No leaks)		
6. Guards		
7. Horn		
8. Lights/turn signals		
9. Muffler & Exhaust Pipe		
10. Muffler Guards		
11. Leveling Jacks		
12. Parking Brakes		
13. Platform Decking (stability)		
14. Rear and Side View Mirror		
15. Seat Belts		
16. Tracks, Tires, Wheels		
17. Engine Gauges		
18. Lifting Cables		
19. Cable Clamps		
20. Cable Safety Latches		
21. Lockouts		
22. PPE (including respirators)		
23. Safety Harness		
24. First Aid Kit		
25. Fire Extinguishers		
26. Safety Shutdowns Tested & Working		
27.		

_____Auditor

_____Others

_____Others

Worker safety is paramount. This Drill Rig Inspection Checklist is provided to all contracted drilling firms as guidance regarding equipment expectations. All equipment should be inspected and found to be in safe working order **prior to** mobilization. Once onsite, this checklist will be reviewed with the Project Manager or his/her representative. Contractor is responsible for its equipment (rented or owned). The PM has the authority to halt work if unsafe conditions or equipment are observed.

Appendix G

WORKING FROM BOATS OR ADJACENT TO WATER
EHS.08

PURPOSE

To ensure that personnel working from boats or adjacent to water remain safe during project activities.

ROLES AND RESPONSIBILITIES

Field or Boat Supervisor

- Ensures the safety of the boat and its passengers
- Ensures the adequacy of the boat (i.e., size and condition) and launch location
- Possesses sufficient knowledge of boating safety and U.S. Coast Guard regulations (power boat operation requires completion of a boat operation training from a credible federal or state agency)
- Communicates hazards associated with the task at hand
- Assesses weather conditions
- Develops and reviews site emergency procedures with Field Team
- Identifies and designates Standby Person
- Completes a Rescue Plan (see Attachment A) as required
- Coordinates activities when working in conjunction with other boats or personnel working from shore
- Assesses the launch area to establish the end of the ramp and the condition of the launch surface
- Completes a Float Plan (see Attachment B) and submits it to the Coast Guard or local authority if applicable
- Verifies that all safety hooks, chains, and/or latches are secure
- Designates a Field Team member on the boat to monitor signs of heat or cold stress of individuals on board
- Evaluates the need for anti-exposure suits (i.e., “Mustang suits”)

Field Team

- Adheres to basic safety rules (e.g., no horseplay, good housekeeping) and other applicable safety procedures
- Follows direction as given by the Field or Boat Supervisor
- Understands sampling activities before going onto the water

Chemours Site Representative (CSR)

- Ensures boat contains necessary safety equipment as specified in Attachment C
- Inspects and approves personal flotation devices (PFDs)
- Ensures that the Standby Person has all necessary safety equipment as specified in the Health and Safety Plan
- Communicates as necessary with local search and rescue services
- Ensures work is implemented in accordance with the Health and Safety Plan

Standby Person

- Reports any changes in the forecast to the Field or Boat Supervisor
- Maintains contact with the Field Team visually or via radio or cellular phone
- Alerts the Field Team of potential hazards
- Implements the Rescue Plan by providing the rescuers pertinent information in Attachment A

PROCEDURE METHODOLOGY

At least three individuals (i.e., two on the boat and one Standby Person) must be involved when work is performed from a boat. Personal boats are prohibited for field work use.

Preplanning

The Field or Boat Supervisor identifies the type of boat before work begins to maximize individuals' safety and allow flexibility during implementation of the work. Identifying a suitable boat type is based on the following factors:

- Carrying capacity of the vessel
- Size and motor type
- Number of personnel
- Weight of sampling gear
- Adequate fuel supply to accomplish the work and return

NOTE: Projects involving sampling should use a flat-bottomed boat.

During the Project Safety Analysis, the Field Team discusses potential limitations presented by the type of boat selected.

If work is being conducted on water out of sight of the Standby Person or more than 600 feet (200 meters) offshore, the Field or Boat Supervisor prepares a Rescue Plan. At a minimum, the Rescue Plan includes the information listed below. A Rescue Plan is provided in Attachment A.

- Name of boat operator and all passengers
- Phone number or radio contact for boat operator
- Description of vessel, including registration number
- Description of vehicle used to pull boat trailer
- Location, time, and date of departure
- Expected return time and date
- Location of work activities
- Emergency contact information

The Field or Boat Supervisor inspects the boat prior to arriving on-site to ensure it is in good working condition.

Fueling

When fueling boats, the following safety requirements apply:

- Remove portable gas tanks from the boat prior to fueling. At no time should portable tanks be fueled while in the boat, especially while on the water.
- Store and secure fuel tanks in proper and out-of-the-way locations.
- Periodically visually inspect the portable fuel tanks for leaks, especially at the fuel line connections.

Pre-Launch

The Field or Boat Supervisor reviews site emergency procedures and boating safety tips with the Field Team. Some of these tips include, but are not limited to, the following:

- Use sunscreen; the likelihood of sunburn may be increased due to the reflection of the light off the water surface.

- When possible, wear non-skid, soft-soled shoes to minimize slipping hazards. (The requirement of steel-toed shoes can be waived by the EHS Consultant during the Project Safety Analysis.).
- Avoid standing in small boats when performing work.
- Wear proper eye protection. (Polarized safety glasses are recommended to reduce glare and help identify potential underwater hazards.)
- File a Float Plan and complete required notifications.
- Ensure a means of communication from the boat to shore.

Daily weather forecasts should be known prior to getting on the water. The Standby Person is responsible for reporting any changes in the forecast to the Field or Boat Supervisor.

The CSR verifies that the required boat safety equipment is on board (see Attachment C for required equipment based on type of work) and ensures that:

- Equipment is stored for easy access and situated in a manner that equally distributes the weight and achieves proper balance to avoid tipping.
- A rope is attached to equipment that will sink.
- The amount of equipment is limited to what is actually needed.
- Equipment that is light or has the potential to be thrown about is strapped down.

For small boats, the Field or Boat Supervisor identifies and selects a suitable launching/retrieval site based on the following factors:

- Location away from traffic (*NOTE: If it is not possible to launch away from traffic, a spotter should be used to ensure worker safety.*)
- Level terrain or gradual slope that allows for safe access to the waterbody
- Location that minimizes the distance the boat needs to be carried (if applicable)

For trailered boats, an established boat ramp must be used. If an established boat ramp is not available, a suitable gradual slope may be used at the discretion of the Field or Boat Supervisor.

For trailered boats, the Field or Boat Supervisor assesses the launch area to establish the end of the ramp and the condition of the launch surface (e.g., mud, debris, excessive algae) and double checks that all safety hooks, chains, and/or latches are secure.

Launching

Small boats up to 80 pounds must be moved by two people. Boats weighing more than 80 pounds require the use of mechanical assistance. In all instances, boat handlers must use proper body positioning and lifting techniques.

When launching a small boat, boat handlers must wear leather gloves and be aware of the risks of pinch points. Extra caution must be exercised in slippery terrain such as mud, snow, and ice and in terrain with poisonous plants. If a small boat must be launched from a steep riverbank, boat handlers must position themselves at the top and bottom of the bank and pass the boat up and down the bank with the assistance of a bowline. When launching from steep banks, boat handlers must be cautious to use proper body positioning and lifting techniques.

All trailered boats must be moved using a four-wheel drive vehicle, and a spotter must assist the driver when s/he backs the trailer down the ramp. Leather gloves must be worn when winching the boat on and off of the trailer to minimize the risks of pinch points. When maneuvering the boat near the ramp

or dock, boat handlers must be aware of hand placement to avoid the pinch point between the boat and the dock.

On-Board

The following requirements apply when on a boat working over water:

- PFDs must be worn by each person on the boat.
- At least one person on board must be certified in Cardiopulmonary Resuscitation (CPR).
- If gear falls overboard, personnel should use a hook, pole, or oar to retrieve it. Equipment that cannot be retrieved safely should not be retrieved.
- Personnel must handle glass sampling jars carefully.
- When conducting work on small river systems, boat operators must avoid potential eye hazards (e.g., low-hanging branches).
- When navigating rivers with areas of small rapids, personnel should take time and plan the safest route through the rapid. If there is not a safe route through the rapid, portage the boat around the rapid to minimize the risk of flipping.
- Personnel must pay attention to weather conditions and get out of the water if necessary.
- The Field or Boat Supervisor must designate a Field Team member on the boat to monitor signs of heat or cold stress of individuals on board.

ATTACHMENT A
RESCUE PLAN

Rescue Plan

The information below must be documented if work will be conducted on a waterbody beyond the sight of the Standby Person.

1. Name, location, and contact information in the event a rescue team must be summoned:

2. Name of boat operator and all passengers:

3. Phone number or radio contact for boat operator:

4. Description of vessel including registration number:

5. Description (to include license plate state and number) of vehicle used to pull boat trailer:

6. Location, time, and date of departure and expected return time and date:

7. Area where working over water:

8. Emergency contact information (for use if not returned by expected time):

ATTACHMENT B
FLOAT PLAN

Float Plan

Name of Operator:			
Telephone No.:		Date of Boating Safety Training:	
Vessel Description:			
Type:		Color and Trim:	
Length:		Horsepower:	
No. of Engines:		Fuel Capacity:	
Primary Means of Propulsion:		Secondary Means of Propulsion:	
Registration No.:			
Registered Person's Name:			
Other Information:			
Auto License:		Type/Make of Auto:	
Color:		Auto Parked (location):	
Boat/Trailer License:		Boat/Trailer Parked (location):	
Name	Address		Telephone No.
Depart Date		Depart Time (A.M./P.M.)	
Expected Return Date:		Expected Return Time (A.M./P.M.)	
Going to:			
Other Pertinent Information:			

If not returned by _____ (insert time),
call the Coast Guard or appropriate search and rescue authority.

Coast Guard/Rescue Telephone No.:_____

ATTACHMENT C
BOAT SAFETY EQUIPMENT CHECKLISTS

Boat Safety Equipment Checklists

	For CRG Work on Small Rivers or On-Site Areas*
☐	U.S. Coast Guard approved PFDs (Type I, II, III, IV, or V) for all boat occupants (Type V PFDs must be properly worn to be considered acceptable)
☐	At least one Type IV PFD
☐	Navigation lights (if necessary)
☐	Anchor
☐	Paddles or oars
☐	Sound-producing device (air horn, whistle, bell)
☐	Radio or cellular phone
☐	Bailing bucket or bilge pump
☐	Emergency eyewash

	For CRG Work on U.S. Navigable Waters
☐	U.S. Coast Guard approved PFDs (Type I, II, III, IV, or V) for all boat occupants (Type V PFDs must be properly worn to be considered acceptable)
☐	At least one ring buoy with a 90-foot line attached (Type IV PFD)
☐	Field first aid kit
☐	At least one type of visual distress signal (battery-powered lights, flares in absence of flammable materials, signal mirror, visual distress flag)
☐	Navigation lights (if necessary)
☐	Reach pole or Shepherd's hook
☐	Anchor
☐	Paddles or oars
☐	Sound-producing device (air horn, whistle, or bell)
☐	U.S. Coast Guard approved B-II fire extinguisher
☐	Radio or cellular phone
☐	Charts or map of waterbody
☐	Bailing bucket or bilge pump
☐	Tools
☐	Spare parts as needed
☐	Emergency eyewash
☐	Emergency blanket

* Includes work on small rivers by canoe or small boat or within site boundaries on surface water bodies

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): Early Business Center Location: 401 Alexander Avenue, Tacoma WA 98421

Project Lead/Organization: Port of Tacoma County: Pierce

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

1. INTRODUCTION

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

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

2. CULTURAL RESOURCE DISCOVERIES

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

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

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

3. ON-SITE RESPONSIBILITIES

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

STEP A: Stop Work.

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

STEP B: Protect the Discovery.

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

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

STEP C: Notify Project Archaeologist (if applicable).

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

STEP D: Notify Project and Washington Department of Ecology (Ecology) contacts.

Project Lead Contacts

Primary Contact		Alternate Contact	
Name:	Melisa Bod	Name:	Dave Myers
Organization:	Port of Tacoma	Organization:	Port of Tacoma
Phone:	253-592-6789	Phone:	(253) 428-8612
Email:	mbod@portoftacoma.com	Email:	dmyers@portoftacoma.com

Ecology Contacts (completed by Ecology Project Manager)

Ecology Project Manager		Alternate or Cultural Resource Contact	
Name:	Sandy Smith	Name:	Sydney Hanson
Program:	Toxics Cleanup Program	Program:	Toxics Cleanup Program
Phone:	360-999-9588 (cell)	Phone:	564-999-1054 (cell)
Email:	sandy.smith@ecy.wa.gov	Email:	syha461@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:	Puyallup Tribe of Indians	Tribe:	Confederated Tribes and Bands of the Yakama Nation
Name:	Brandon Reynon	Name:	Jerry Meninick
Title:	Cultural Resources	Title:	Deputy Director of Cultural Resources
Phone:	253-573-7965 or 253-442-9361 (cell)	Phone:	509-865-5121
Email:	brandon.reynon@puyalluptribe-nsn.gov	Email:	jerry_meninick@yakama.com
Tribe:	Suquamish Tribe	Tribe:	Squaxin Island Tribe
Name:	Stephanie Trudel	Name:	Rhonda Foster
Title:	THPO	Title:	THPO
Phone:	360-394-8533	Phone:	360-432-3850
Email:	strudel@Suquamish.nsn.us	Email:	rfoster@squaxin.us

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

5. FURTHER CONTACTS (if applicable)

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

Federal Agency:		State Agency:	
Agency:	USACE (Shoreline work only)	Agency:	
Name:	Lance Lundquist	Name:	
Title:	Cultural Resources Program Manager	Title:	
Phone:	(206) 764-6909	Phone:	
Email:	lance.a.lundquist@usace.army.mil	Email:	

6. SPECIAL PROCEDURES FOR THE DISCOVERY OF HUMAN SKELETAL MATERIAL

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

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

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

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

1. Notify law enforcement and the Medical Examiner/Coroner using the contacts below. **Do not call 911** unless it is the only number available to you.

   Enter contact information below (required):
   - Local Medical Examiner or Coroner name and phone: CME: Karen Cline-Parhamovich 253-798-6494
   - Local Law Enforcement main name and phone: Tacoma Police: 911
   - Local Non-Emergency phone number (911 if without a non-emergency number): 253-287-4455
2. The Medical Examiner/Coroner (with assistance of law enforcement personnel) will determine if the remains are human or if the discovery site constitutes a crime scene and will notify DAHP.
3. **DO NOT speak with the media, allow photography or disturbance of the remains, or release any information about the discovery on social media.**
4. If the remains are determined to be non-forensic, Cover the remains with a tarp or other materials (not soil or rocks) for temporary protection and to shield them from being photographed by others or disturbed.

Further activities:

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

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

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

7. DOCUMENTATION OF ARCHAEOLOGICAL MATERIALS

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

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

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

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

The archaeologist will record spatial information, depth of excavation levels, natural and cultural stratigraphy, presence or absence of cultural material, and depth to sterile soil, regolith, or bedrock for each unit on a standard form. They will complete test excavation unit level forms, which will include plan maps for each excavation level and artifact counts and material types, number, and vertical provenience (depth below

surface and stratum association where applicable) for all recovered artifacts. They will draw a stratigraphic profile for at least one wall of each test excavation unit.

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

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

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

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

8. PROCEEDING WITH WORK

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

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

9. ORGANIZATION RESPONSIBILITY

The Project Lead/Organization is responsible for ensuring:

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

10. ADDITIONAL RESOURCES

Informative Video

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

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

Informational Resources

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

Washington State Archeology (DAHP 2003)

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

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

Potentially Interested Tribes

Interactive Map of Tribes by Area

(https://dahp.wa.gov/archaeology/tribal-consultation-information)

WSDOT Tribal Contact Website

(https://wsdot.wa.gov/tribal/TribalContacts.htm)

11. ADDITIONAL INFORMATION

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

Additional Puyallup Tribe of Indians contact:
• Alternate Contact: Michael Shong, Archaeologist, 253-339-1967 (mobile); Mike.Shong@PuyallupTribe-nsn.gov

Additional Tribes to consult:
Snoqualmie Indian Tribe: Steven Moses, Archaeology and Historic Preservation
Cell: 425-495-6097, email: steve@snoqualmietribe.us

Nisqually Indian Tribe: Brad Beach, THPO, Phone: 360-456-5221 ext 127
email: beach.brad@nisqually-nsn.gov

Muckleshoot Indian Tribe: Laura Murphy, Archaeologist Cultural Resources,
Phone: 253-876-3272, Email: laura.murphy@muckleshoot.nsn.us

As requested by the Puyallup Tribe Historic Preservation Department, excavation activities deeper than 10 ft below ground surface will be monitored for cultural resources by a professional archaeologist procured by the Port of Tacoma. Specific archaeological monitoring is not required for shallower excavations, shoreline work, and other project work; however, the IDP will be on-site and implemented should an inadvertent discovery be made at any time.

Implement the IDP if you see…

Chipped stone artifacts.

Examples are:

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

Stone artifacts from Oregon.

Stone artifacts from Washington.

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

Implement the IDP if you see…

Ground stone artifacts.

Examples are:

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

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

Artifacts from unknown locations (left and right images).

Implement the IDP if you see…

Bone or shell artifacts, tools, or beads.

Examples are:

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

Upper Left:*Bone Awls from Oregon.*

Upper Center: *Bone Wedge from California.*

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

Above: *Tooth Pendants. Right: Bone Pendants. Both from Oregon and Washington.*

Implement the IDP if you see…

Culturally modified trees, fiber, or wood artifacts.

Examples are:

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

Left and Below: *Culturally modified tree and an old carving on an aspen (Courtesy of DAHP).*

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

Implement the IDP if you see…

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

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

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

Shell Midden pocket in modern fill discovered in sewer trench.

Underground oven. Courtesy of DAHP.

Shell midden with fire cracked rock.

Hearth excavated near Hamilton, WA.

Implement the IDP if you see…

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

Examples are:

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

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

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

Implement the IDP if you see…

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

Examples are:

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

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

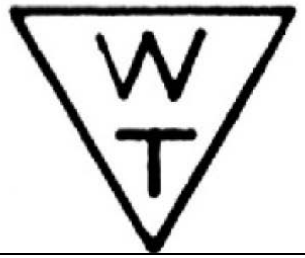
Right, from Top to Bottom: *Coins, token, spectacles and Montgomery Ward pitchfork toy discovered during Seattle Smith Cove shantytown (45-KI-1200) excavation.*

Implement the IDP if you see…

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

Far Left: .303 British cartridge found by a WCC planting crew on Skagit River. Don't ever touch something like this!
Left: Maker's mark on bottom of old bottle.

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



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

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

Implement the IDP if you see…

You see historic foundations or buried structures.

Examples are:

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

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

Implement the IDP if you see...

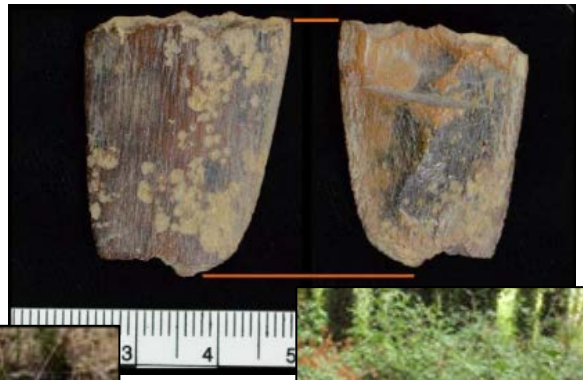
Potential human remains.

Examples are:

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

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

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



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

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

Hint: *Read the plan!*