Interstate 82 Exit 33A Yakima City Landfill
Updated Preliminary Cleanup Levels

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Background and Scope

This memorandum summarizes the preliminary cleanup levels (PCULs) for hazardous substances and mixtures that have been tested for at the Interstate 82 Exit 33A Yakima City Landfill Cleanup Site. Please note that this is an update and supersedes the September 22, 2023 Memorandum: "Interstate 82 Exit 33A Yakima City Landfill Preliminary Cleanup Levels" (Ecology, 2023), where more recent sampling and information has allowed us this update. Additional clarifications referenced can be found in the following documents:

- "Interstate 82 Exit 33A Yakima City Landfill: Response and Resolution to Comments Regarding Groundwater and Surface Water PCULs" (Ecology, 2024).
- "Interstate 82 Exit 33A Yakima City Landfill: Discussion of Changes and Responses to Comments Regarding Unsaturated and Saturated Soil PCULs" (Ecology, 2024).

This memorandum describes the process under the Model Toxics Control Act (MTCA) (Ecology, 2013) for determining these values and provides preliminary recommendations that can be used as a tool for site-specific decision-making. Actual cleanup levels at individual sites will depend on additional site-specific factors that are beyond the scope of this memorandum.

MTCA Methods for Establishing Cleanup Levels

Method A, Method B, and Method C may be used for establishing cleanup levels at sites. It is recommended that Method B (with the use of some Method A Values – when available) is used at the Interstate 82 Exit 33A Yakima City Landfill Cleanup Site because:

- Numerous individual contaminants and mixtures have been investigated at the site; and
- Pathways potentially exist for soil, groundwater, and surface water; and
- Specifically, Ecology uses the following general guidelines for mixing methods:
    - When using Method A, the site must be considered a simple site or routine cleanup and there must not be multiple chemicals without Method A table values;
    - When using Method B, Method A cleanup levels may be used but not Method C cleanup levels.
    - Method B is intended for all other sites.
- While each medium must be evaluated separately using criteria applicable to that medium, it has not been established that any medium within any of the sites qualify to use Method C.

Groundwater Preliminary Cleanup Levels

In general, WAC 173-340-720[1] requires that groundwater cleanup levels be set at concentrations that protect for drinking water beneficial uses unless the groundwater qualifies as nonpotable. A determination of whether the groundwater qualifies as nonpotable must be made on a site-specific basis, based on the criteria in WAC 173-340-720(2). However, at the site referred to in this memo, it is assumed that the groundwater shall be protected for drinking water beneficial use.

WAC 173-340-720 also requires groundwater cleanup levels to be protective of surface water beneficial uses unless it can be demonstrated that the hazardous substances in the groundwater are not likely to reach surface water. The exposure pathway of concern is the discharge of contaminated groundwater into the surface water and the protection of aquatic organisms living in that surface water and sediment, and persons that consume those organisms. This can occur directly through migration and seepage of the groundwater into the surface water and sorption onto the sediments, or indirectly through groundwater intercepted by ditches, foundation drains, utility corridors, and stormwater systems (including pipes, which typically are not water-tight), that then drain to surface water. It can also occur through temporary construction dewatering systems that discharge to storm drains that then discharge either directly or indirectly to surface water. It is this pathway that is the focus of this memorandum.

For the groundwater to surface water exposure pathway, WAC 173-340-720 requires that the methods specified in WAC 173-340-730[2] for establishing surface water cleanup levels be used to develop groundwater cleanup levels protective of surface water.

[1] https://app.leg.wa.gov/wac/default.aspx?cite=173-340-720
[2] https://app.leg.wa.gov/wac/default.aspx?cite=173-340-730

Surface Water Preliminary Cleanup Levels

In general, WAC 173-340-730 requires surface water cleanup levels to be protective of aquatic organisms, and persons that consume these organisms (Ecology, 2005). More specifically, it requires surface water cleanup levels to be at least as stringent as:

- Applicable state and federal laws;
- Concentrations protective of wildlife, fish, and other aquatic life;
- Concentrations protective of human health (such as through consumption of fish); and
- Drinking water, for surface waters classified as suitable for domestic water supply under water quality law.

In addition, both WAC 173-340-720(1)(c) and 730(1)(d) require cleanup levels that do not directly or indirectly cause violations of cleanup standards in other media, including the sediment cleanup standards. And, if a conditional point of compliance is used, WAC 173-340-720(8)(d) requires groundwater discharges not result in violations of sediment cleanup levels published in Chapter 173-204 WAC.[3]

If multiple chemicals with similar toxic effects on human health are present at a site, these concentrations may need to be further adjusted so that the additive risk does not exceed the acceptable thresholds in the rule (hazard index $\leq$ 1 and cancer risk $\leq 1X10^{-5}$). These adjustments will need to be made on a site-specific basis. This adjustment for additive risk does not need to be made for contaminants with cleanup levels controlled by protection of the environment (wildlife, fish, and other aquatic life). Rather, if multiple chemicals are present, it may be appropriate to otherwise account for additive risk by, for example, conducting bioassays with the groundwater (Ecology, 1993), to determine if the combined effect is an environmental concern.

Point of Compliance (Groundwater and Surface Water)

The Point of Compliance in groundwater is:

- Throughout the site from the uppermost level of the saturated zone extending vertically to the lowest most depth which could potentially be affected by the site; and the standard point of compliance is,
    - The point or points where the groundwater cleanup levels must be attained at the site to be in compliance with groundwater cleanup standards. Groundwater cleanup levels shall be attained in all groundwaters from the point of compliance to the outer boundary of the hazardous substance plume. This means that the Point of Compliance for groundwater is all wells within the characterized area.

[3] https://apps.leg.wa.gov/wac/default.aspx?cite=173-204

The Point of Compliance for surface water is:

- The point or points at which hazardous substances are released to the surface waters of the state; and
- The point at which hazardous substances are released to the surface water as a result of groundwater flows; no mixing zone shall be allowed to demonstrate compliance with surface water cleanup levels. Demonstration of compliance may be at the point at which there is a discharge to the surface water, or at the nearest groundwater well (or soil erosion) to the surface water.
- There are two possible results if surface water is located on or directly adjacent to the site:
    - Result (1): There is no contamination reaching the surface water (check wells and soil near the surface water):
        - Eliminate the surface water pathway in the remedial investigation. Use your groundwater cleanup level (i.e., drinking water) throughout the site.
    - Result (2): There is contamination reaching the surface water (check wells and soil near the surface water):
        - Retain the surface water pathway in the remedial investigation. Use the more stringent cleanup level (groundwater vs. surface water) throughout the site (or as close as practicable to the source of contamination if a conditional point of compliance is approved by Ecology).

As a result of the Point of Compliance for groundwater and surface water, it is important to be sure that the wells are properly placed, so that any contamination that reaches the surface water (down-gradient from the contamination) may be documented in the remedial investigation.

Establishing Preliminary Cleanup Levels for Groundwater

Under Method B, WAC 173-340-730(4) (b) requires that groundwater cleanup levels to be at least as stringent as all of the following:

- Maximum contaminant levels established under the Safe Drinking Water Act and published in 40 C.F.R. 141; and
- Maximum contaminant level goals for noncarcinogens established under the Safe Drinking Water Act and published in 40 C.F.R. 141; and
- Maximum contaminant levels established by the state board of health and published in Chapter 246-290 WAC.[4]

[4] https://apps.leg.wa.gov/WAC/default.aspx?cite=246-290

- Concentrations in groundwater must be protective of surface water beneficial use unless it can be demonstrated that the hazardous substances are not likely to reach surface water. This demonstration must be based on factors other than implementation of a cleanup action at the site.

Under WAC 173-340-720(7)(b), when a cleanup level is based on the applicable state or federal law and the level of risk upon which the standard is based exceeds an excess cancer risk of one in one hundred thousand (1×10^{-5}) or a hazard index of one (1), the cleanup level shall be adjusted downward so that the total excess cancer risk does not exceed one in one hundred thousand (1×10^{-5}) or a hazard index of one (1) at the site.

Based on the pathways and contaminants that were tested onsite, the following hazardous substances are considered Contaminants of Potential Concern (COPC) with the associated Preliminary Cleanup Levels (PCULs) for groundwater (see Table 1):

Table 1: Contaminants of Potential Concern in Groundwater – Protective of Drinking Water (ug/L).

Hazardous Substance	Preliminary Cleanup Level (ug/L)	Highest Value Detected (ug/L)	Based on Location
Diesel + Heavy Oil	5.00E+02	9.70E+02	MW-106
Bis(2-Ethylhexyl)Phthalate	6.00E+00	8.10E+01	MW-106
Vinyl Chloride	2.92E-01	3.90E-01	MW-106
Arsenic	6.00E+00	9.20E+00	MW-106
Iron	3.00E+02	5.70E+04	MW-106
Manganese	5.00E+01	5.70E+03	MW-106

Establishing Preliminary Cleanup Levels for Surface Water

Under Method B, WAC 173-340-730(3) (b) requires surface water cleanup levels to be at least as stringent as all of the following:

- Concentrations established under applicable state and federal laws (ARARs) including:
  - Water quality criteria published in the water quality standards for surface waters of the state of Washington, Chapter 173-201A WAC;[5]
  - Water quality criteria based on the protection of aquatic organisms (acute and chronic criteria) and human health published under section 304 of the Clean Water Act *unless it can be demonstrated that such criteria are not relevant and appropriate for a specific surface water body or hazardous substance*; and
  - National Toxics Rule (40 C.F.R. Part 131).

[5] https://app.leg.wa.gov/wac/default.aspx?cite=173-201A

- For substances for which environmental effects-based concentrations have not been established under applicable state or federal laws, concentrations that are estimated to result in no adverse effects on the protection and propagation of wildlife, fish, and other aquatic life.
- For substances for which sufficiently protective, health-based criteria or standards have not been established under state and federal laws, concentrations that protect human health as determined using the formulae in the rule.
- Potable water cleanup levels, for surface waters classified as suitable for use as a domestic water supply under chapter 173-201A WAC.

In addition, under WAC 173-340-730(5)(b), when a cleanup level is based on the applicable state or federal law and the level of risk upon which the standard is based exceeds an excess cancer risk of one in one hundred thousand (1×10^{-5}) or a hazard index of one (1), the cleanup level shall be adjusted downward so that the total excess cancer risk does not exceed one in one hundred thousand (1×10^{-5}) or a hazard index of one (1) at the site.

Based on the pathways and contaminants that were tested onsite, the following hazardous substances are considered Contaminants of Potential Concern (COPC) with the associated Preliminary Cleanup Levels (PCULs) for groundwater protective of surface water beneficial uses (see Table 2):

Table 2: Contaminants of Potential Concern in Groundwater – Protective of Surface Water Beneficial Uses (ug/L).

Hazardous Substance	Preliminary Cleanup Level (ug/L)	Highest Value Detected (ug/L)	Based on Location
Bis(2-Ethylhexyl)Phthalate	3.00E+00	8.10E+01	MW-106
N-Nitrosodiphenylamine	2.00E+00	5.80E+00	MW-106
1,2,4-Trichlorobenzene	1.00E-01	9.40E-01	MW-8
Arsenic	6.00E+00	9.20E+00	MW-106
Iron	1.00E+03	5.70E+04	MW-106
Manganese	5.00E+01	5.70E+03	MW-106

Based on the above conceptual framework, Table 3 and Table 4 present contaminant concentrations in groundwater (human health) and groundwater discharging to surface water (human health and freshwater aquatic organisms), that would be expected to be protective.

Please note that these values have been adjusted for the practical quantitation limits and natural background concentrations for groundwater and Surface Water as required by WAC 173-340-720(7) (c) and 730(5) (c) when establishing cleanup standards, should that be necessary.

Table 3: Preliminary Cleanup Levels (PCULs) for Groundwater Protective of Drinking Water for Selected Contaminants at the Interstate 82 Exit 33A Yakima City Landfill Site.

Analyte	CAS	H.H. GW Method A (ug/L)	H.H. GW Method B (ug/L)	Final Protective Value (ug/L)	Natural Background	Consultant MRL (ug/L)	Ecology MRL (ug/L)	Final PQL (ug/L)	PCUL (ug/L)	Highest Value Detected (ug/L)	COPC ?	
Master CLARC Spreadsheet Column	A	AC	AM				Guidance for TPH					
Diesel + HO	x	5.00E+02	x	5.00E+02	x	1.30E+02	2.50E+02	2.50E+02	5.00E+02	9.70E+02	y	
Acenaphthene	83-32-9	x	4.80E+02	4.80E+02	x	2.00E-02	5.00E-02	5.00E-02	4.80E+02	1.60E-01	n	
Anthracene	120-12-7	x	2.40E+03	2.40E+03	x	2.00E-02	5.00E-02	5.00E-02	2.40E+03	3.60E-02	n	
Benzo(G,H,I)Perylene	x	x	x	x	x	2.00E-02	3.50E-03	3.50E-03	x	2.00E-02	n	
Bis(2-Ethylhexyl)Phthalate	117-81-7	x	6.00E+00	6.00E+00	x	2.00E+00	3.00E+00	3.00E+00	6.00E+00	8.10E+01	y	
Chlorobenzene	108-90-7	x	1.00E+02	1.00E+02	x	2.00E+00	5.50E-02	5.50E-02	1.00E+02	3.00E+00	n	
Chloroform	67-66-3	x	1.41E+01	1.41E+01	x	2.00E+00	5.20E-02	5.20E-02	1.41E+01	5.70E-01	n	
3,3'-Dichlorobenzidine	91-94-1	x	1.94E-01	1.94E-01	x	2.00E+00	x	2.00E+00	2.00E+00	<2.00E+00	n	See GW/SW Memo
2,4-Dichlorophenol	120-83-2	x	4.80E+01	4.80E+01	x	2.00E+00	x	2.00E+00	4.80E+01	4.00E+00	n	
Fluoranthene	206-44-0	x	6.40E+02	6.40E+02	x	2.00E-02	5.00E-02	5.00E-02	6.40E+02	2.00E-02	n	
Fluorene	86-73-7	x	3.20E+02	3.20E+02	x	2.00E-02	5.00E-02	5.00E-02	3.20E+02	1.80E-02	n	
1-Methylnaphthalene	90-12-0	x	1.51E+00	1.51E+00	x	2.00E-02	1.00E+00	1.00E+00	1.51E+00	2.20E-01	n	
2-Methylnaphthalene	91-57-6	x	3.20E+01	3.20E+01	x	2.00E-02	1.00E+00	1.00E+00	3.20E+01	1.10E-01	n	
3-Methylphenol	x	x	x	x	x	2.00E+00	x	2.00E+00	x	1.10E+02	n	
Naphthalene	91-20-3	1.60E+02	1.60E+02	1.60E+02	x	2.00E-02	1.00E+00	1.00E+00	1.60E+02	1.30E-01	n	
N-Nitrosodiphenylamine	86-30-6	x	1.79E+01	1.79E+01	x	2.00E+00	x	2.00E+00	1.79E+01	5.80E+00	n	
Aroclor 1016	12674-11-2	x	5.60E-01	5.60E-01	x	1.00E-01	1.00E-01	1.00E-01	5.60E-01	ND	n	
Aroclor 1254	11097-69-1	x	2.19E-02	2.19E-02	x	1.00E-01	1.00E-01	1.00E-01	1.00E-01	ND	n	
Aroclor 1260	11096-82-5	x	2.19E-02	2.19E-02	x	1.00E-01	1.00E-01	1.00E-01	1.00E-01	ND	n	
Total PCBs (Aroclors)	1336-36-3	1.00E-01	2.19E-01	2.19E-01	x	x	1.00E-01	1.00E-01	2.19E-01	7.30E-02	n	
Pentachlorophenol	87-86-5	x	1.00E+00	1.00E+00	x	5.00E-01	6.00E-02	6.00E-02	1.00E+00	2.20E-01	n	
Phenanthrene (use pyrene as surr.)	x	x	2.40E+02	2.40E+02	x	2.00E-02	5.00E-02	5.00E-02	2.40E+02	3.10E-02	n	
Pyrene	129-00-0	x	2.40E+02	2.40E+02	x	2.00E-02	5.00E-02	5.00E-02	2.40E+02	1.30E-01	n	
1,2,4-Trichlorobenzene	120-82-1	x	1.51E+01	1.51E+01	x	2.00E+00	3.90E-02	3.90E-02	1.51E+01	9.40E-01	n	
Vinyl Chloride	75-01-4	2.00E-01	2.92E-01	2.92E-01	x	3.10E-02	6.00E-02	6.00E-02	2.92E-01	3.90E-01	y	
cPAHs												
Benzo(a)pyrene	50-32-8	1.00E-01	2.00E-01	2.00E-01	x	2.00E-02	2.00E-02	2.00E-02	2.00E-01	ND	n	
Benzo(a)anthracene	56-55-3	x	x	x	x	2.00E-02	2.00E-02	2.00E-02	x	ND	n	
Benzo(b)fluoranthene	205-99-2	x	x	x	x	2.00E-02	2.00E-02	2.00E-02	x	8.30E-02	n	
Benzo(k)fluoranthene	207-08-9	x	x	x	x	2.00E-02	2.00E-02	2.00E-02	x	1.90E-02	n	
Chrysene	218-01-9	x	x	x	x	2.00E-02	2.00E-02	2.00E-02	x	ND	n	
Dibenz(a,h)anthracene	53-70-3	x	x	x	x	2.00E-02	2.00E-02	2.00E-02	x	ND	n	
Indeno(1,2,3-cd)pyrene	193-39-5	x	x	x	x	2.00E-02	2.00E-02	2.00E-02	x	ND	n	
cPAH Total (TEQ)	x	1.00E-01	2.00E-01	2.00E-01	x	2.00E-02	2.00E-02	2.00E-02	2.00E-01	8.00E-03	n	
Metals (mg/L)												
Arsenic	7440-38-2	5.00E+00	5.00E+00	5.00E+00	6.00E+00	5.00E-01	5.00E-01	5.00E-01	6.00E+00	9.20E+00	y	
Barium	7440-39-3	x	2.00E+03	2.00E+03	x	6.25E-01	6.25E-01	6.25E-01	2.00E+03	1.40E+02	n	
Chromium III	16065-83-1	x	2.40E+04	2.40E+04	x	2.00E-01	2.00E-01	2.00E-01	2.40E+04	1.50E+01	n	
Chromium (Total)	7440-47-3	5.00E+01	x	5.00E+01	x	2.00E-01	2.00E-01	2.00E-01	5.00E+01	1.50E+01	n	
Iron	7439-89-6	x	3.00E+02	3.00E+02	x	2.05E+00	2.05E+00	2.05E+00	3.00E+02	5.70E+04	y	
Lead	7439-92-1	1.50E+01	1.50E+01	1.50E+01	x	1.00E-01	1.00E-01	1.00E-01	1.50E+01	2.10E+00	n	
Magnesium	x	x	x	x	x	x	5.00E+01	5.00E+01	x	3.30E+04	n	
Manganese	7439-96-5a	x	5.00E+01	5.00E+01	x	1.03E+00	1.03E+00	1.03E+00	5.00E+01	5.70E+03	y	
Mercury	7439-97-6	2.00E+00	2.00E+00	2.00E+00	x	6.00E-03	6.00E-03	6.00E-03	2.00E+00	ND	n	
Potassium	7440-09-7	x	x	x	x	x	x	x	x	2.00E+04	n	
Sodium	7440-23-5	x	x	x	x	x	x	x	x	1.40E+05	n	
Pesticides												
4,4'-DDD	72-54-8	x	3.65E-01	3.65E-01	x	2.50E-03	2.00E-03	2.50E-03	3.65E-01	1.50E-01	n	
4,4'-DDT	50-29-3	3.00E-01	2.57E-01	3.00E-01	x	3.00E-03	2.00E-03	3.00E-03	3.00E-01	9.00E-02	n	
Endosulfan II (beta)	33213-65-9	x	x	x	x	2.50E-03	2.50E-03	2.50E-03	x	6.80E-02	n	

Table 4: Preliminary Cleanup Levels (PCULs) for Groundwater Protective of Surface Water Beneficial Uses for Selected Contaminants at the Interstate 82 Exit 33A Yakima City Landfill Site.

Analyte	CAS	H.H. SW Method B (ug/L)	H.H. SW ARAR (ug/L)	Final Human Health (ug/L)	Eco. SW ARAR (ug/L)	Other Eco (ug/L)	Final Eco. (ug/L)	Final Protective Value (ug/L)	Consultant MRL (ug/L)	Ecology MRL (ug/L)	Final PQL (ug/L)	PCUL (ug/L)	Highest Value Detected (ug/L)	COPC ?	
Master CLARC Spreadsheet Column	A	AP and AQ	AX to AZ or BE to BG		AT to AW or BA to BD	RAIS (other Eco.)				Guidance for TPH					
Diesel + HO	x	5.00E+02	x	5.00E+02	x	3.00E+03	3.00E+03	5.00E+02	1.30E+02	2.50E+02	2.50E+02	5.00E+02	9.70E+02	n	See GW/SW Memo
Acenaphthene	83-32-9	6.40E+02	3.00E+01	3.00E+01	x	2.30E+01	2.30E+01	2.30E+01	2.00E-02	5.00E-02	5.00E-02	2.30E+01	1.60E-01	n	
Anthracene	120-12-7	2.60E+04	1.00E+02	1.00E+02	x	3.00E-01	3.00E-01	3.00E-01	2.00E-02	5.00E-02	5.00E-02	3.00E-01	3.60E-02	n	
Benzo(G,H,I)Perylene	x	x	x	x	x	x	x	x	2.00E-02	3.50E-03	3.50E-03	x	2.00E-02	n	
Bis(2-Ethylhexyl)Phthalate	117-81-7	3.60E+00	4.50E-02	4.50E-02	x	7.00E+00	7.00E+00	4.50E-02	2.00E+00	3.00E+00	3.00E+00	3.00E+00	8.10E+01	y	
Chlorobenzene	108-90-7	5.00E+03	1.00E+02	1.00E+02	x	6.40E+01	6.40E+01	6.40E+01	2.00E+00	5.50E-02	5.50E-02	6.40E+01	3.00E+00	n	
Chloroform	67-66-3	5.60E+01	6.00E+01	5.60E+01	x	8.90E+02	8.90E+02	5.60E+01	2.00E+00	5.20E-02	5.20E-02	5.60E+01	2.20E+01	n	
3,3'-Dichlorobenzidine	91-94-1	4.60E-02	3.10E-03	3.10E-03	x	1.05E+02	1.05E+02	3.10E-03	2.00E+00	x	2.00E+00	2.00E+00	1.30E+01	n	See GW/SW Memo
2,4-Dichlorophenol	120-83-2	1.90E+02	1.00E+01	1.00E+01	x	8.50E+01	8.50E+01	1.00E+01	2.00E+00	x	2.00E+00	1.00E+01	4.00E+00	n	
Fluoranthene	206-44-0	9.00E+01	6.00E+00	6.00E+00	x	6.16E+00	6.16E+00	6.00E+00	2.00E-02	5.00E-02	5.00E-02	6.00E+00	2.00E-02	n	
Fluorene	86-73-7	3.50E+03	1.00E+01	1.00E+01	x	1.10E+01	1.10E+01	1.00E+01	2.00E-02	5.00E-02	5.00E-02	1.00E+01	1.80E-02	n	
1-Methylnaphthalene	90-12-0	x	x	x	x	2.10E+00	2.10E+00	2.10E+00	2.00E-02	1.00E+00	1.00E+00	2.10E+00	2.20E-01	n	
2-Methylnaphthalene	91-57-6	x	x	x	x	1.30E+02	1.30E+02	1.30E+02	2.00E-02	1.00E+00	1.00E+00	1.30E+02	1.10E-01	n	
3-Methylphenol	x	x	x	x	x	x	x	x	2.00E+00	x	2.00E+00	x	1.10E+02	n	
Naphthalene	91-20-3	4.90E+03	x	4.90E+03	x	4.90E+02	4.90E+02	4.90E+02	2.00E-02	1.00E+00	1.00E+00	4.90E+02	1.30E-01	n	
N-Nitrosodiphenylamine	86-30-6	9.70E+00	6.20E-01	6.20E-01	x	5.80E+02	5.80E+02	6.20E-01	2.00E+00	x	2.00E+00	2.00E+00	5.80E+00	y	
Aroclor 1016	12674-11-2	3.00E-03	x	3.00E-03	x	7.40E-05	7.40E-05	7.40E-05	1.00E-01	1.00E-01	1.00E-01	1.00E-01	ND	n	
Aroclor 1254	11097-69-1	1.00E-04	x	1.00E-04	x	7.40E-05	7.40E-05	7.40E-05	1.00E-01	1.00E-01	1.00E-01	1.00E-01	ND	n	
Aroclor 1260	11096-82-5	x	x	x	x	7.40E-05	7.40E-05	7.40E-05	1.00E-01	1.00E-01	1.00E-01	1.00E-01	ND	n	
Total PCBs (Aroclors)	1336-36-3	1.00E-04	7.00E-06	7.00E-06	1.40E-02	1.40E-02	1.40E-02	7.00E-06	x	1.00E-01	1.00E-01	1.00E-01	7.30E-02	n	
Pentachlorophenol	87-86-5	1.50E+00	2.00E-03	2.00E-03	1.30E+01	1.30E+01	1.30E+01	2.00E-03	1.30E-01	6.00E-02	1.30E-01	1.30E-01	ND	n	
Phenanthrene (use pyrene as surr.)	x	2.60E+03	8.00E+00	8.00E+00	x	3.00E+01	3.00E+01	8.00E+00	2.00E-02	5.00E-02	5.00E-02	8.00E+00	3.10E-02	n	
Pyrene	129-00-0	2.60E+03	8.00E+00	8.00E+00	x	7.00E+00	7.00E+00	8.00E+00	2.00E-02	5.00E-02	5.00E-02	8.00E+00	1.30E-01	n	
1,2,4-Trichlorobenzene	120-82-1	2.00E+00	3.60E-02	3.60E-02	x	5.10E+01	5.10E+01	3.60E-02	1.00E-01	3.90E-02	1.00E-01	1.00E-01	9.4E-01	y	
Vinyl Chloride	75-01-4	3.70E+00	2.00E-02	2.00E-02	x	5.63E+03	5.63E+03	2.00E-02	3.10E-02	6.00E-02	6.00E-02	6.00E-02	3.90E-01	y	
cPAHs															
Benzo(a)pyrene	50-32-8	3.50E-02	1.60E-05	1.60E-05	x	1.40E-02	1.40E-02	1.60E-05	2.00E-02	2.00E-02	2.00E-02	2.00E-02	ND	n	
Benzo(a)anthracene	56-55-3	x	1.60E-04	1.60E-04	x	3.46E+01	3.46E+01	1.60E-04	2.00E-02	2.00E-02	2.00E-02	2.00E-02	ND	n	
Benzo(b)fluoranthene	205-99-2	x	1.60E-04	1.60E-04	x	x	x	1.60E-04	2.00E-02	2.00E-02	2.00E-02	2.00E-02	8.30E-02	n	See GW/SW Memo
Benzo(k)fluoranthene	207-08-9	x	1.60E-03	1.60E-03	x	x	x	1.60E-03	2.00E-02	2.00E-02	2.00E-02	2.00E-02	1.90E-02	n	
Chrysene	218-01-9	x	1.60E-02	1.60E-02	x	7.00E+00	7.00E+00	1.60E-02	2.00E-02	2.00E-02	2.00E-02	2.00E-02	ND	n	
Dibenz(a,h)anthracene	53-70-3	x	1.60E-05	1.60E-05	x	5.00E+00	5.00E+00	1.60E-05	2.00E-02	2.00E-02	2.00E-02	2.00E-02	ND	n	
Indeno(1,2,3-cd)pyrene	193-39-5	x	1.60E-04	1.60E-04	x	x	x	1.60E-04	2.00E-02	2.00E-02	2.00E-02	2.00E-02	ND	n	
cPAH Total (TEQ)	x	3.50E-02	1.60E-05	1.60E-05	x	1.40E-02	1.40E-02	1.60E-05	2.00E-02	2.00E-02	2.00E-02	2.00E-02	8.00E-03	n	
Metals (mg/L)															
Arsenic	7440-38-2	9.80E-02	1.80E-02	1.80E-02	1.50E+02	5.00E+00	5.00E+00	1.80E-02	1.00E+00	5.00E-01	5.00E-01	6.00E+00	9.20E+00	y	
Barium	7440-39-3	x	1.00E+03	1.00E+03	x	2.20E+02	2.20E+02	4.00E+00	1.00E+00	6.25E-01	6.25E-01	2.20E+02	1.40E+02	n	See GW/SW Memo
Chromium III	16065-83-1	2.40E+05	x	2.40E+05	7.40E+01	7.40E+01	7.40E+01	7.40E+01	2.00E+00	2.00E-01	2.00E-01	7.40E+01	1.50E+01	n	
Chromium (Total)	7440-47-3	x	x	x	x	1.01E+02	1.01E+02	1.01E+02	2.00E+00	2.00E-01	2.00E-01	1.01E+02	1.50E+01	n	
Iron	7439-89-6	x	x	x	1.00E+03	1.00E+03	1.00E+03	1.00E+03	5.00E+01	2.05E+00	2.05E+00	1.00E+03	5.70E+04	y	
Lead	7439-92-1	x	x	x	2.50E+00	2.50E+00	2.50E+00	2.50E+00	1.00E+00	1.00E-01	1.00E-01	2.50E+00	2.10E+00	n	
Magnesium	x	x	x	x	x	x	x	x	5.00E+01	x	5.00E+01	x	3.30E+04	n	
Manganese	7439-96-5a	x	5.00E+01	5.00E+01	x	1.20E+02	1.20E+02	5.00E+01	2.00E+00	1.03E+00	1.03E+00	5.00E+01	5.70E+03	y	
Mercury	7439-97-6	x	x	x	1.20E-02	1.20E-02	1.20E-02	1.20E-02	2.00E-01	6.00E-03	6.00E-03	1.20E-02	ND	n	
Potassium	7440-09-7	x	x	x	x	x	x	x	x	x	x	x	2.00E+04	n	
Sodium	7440-23-5	x	x	x	x	x	x	x	x	x	x	x	1.40E+05	n	
Pesticides															
4,4'-DDD	72-54-8	5.00E-04	7.90E-06	7.90E-06	x	1.10E-02	1.10E-02	7.90E-06	5.00E-03	5.00E-03	5.00E-03	5.00E-03	1.50E-01	n	See GW/SW Memo
4,4'-DDT	50-29-3	3.60E-04	1.20E-06	1.20E-06	1.00E-03	1.00E-03	1.00E-03	1.20E-06	5.00E-03	5.00E-03	5.00E-03	5.00E-03	9.00E-02	n	See GW/SW Memo
Endosulfan II (beta)	33213-65-9	x	9.70E+00	9.70E+00	5.60E-02	5.60E-02	5.60E-02	5.60E-02	x	2.50E-03	2.50E-03	5.60E-02	6.80E-03	n	

Soil Preliminary Cleanup Levels

In general, WAC 173-340-740[6] requires that soil cleanup levels be set at concentrations that:

- Eliminate or substantially reduce the potential for food chain contamination; and
- Eliminate or substantially reduce the potential for damage to soils or biota in the soils which could impair the use of soils for agriculture or silviculture purposes; and
- Protect the potential health risk posed by dust at a site; and
- Protect the groundwater at a site; and
- Protect nearby surface waters from the site; and
- Eliminate or minimize the potential for vapors in building or structures.

To meet these requirements for soil, preliminary concentrations have been established based on the protection of:

- Human health (direct contact); and
- Terrestrial Ecological Receptors; and
- Soil protective of groundwater (highest beneficial use); and
- Soil protective of groundwater with transport to surface water (highest beneficial use).

Note that protective values have been adjusted for the practical quantitation limits and natural background concentrations for soil as required by WAC 173-340-740(5) (c) when establishing cleanup standards, should that be necessary.

In addition, if multiple chemicals with similar toxic effects on human health are present at a site, these concentrations may need to be further adjusted so that the additive risk does not exceed the acceptable thresholds in the rule (hazard index $\leq$ 1 and cancer risk $\leq$ $1X10^{-5}$). These adjustments will need to be made on a site-specific basis. This adjustment for additive risk does not need to be made for contaminants with cleanup levels controlled by protection of the environment (terrestrial ecological receptors). Rather, if multiple chemicals are present, it may be appropriate to otherwise account for additive risk by, for example, conducting bioassays with the soil, to determine if the combined effect is an environmental concern.

Point of Compliance (Soil)

The Point of Compliance for soil is:

- For soil cleanup levels based on the protection of groundwater, the point of compliance shall be established in the soils throughout the site; and

[6] https://app.leg.wa.gov/wac/default.aspx?cite=173-340-740

- For soil cleanup levels based on protection from vapors, the point of compliance shall be established in the soils throughout the site from the ground surface to the uppermost groundwater saturated zone (e.g., from the ground surface to the uppermost water table); and
- For soil cleanup levels based on human exposure via direct contact or other exposure pathways where contact with the soil is required to complete the pathway, the point of compliance shall be established in the soils throughout the site from the ground surface to fifteen feet below the ground surface. This represents a reasonable estimate of the depth of soil that could be excavated and distributed at the soil surface as a result of site development activities; and
- For soil cleanup levels based on ecological receptors, the standard point of compliance is set from the ground surface to fifteen feet below the ground surface. The department may approve a conditional point of compliance set at the biologically active zone with placement of an institutional control to prevent excavation of deeper soil.

Establishing Preliminary Cleanup Levels for Soil

In general, standard Method B soil cleanup levels shall be at least as stringent as the following:

- Concentrations established under applicable state and federal laws; and
- Concentrations that result in no significant adverse effects on the protection and propagation of terrestrial ecological receptors using the procedures specified in WAC 173-340-7490[7] through 7494; and
- For hazardous substances for which sufficiently protective, health-based criteria or standards have not been established under applicable state and federal laws, those concentrations that protect human health as determined by evaluating the following exposure pathways:
    - Ground water protection; and
    - Soil direct contact; and
    - Soil vapors

It is assumed that soil vapors are not a pathway at this site.

Terrestrial Ecological Receptors

Protective values for terrestrial ecological receptors were established under the assumption that a Simplified terrestrial ecological evaluation (Simplified TEE) would meet the requirements at this site. Protective concentrations were obtained from Table 749-2 of MTCA.

[7] https://app.leg.wa.gov/WAC/default.aspx?cite=173-340-7490

Soil Protective of Groundwater and Soil Protective of Groundwater with Transport to Surface Water – Both Saturated and Unsaturated Conditions

Soil values that are protective of groundwater, and soil protective of groundwater with transport to surface water were calculated using the fixed parameter three-phase partitioning model found in WAC 173-340-747[8] are included in Table 11 (unsaturated conditions) and Table 12 (saturated conditions). Both saturated and unsaturated conditions were assumed for in the calculations to allow for site-specific decision-making. Note: Conditions at the site made differentiating between unsaturated and saturated soil samples difficult. The same maximum concentration was used for both Tables 11 and 12.

PCULs established earlier for groundwater (Table 3) and surface water (Table 4) were used as the cleanup level to be met – these cleanup levels were based on protection of the highest beneficial use with and upward adjustment to take into account natural background or practical quantitation limits, where applicable. Note: Where "Empirical" is listed in the row, it has been assumed that an empirical demonstration, based on groundwater quality data, indicates that the contaminant is not reaching the groundwater/surface water at values above what is considered protective.

The Cleanup Levels and Risk Calculation (CLARC)[9] Tool was used to derive the following chemical-specific parameters:

- Hcc = Henry's Law Constant @ 13º C (dimensionless); and
- Kd = Distribution Coefficient (L/kg); and
- Koc = Soil organic carbon-water partitioning coefficient (ml/g).

Equation 747-1 was used to derive the following default parameters:

- UCF = Unit conversion factor (1 mg/1,000 ug); and
- DF = Dilution faction (dimensionless – 20 for unsaturated, 1 for saturated); and
- Θw = Water-filled soil porosity (ml water/ml soil – 0.3 for unsaturated, 0.43 for saturated; and
- Θa = Air-filled soil porosity (ml air/ml soil – 0.13 for unsaturated, 0 for saturated; and
- *Pb* = Dry soil bulk density (1.5 kg/L).

Soil Protective of Direct Contact

Soil that is protective of direct contact is based on concentrations that are estimated to result in no acute or chronic noncarcinogenic toxic effects on human health using a hazard quotient of one (1) and concentrations for which the upper bound on the estimated excess cancer risk is less than or equal to on in on million (1×10^{-6}).

[8] https://app.leg.wa.gov/wac/default.aspx?cite=173-340-747

[9] https://ecology.wa.gov/regulations-permits/guidance-technical-assistance/contamination-clean-up-tools/clarc

Equations 740-1 and 740-2 (MTCA) and the associated default assumptions shall be used to calculate the concentration for direct contact with contaminated soil.

Based on the pathways and contaminants that were tested onsite, hazardous substances are considered Contaminants of Potential Concern (COPC) with the associated Preliminary Cleanup Levels (PCULs) for soil (assuming both unsaturated and saturated conditions) in Tables 7 and 8. Tables 11 and 12 include the matrix for which determinations were derived.

Evaluating the Human Health Toxicity of Carcinogenic PAHs (cPAHs) Using Toxicity Equivalency Factors TEFs (Ecology, 2015).

A method that can be used to evaluate the potential for cPAH mixtures in soil to impact groundwater is to convert the cPAH mixture to an equivalent concentration of benzo(a)pyrene that accounts for both the toxicity and mobility of the individual cPAH compounds relative to benzo(a)pyrene (see Equation 1 and Tables 5 and 6).

Under this method, the mobility of a cPAH relative to benzo(a)pyrene can be approximated by dividing the Koc for benzo(a)pyrene by the Koc for the cPAH of interest. This "relative mobility factor" can then be used to assess the mobility of individual cPAHs and cPAH mixtures.
The calculation to convert the chemical concentrations in a cPAH mixture to an equivalent concentration of benzo(a)pyrene that factors in both the toxicity and leaching mobility of the individual cPAHs can be expressed mathematically as follows. For notation purposes, the result is referred here as the "total toxic mobility equivalent concentration" or "Total TMEQ."

Equation 1: Total Toxic Mobility Equivalent Concentration (Total TMEQ).

$$\text{Total TMEQ} = \sum C_n * TEF_n * RMF_n$$

Where:

Total TMEQ	=	Total Toxic Mobility Equivalent Concentration
C_n	=	Concentration of the individual cPAH in the mixture
TEF_n	=	Toxic equivalency factor for the individual cPAH in the mixture (from Table 1)
RMF_n	=	Relative mobility factor for the individual cPAH in the mixture (from Table 2)

Table 5: Toxicity Equivalency Factors (TEFs) for the minimum required carcinogenic polycyclic aromatic hydrocarbons under WAC 173-340-708(e) (from Table 708-2 in WAC 173-340-900).

CAS Number	cPAH	TEF (Unitless)
50-32-8	Benzo(a)pyrene	1
56-55-3	Benzo(a)anthracene	0.1
205-99-2	Benzo(b)fluoranthene	0.1
207-08-9	Benzo(k)fluoranthene	0.1
218-01-9	Chrysene	0.01
53-70-3	Dibenz(a,h)anthracene	0.1
193-39-5	Indeno(1,2,3-cd)pyrene	0.1

Table 6: Relative mobility factors for the minimum required carcinogenic polycyclic aromatic hydrocarbons under WAC 173-340-708(e).

CAS #	cPAH	Koc [6]	Relative Mobility Factor
50-32-8	Benzo(a)pyrene	968,774	1.00
56-55-3	Benzo(a)anthracene	357,537	2.71
205-99-2	Benzo(b) fluoranthene	1,230,000	0.79
207-08-9	Benzo(k) fluoranthene	1,230,000	0.79
218-01-9	Chrysene	398,000	2.43
53-70-3	Dibenz(a,h)anthracene	1,789,101	0.54
207-08-9	Indeno(1,2,3-cd)pyrene	3,470,000	0.28
Koc = Organic carbon – water partitioning coefficient Relative mobility factor = Benzo(a)pyrene Koc / cPAH Koc			

The following steps describe how to determine the Total TMEQ for mixtures of cPAHs, and how to use this value to evaluate compliance:

1. Analyze the sample to determine the concentration of each cPAH.
2. Multiply each cPAH concentration in the sample by its corresponding TEF from Table 5 (above) and its corresponding relative mobility factor from Table 6 (above). This calculates a toxic mobility equivalent concentration (TMEQ) for each cPAH.
3. Add the products in Step 2 to obtain the Total TMEQ for the cPAH mixture.
4. Either look up or calculate a cleanup level for benzo(a)pyrene that is protective of groundwater through the leaching pathway.
5. To evaluate compliance for the sample, compare the Total TMEQ for the cPAH mixture with the soil concentration protective of groundwater for benzo(a)pyrene.

See Tables 9 and 10 for site-specific calculations.

Table 7: Contaminants of Potential Concern in Soil (mg/kg), based on Unsaturated Conditions.

Hazardous Substance	Preliminary Cleanup Level (mg/kg)	Highest Value Detected (mg/kg)	Pathway	Based on Location
Diesel + Heavy Oil	4.60E+02	1.29E+03	Upland Ecological Risk	MW-107
Bis(2-Ethylhexyl)Phthalate	1.19E-01	8.20E-01	Soil Protective of Groundwater Soil Protective of Surface Water Upward Adjusted to PQL	MW-106
N-Nitrosodiphenylamine	1.00E-01	1.10E-01	Soil Protective of Surface Water Upward Adjusted to PQL	MW-106

Table 8: Contaminants of Potential Concern in Soil (mg/kg), based on Saturated Conditions.

Hazardous Substance	Preliminary Cleanup Level (mg/kg)	Highest Value Detected (mg/kg)	Pathway	Based on Location
Diesel + Heavy Oil	4.60E+02	1.29E+03	Upland Ecological Risk	MW-107
Bis(2-Ethylhexyl)Phthalate	1.19E-01	8.20E-01	Soil Protective of Groundwater Soil Protective of Surface Water Upward Adjusted to PQL	MW-106
N-Nitrosodiphenylamine	1.00E-01	1.10E-01	Soil Protective of Surface Water Upward Adjusted to PQL	MW-106

Table 9: Total Toxic Mobility Equivalent Concentration (Total TMEQ) for Specific Site Samples.

Sample #	MW-104								
Analyte	CAS	TEF	Relative Mobility Factor	Measured Soil Concentration (mg/kg)	TMEQ (Total)	Soil CUL (mg/kg)	COPC?		
Ecology IM #10 Method 2			Benzo(a)pyrene Koc/cPAH Koc						
cPAHs									
Benzo(a)pyrene	50-32-8	1	1.00E+00	2.20E-02	2.20E-02				
Benzo(a)anthracene	56-55-3	0.1	2.71E+00	2.10E-02	5.69E-03				
Benzo(b)fluoranthene	205-99-2	0.1	7.90E-01	3.00E-02	2.37E-03				
Benzo(k)fluoranthene	207-08-9	0.1	7.90E-01	1.00E-02	7.90E-04				
Chrysene	218-01-9	0.01	2.43E+00	1.00E-02	2.43E-04				
Dibenz(a,h)anthracene	53-70-3	0.1	5.40E-01	0.00E+00	0.00E+00				
Indeno(1,2,3-cd)pyrene	193-39-5	0.1	2.80E-01	1.00E-02	2.80E-04				
Sum				1.03E-01	3.14E-02	1.90E-01	N	Vadose	Soil> GW
					3.14E-02	1.90E-01	N	Saturated	Soil> GW
					3.14E-02	5.00E-02	N	Vadose	Soil> GW>SW
					3.14E-02	5.00E-02	N	Saturated	Soil> GW>SW

Sample #	MW-105								
Analyte	CAS	TEF	Relative Mobility Factor	Measured Soil Concentration (mg/kg)	TMEQ (Total)	Soil CUL (mg/kg)	COPC?		
Ecology IM #10 Method 2			Benzo(a)pyrene Koc/cPAH Koc						
cPAHs									
Benzo(a)pyrene	50-32-8	1	1.00E+00	7.10E-02	7.10E-02				
Benzo(a)anthracene	56-55-3	0.1	2.71E+00	9.90E-02	2.68E-02				
Benzo(b)fluoranthene	205-99-2	0.1	7.90E-01	1.10E-01	8.69E-03				
Benzo(k)fluoranthene	207-08-9	0.1	7.90E-01	3.10E-02	2.45E-03				
Chrysene	218-01-9	0.01	2.43E+00	6.30E-02	1.53E-03				
Dibenz(a,h)anthracene	53-70-3	0.1	5.40E-01	0.00E+00	0.00E+00				
Indeno(1,2,3-cd)pyrene	193-39-5	0.1	2.80E-01	3.80E-02	1.06E-03				
Sum				4.12E-01	1.12E-01	1.90E-01	N	Vadose	Soil> GW
					1.12E-01	1.90E-01	N	Saturated	Soil> GW
					1.12E-01	5.00E-02	Y	Vadose	Soil> GW>SW
					1.12E-01	5.00E-02	Y	Saturated	Soil> GW>SW

Sample #	MW-106								
Analyte	CAS	TEF	Relative Mobility Factor	Measured Soil Concentration (mg/kg)	TMEQ (Total)	Soil CUL (mg/kg)	COPC?		
Ecology IM #10 Method 2			Benzo(a)pyrene Koc/cPAH Koc						
cPAHs									
Benzo(a)pyrene	50-32-8	1	1.00E+00	1.00E-02	1.00E-02				
Benzo(a)anthracene	56-55-3	0.1	2.71E+00	1.00E-02	2.71E-03				
Benzo(b)fluoranthene	205-99-2	0.1	7.90E-01	2.10E-02	1.66E-03				
Benzo(k)fluoranthene	207-08-9	0.1	7.90E-01	1.00E-02	7.90E-04				
Chrysene	218-01-9	0.01	2.43E+00	1.00E-02	2.43E-04				
Dibenz(a,h)anthracene	53-70-3	0.1	5.40E-01	0.00E+00	0.00E+00				
Indeno(1,2,3-cd)pyrene	193-39-5	0.1	2.80E-01	1.00E-02	2.80E-04				
Sum				7.10E-02	1.57E-02	1.90E-01	N	Vadose	Soil> GW
					1.57E-02	1.90E-01	N	Saturated	Soil> GW
					1.57E-02	5.00E-02	N	Vadose	Soil> GW>SW
					1.57E-02	5.00E-02	N	Saturated	Soil> GW>SW

Table 10: Total Toxic Mobility Equivalent Concentration (Total TMEQ) for Specific Site Samples.

Sample #	MW-108								
Analyte	CAS	TEF	Relative Mobility Factor	Measured Soil Concentration (mg/kg)	TMEQ (Total)	Soil CUL (mg/kg)	COPC?		
Ecology IM #10 Method 2			Benzo(a)pyrene Koc/cPAH Koc						
cPAHs									
Benzo(a)pyrene	50-32-8	1	1.00E+00	1.00E-02	1.00E-02				
Benzo(a)anthracene	56-55-3	0.1	2.71E+00	5.20E-02	1.41E-02				
Benzo(b)fluoranthene	205-99-2	0.1	7.90E-01	1.00E-02	7.90E-04				
Benzo(k)fluoranthene	207-08-9	0.1	7.90E-01	1.00E-02	7.90E-04				
Chrysene	218-01-9	0.01	2.43E+00	1.00E-02	2.43E-04				
Dibenz(a,h)anthracene	53-70-3	0.1	5.40E-01	0.00E+00	0.00E+00				
Indeno(1,2,3-cd)pyrene	193-39-5	0.1	2.80E-01	1.00E-02	2.80E-04				
Sum				1.02E-01	2.62E-02	1.90E-01	N	Vadose	Soil> GW
					2.62E-02	1.90E-01	N	Saturated	Soil> GW
					2.62E-02	5.00E-02	N	Vadose	Soil> GW> SW
					2.62E-02	5.00E-02	N	Saturated	Soil> GW> SW

Sample #	MW-109								
Analyte	CAS	TEF	Relative Mobility Factor	Measured Soil Concentration (mg/kg)	TMEQ (Total)	Soil CUL (mg/kg)	COPC?		
Ecology IM #10 Method 2			Benzo(a)pyrene Koc/cPAH Koc						
cPAHs									
Benzo(a)pyrene	50-32-8	1	1.00E+00	1.00E-02	1.00E-02				
Benzo(a)anthracene	56-55-3	0.1	2.71E+00	1.00E-02	2.71E-03				
Benzo(b)fluoranthene	205-99-2	0.1	7.90E-01	1.00E-02	7.90E-04				
Benzo(k)fluoranthene	207-08-9	0.1	7.90E-01	2.10E-02	1.66E-03				
Chrysene	218-01-9	0.01	2.43E+00	2.40E-02	5.83E-04				
Dibenz(a,h)anthracene	53-70-3	0.1	5.40E-01	0.00E+00	0.00E+00				
Indeno(1,2,3-cd)pyrene	193-39-5	0.1	2.80E-01	1.00E-02	2.80E-04				
Sum				8.50E-02	1.60E-02	1.90E-01	N	Vadose	Soil> GW
					1.60E-02	1.90E-01	N	Saturated	Soil> GW
					1.60E-02	5.00E-02	N	Vadose	Soil> GW> SW
					1.60E-02	5.00E-02	N	Saturated	Soil> GW> SW

Sample #	GP-23								
Analyte	CAS	TEF	Relative Mobility Factor	Measured Soil Concentration (mg/kg)	TMEQ (Total)	Soil CUL (mg/kg)	COPC?		
Ecology IM #10 Method 2			Benzo(a)pyrene Koc/cPAH Koc						
cPAHs									
Benzo(a)pyrene	50-32-8	1	1.00E+00	3.50E-02	3.50E-02				
Benzo(a)anthracene	56-55-3	0.1	2.71E+00	4.40E-02	1.19E-02				
Benzo(b)fluoranthene	205-99-2	0.1	7.90E-01	8.80E-02	6.95E-03				
Benzo(k)fluoranthene	207-08-9	0.1	7.90E-01	1.00E-02	7.90E-04				
Chrysene	218-01-9	0.01	2.43E+00	4.50E-02	1.09E-03				
Dibenz(a,h)anthracene	53-70-3	0.1	5.40E-01	0.00E+00	0.00E+00				
Indeno(1,2,3-cd)pyrene	193-39-5	0.1	2.80E-01	2.70E-02	7.56E-04				
Sum				2.49E-01	5.65E-02	1.90E-01	N	Vadose	Soil> GW
					5.65E-02	1.90E-01	N	Saturated	Soil> GW
					5.65E-02	5.00E-02	Y	Vadose	Soil> GW> SW
					5.65E-02	5.00E-02	Y	Saturated	Soil> GW> SW

Sample #	GP-26								
Analyte	CAS	TEF	Relative Mobility Factor	Measured Soil Concentration (mg/kg)	TMEQ (Total)	Soil CUL (mg/kg)	COPC?		
Ecology IM #10 Method 2			Benzo(a)pyrene Koc/cPAH Koc						
cPAHs									
Benzo(a)pyrene	50-32-8	1	1.00E+00	1.00E-02	1.00E-02				
Benzo(a)anthracene	56-55-3	0.1	2.71E+00	2.90E-02	7.86E-03				
Benzo(b)fluoranthene	205-99-2	0.1	7.90E-01	3.70E-02	2.92E-03				
Benzo(k)fluoranthene	207-08-9	0.1	7.90E-01	1.00E-02	7.90E-04				
Chrysene	218-01-9	0.01	2.43E+00	1.00E-02	2.43E-04				
Dibenz(a,h)anthracene	53-70-3	0.1	5.40E-01	0.00E+00	0.00E+00				
Indeno(1,2,3-cd)pyrene	193-39-5	0.1	2.80E-01	1.00E-02	2.80E-04				
Sum				1.06E-01	2.21E-02	1.90E-01	N	Vadose	Soil> GW
					2.21E-02	1.90E-01	N	Saturated	Soil> GW
					2.21E-02	5.00E-02	N	Vadose	Soil> GW> SW
					2.21E-02	5.00E-02	N	Saturated	Soil> GW> SW

Notes: 1. Sample locations GP-23 and GP-26 are located up-gradient of the Landfill Site on the adjacent Boise Cascade Mill Cleanup Site (FSID: 450, CSID: 12095), and therefore have been eliminated as a contributing source of COPCs.

2. An empirical demonstration was used to demonstrate soil TMEQ concentrations at MW-105 have not caused groundwater and surface water PCULs to be exceeded.

Table 11: Soil concentrations determined to be protective of human health and ecological receptors based on a site-specific pathway analysis (assumed unsaturated conditions for the leaching model).

Analyte	CAS	Soil Method A (mg/kg)	Soil Method B Direct Contact (mg/kg)	Soil Method B Protection of Groundwater (mg/kg) - Unsat	Soil Method B Protection of Surface Water (mg/kg) - Unsat	Final Protective H.H. Value (mg/kg)	TEE Value (mg/kg)	Final Protective Value (mg/kg)	Consultant MRL (mg/kg)	Ecology MRL (mg/kg)	Final PQL (mg/kg)	Natural Background	PCUL (mg/kg)	Highest Recorded Value (mg/kg)	COPC?	
Master CLARC Spreadsheet Column	A	B	Q and R	Based on 3-Phase Model Results	Based on 3-Phase Model Results		Search Table 749-2			Guidance for TPH		Natural Background Metals				
Gasoline	x	1.00E+02	x	x	x	1.00E+02	2.00E+02	1.00E+02	3.00E+00	5.00E+00	5.00E+00	x	1.00E+02	1.40E+01	n	
Diesel + HO	x	2.00E+03	x	x	x	2.00E+03	4.60E+02	4.60E+02	2.50E+01	2.50E+01	2.50E+01	x	4.60E+02	1.29E+03	y	
Acenaphthene	83-32-9	x	4.80E+03	Empirical	Empirical	4.80E+03	x	4.80E+03	2.00E-02	4.35E-02	4.35E-02	x	4.80E+03	2.20E-02	n	
Acenaphthylene	x	x	x	x	x	x	x	x	2.00E-02	6.70E-02	6.70E-02	x	x	8.10E-02	n	
Acetone	67-64-1	x	7.20E+04	Empirical	Empirical	7.20E+04	x	7.20E+04	5.00E-02	1.50E-02	1.50E-02	x	7.20E+04	2.80E-01	n	
Aldrin	309-00-2	x	5.90E-02	Empirical	Empirical	5.90E-02	1.70E-01	5.90E-02	1.00E-02	1.35E-03	1.35E-03	x	5.90E-02	9.40E-03	n	
Anthracene	120-12-7	x	2.40E+04	Empirical	Empirical	2.40E+04	x	2.40E+04	1.00E-01	4.35E-02	4.35E-02	x	2.40E+04	2.80E-02	n	
Benzo(G,H,I)Perylene	x	x	x	x	x	x	x	x	1.00E-01	4.60E-02	4.60E-02	x	x	x	n	
Bis(2-Ethylhexyl)Phthalate	117-81-7	x	7.10E+01	1.33E+01	1.00E-01	1.00E-01	x	1.00E-01	1.00E-02	1.19E-01	1.19E-01	x	1.19E-01	8.20E-01	y	See Soil Memo
Chlorobenzene	108-90-7	x	1.60E+03	Empirical	Empirical	1.60E+03	x	1.60E+03	1.00E-02	2.00E-03	2.00E-03	x	1.60E+03	ND	n	
Chloroform	67-66-3	x	3.20E+01	Empirical	Empirical	3.20E+01	x	3.20E+01	1.00E-02	2.00E-03	2.00E-03	x	3.20E+01	ND	n	
3,3'-Dichlorobenzidine	91-94-1	x	2.20E+00	1.30E-02	2.10E-04	2.10E-04	x	2.10E-04	2.50E-01	3.30E-01	3.30E-01	x	3.30E-01	ND	n	
2,4-Dichlorophenol	120-83-2	x	2.40E+02	Empirical	Empirical	2.40E+02	x	2.40E+02	5.00E-01	2.15E-01	2.15E-01	x	2.40E+02	ND	n	
Fluoranthene	206-44-0	x	3.20E+03	Empirical	Empirical	3.20E+03	x	3.20E+03	2.00E-02	5.00E-03	5.00E-03	x	3.20E+03	2.50E-01	n	
Fluorene	86-73-7	x	3.20E+03	Empirical	Empirical	3.20E+03	x	3.20E+03	2.00E-02	5.00E-03	5.00E-03	x	3.20E+03	ND	n	
1-Methylnaphthalene	90-12-0	x	3.40E+01	Empirical	Empirical	3.40E+01	x	3.40E+01	2.00E-02	5.00E-01	5.00E-01	x	3.40E+01	6.10E-02	n	
2-Methylnaphthalene	91-57-6	x	3.20E+02	Empirical	Empirical	3.20E+02	x	3.20E+02	2.00E-02	5.00E-01	5.00E-01	x	3.20E+02	9.50E-02	n	
3-Methylphenol	x	x	x	x	x	x	x	x	x	x	x	x	x	4.00E-01	n	
Naphthalene	91-20-3	5.00E+00	1.60E+03	Empirical	Empirical	1.60E+03	x	1.60E+03	2.00E-02	5.00E-01	5.00E-01	x	1.60E+03	2.50E-01	n	
N-Nitrosodiphenylamine	86-30-6	x	2.00E+02	1.00E+00	3.50E-02	3.50E-02	x	3.50E-02	1.00E-01	5.00E-02	1.00E-01	x	1.00E-01	1.10E-01	y	See Soil Memo
Aroclor 1016	12674-11-2	x	5.60E+00	x	x	5.60E+00	x	5.60E+00	1.00E-01	4.00E-02	4.00E-02	x	5.60E+00	ND	n	
Aroclor 1254	11097-69-1	x	5.00E-01	Empirical	Empirical	5.00E-01	x	5.00E-01	1.00E-01	4.00E-02	4.00E-02	x	5.00E-01	9.90E-03	n	
Aroclor 1260	11096-82-5	x	5.00E-01	x	x	5.00E-01	x	5.00E-01	1.00E-01	4.00E-02	4.00E-02	x	5.00E-01	5.70E-03	n	
Total PCBs (Aroclors)	1336-36-3	1.00E+00	5.00E-01	x	x	1.00E+00	2.00E+00	1.00E+00	x	4.00E-02	4.00E-02	x	1.00E+00	2.80E-02	n	
Pentachlorophenol	87-86-5	x	2.50E+00	x	x	2.50E+00	1.10E+01	2.50E+00	1.00E-01	1.85E-01	1.85E-01	x	2.50E+00	ND	n	
Phenanthrene	x	x	2.40E+03	Empirical	Empirical	2.40E+03	x	2.40E+03	1.00E-01	5.00E-02	5.00E-02	x	2.40E+03	x	n	
Pyrene	129-00-0	x	2.40E+03	Empirical	Empirical	2.40E+03	x	2.40E+03	2.00E+01	2.00E-02	2.00E-02	x	2.40E+03	1.70E-01	n	
1,2,4-Trichlorobenzene	120-82-1	x	3.40E+01	5.60E-01	1.30E-03	1.30E-03	x	1.30E-03	1.00E-01	5.00E-02	5.00E-02	x	5.00E-02	ND	n	
Vinyl Chloride	75-01-4	x	6.70E-01	1.72E-03	1.20E-04	1.20E-04	x	1.20E-04	1.00E-02	2.00E-03	2.00E-03	x	2.00E-03	1.00E-03	n	
cPAHs																
Benzo(a)pyrene	50-32-8	1.00E-01	1.90E-01	3.90E+00	3.10E-04	3.10E-04	3.00E+01	3.10E-04	2.00E-02	5.00E-02	5.00E-02	x	5.00E-02	7.30E-02	n	
Benzo(a)anthracene	56-55-3	x	x	x	Empirical	x	x	x	2.00E-02	5.00E-02	5.00E-02	x	x	9.90E-02	n	
Benzo(b)fluoranthene	205-99-2	x	x	x	x	x	x	x	2.00E-02	5.00E-02	5.00E-02	x	x	1.10E-01	n	See Soil Memo
Benzo(k)fluoranthene	207-08-9	x	x	x	Empirical	x	x	x	2.00E-02	5.00E-02	5.00E-02	x	x	4.60E-02	n	
Chrysene	218-01-9	x	x	x	Empirical	x	x	x	2.00E-02	5.00E-02	5.00E-02	x	x	6.30E-02	n	
Dibenz(a,h)anthracene	53-70-3	x	x	x	Empirical	x	x	x	2.00E-02	5.00E-02	5.00E-02	x	x	ND	n	
Indeno(1,2,3-cd)pyrene	193-39-5	x	x	x	Empirical	x	x	x	2.00E-02	5.00E-02	5.00E-02	x	x	6.40E-02	n	
cPAH Total	x	1.00E-01	1.90E-01	3.90E+00	3.10E-04	3.10E-04	x	3.10E-04	2.00E-02	5.00E-02	5.00E-02	x	5.00E-02	1.00E-01	n	See Soil Memo
Metals (mg/L)																
Arsenic	7440-38-2	2.00E+01	6.70E-01	2.90E+00	2.90E+00	2.90E+00	9.50E+01	2.90E+00	1.00E+00	4.50E+00	4.50E+00	2.00E+01	2.00E+01	5.40E+00	n	
Barium	7440-39-3	x	1.60E+04	Empirical	Empirical	1.60E+04	1.25E+03	3.30E+00	5.00E-01	3.00E-01	3.00E-01	x	1.25E+03	1.90E+02	n	See Soil Memo
Cadmium	7440-43-9a	2.00E+00	8.00E+01	Empirical	Empirical	8.00E+01	2.50E+01	2.50E+01	5.00E-01	1.00E-01	1.00E-01	1.00E+00	2.50E+01	1.30E+00	n	
Chromium III	16065-83-1	2.00E+03	1.20E+05	Empirical	Empirical	1.20E+05	4.20E+01	4.20E+01	5.00E-01	5.00E-01	5.00E-01	4.20E+01	4.20E+01	4.10E+01	n	
Chromium (Total)	7440-47-3	x	x	x	x	x	4.20E+01	4.20E+01	5.00E-01	5.00E-01	5.00E-01	4.20E+01	4.20E+01	4.10E+01	n	
Iron	7439-89-6	x	5.60E+04	1.51E+02	5.04E+02	1.51E+02	x	1.51E+02	5.00E+01	5.00E+00	5.00E+00	5.15E+04	5.15E+04	4.00E+04	n	
Lead	7439-92-1	2.50E+02	x	Empirical	Empirical	2.50E+02	2.20E+02	2.20E+02	5.00E-01	1.00E-01	1.00E-01	1.70E+01	2.20E+02	1.90E+02	n	
Magnesium	x	x	x	x	x	x	x	x	x	x	x	x	x	x	n	
Manganese	7439-96-5a	x	3.70E+03	6.52E+01	6.52E+01	6.52E+01	x	6.52E+01	5.00E-01	1.00E-01	1.00E-01	1.10E+03	1.10E+03	6.80E+02	n	
Mercury	7439-97-6	2.00E+00	x	Empirical	Empirical	2.00E+00	9.00E+00	2.00E+00	2.00E-02	2.00E-02	2.00E-02	7.00E-02	2.00E+00	2.30E-01	n	
Potassium	7440-09-7	x	x	x	x	x	x	x	x	x	x	x	x	x	n	
Sodium	7440-23-5	x	x	x	x	x	x	x	x	x	x	x	x	x	n	
Pesticides																
4,4'-DDD	72-54-8	x	4.20E+00	Empirical	Empirical	4.20E+00	1.00E+00	1.00E+00	1.00E-02	2.65E-03	2.65E-03	x	1.00E+00	4.50E-02	n	See Soil Memo
4,4'-DDE	72-55-9	x	2.90E+00	Empirical	Empirical	2.90E+00	1.00E+00	1.00E+00	1.00E-02	2.65E-03	2.65E-03	x	1.00E+00	2.20E-02	n	
4,4'-DDT	50-29-3	3.00E+00	2.90E+00	Empirical	Empirical	2.90E+00	1.00E+00	1.00E+00	1.00E-02	2.65E-03	2.65E-03	x	1.00E+00	3.50E+00	n	See Soil Memo
Endosulfan II (beta)	33213-65-9	x	x	x	x	x	x	x	1.00E-02	2.65E-03	2.65E-03	x	x	x	n	
Endosulfan sulfate	1031-07-8	x	4.80E+02	1.90E+01	1.80E+00	1.80E+00	x	1.80E+00	1.00E-02	2.65E-03	2.65E-03	x	1.80E+00	5.30E-03	n	

Note: See Tables 9 and 10 – Based on the TMEQ Calculations and Tables 9 and 10 (leaching to soil), Benzo(b)fluoranthene has been eliminated as a COPC for this site.

Table 12: Soil concentrations determined to be protective of human health and ecological receptors based on a site-specific pathway analysis (assumed saturated conditions for the leaching model).

Analyte	CAS	Soil Method A (mg/kg)	Soil Method B Direct Contact (mg/kg)	Soil Method B Protection of Groundwater (mg/kg) - Sat	Soil Method B Protection of Surface Water (mg/kg) - Sat	Final Protective H.H. Value (mg/kg)	TEE Value (mg/kg)	Final Protective Value (mg/kg)	Consultant MRL (mg/kg)	Ecology MRL (mg/kg)	Final PQL (mg/kg)	Natural Background	PCUL (mg/kg)	Highest Recorded Value (mg/kg)	COPC?	
Master CLARC Spreadsheet Column		A	Q and R	Based on 3-Phase Model Results	Based on 3-Phase Model Results		Search Table 749-2			Guidance for TPH		Natural Background Metals				
Gasoline	x	1.00E+02	x	x	x	1.00E+02	2.00E+02	1.00E+02	3.00E+00	5.00E+00	5.00E+00	x	1.00E+02	1.40E+01	n	
Diesel + HO	x	2.00E+03	x	x	x	2.00E+03	4.60E+02	4.60E+02	2.50E+01	2.50E+01	2.50E+01	x	4.60E+02	1.29E+03	y	
Acenaphthene	83-32-9	x	4.80E+03	Empirical	Empirical	4.80E+03	x	4.80E+03	2.00E-02	4.35E-02	4.35E-02	x	4.80E+03	2.20E-02	n	
Acenaphthylene	x	x	x	Empirical	Empirical	x	x	x	2.00E-02	6.70E-02	6.70E-02	x	x	8.10E-02	n	
Acetone	67-64-1	x	7.20E+04	Empirical	Empirical	7.20E+04	x	7.20E+04	5.00E-02	1.50E-02	1.50E-02	x	7.20E+04	2.80E-01	n	
Aldrin	309-00-2	x	5.90E-02	Empirical	Empirical	5.90E-02	1.70E-01	5.90E-02	1.00E-02	1.35E-03	1.35E-03	x	5.90E-02	9.40E-03	n	
Anthracene	120-12-7	x	2.40E+04	Empirical	Empirical	2.40E+04	x	2.40E+04	1.00E-01	4.35E-02	4.35E-02	x	2.40E+04	2.80E-02	n	
Benzo(G,H,I)Perylene	x	x	x	x	x	x	x	x	1.00E-01	4.60E-02	4.60E-02	x	x	x	n	
Bis(2-Ethylhexyl)Phthalate	117-81-7	x	7.10E+01	6.68E-01	5.00E-03	5.00E-03	x	5.00E-03	1.00E-02	1.19E-01	1.19E-01	x	1.19E-01	8.20E-01	y	
Chlorobenzene	108-90-7	x	1.60E+03	Empirical	Empirical	1.60E+03	x	1.60E+03	1.00E-02	2.00E-03	2.00E-03	x	1.60E+03	ND	n	
Chloroform	67-66-3	x	3.20E+01	Empirical	Empirical	3.20E+01	x	3.20E+01	1.00E-02	2.00E-03	2.00E-03	x	3.20E+01	ND	n	
3,3'-Dichlorobenzidine	91-94-1	x	2.20E+00	6.80E-04	1.10E-05	1.10E-05	x	1.10E-05	2.50E-01	3.30E-01	3.30E-01	x	3.30E-01	ND	n	
2,4-Dichlorophenol	120-83-2	x	2.40E+02	Empirical	Empirical	2.40E+02	x	2.40E+02	5.00E-01	2.15E-01	2.15E-01	x	2.40E+02	ND	n	
Fluoranthene	206-44-0	x	3.20E+03	Empirical	Empirical	3.20E+03	x	3.20E+03	2.00E-02	5.00E-03	5.00E-03	x	3.20E+03	2.50E-01	n	
Fluorene	86-73-7	x	3.20E+03	Empirical	Empirical	3.20E+03	x	3.20E+03	2.00E-02	5.00E-03	5.00E-03	x	3.20E+03	ND	n	
1-Methylnaphthalene	90-12-0	x	3.40E+01	Empirical	Empirical	3.40E+01	x	3.40E+01	2.00E-02	5.00E-01	5.00E-01	x	3.40E+01	6.10E-02	n	
2-Methylnaphthalene	91-57-6	x	3.20E+02	Empirical	Empirical	3.20E+02	x	3.20E+02	2.00E-02	5.00E-01	5.00E-01	x	3.20E+02	9.50E-02	n	
3-Methylphenol	x	x	x	x	x	x	x	x	x	x	x	x	x	4.00E-01	n	
Naphthalene	91-20-3	5.00E+00	1.60E+03	Empirical	Empirical	1.60E+03	x	1.60E+03	2.00E-02	5.00E-01	5.00E-01	x	1.60E+03	2.50E-01	n	
N-Nitrosodiphenylamine	86-30-6	x	2.00E+02	5.20E-02	1.80E-03	1.80E-03	x	1.80E-03	1.00E-01	1.00E-01	1.00E-01	x	1.00E-01	1.10E-01	y	See Soil Memo
Aroclor 1016	12674-11-2	x	5.60E+00	x	x	5.60E+00	x	5.60E+00	1.00E-01	4.00E-02	4.00E-02	x	5.60E+00	ND	n	
Aroclor 1254	11097-69-1	x	5.00E-01	Empirical	Empirical	5.00E-01	x	5.00E-01	1.00E-01	4.00E-02	4.00E-02	x	5.00E-01	9.90E-03	n	
Aroclor 1260	11096-82-5	x	5.00E-01	x	x	5.00E-01	x	5.00E-01	1.00E-01	4.00E-02	4.00E-02	x	5.00E-01	5.70E-03	n	
Total PCBs (Aroclors)	1336-36-3	1.00E+00	5.00E-01	x	x	1.00E+00	2.00E+00	1.00E+00	x	4.00E-02	4.00E-02	x	1.00E+00	2.80E-02	n	
Pentachlorophenol	87-86-5	x	2.50E+00	x	x	2.50E+00	1.10E+01	2.50E+00	1.00E-01	1.85E-01	1.85E-01	x	2.50E+00	ND	n	
Phenanthrene	x	x	2.40E+03	Empirical	Empirical	2.40E+03	x	2.40E+03	1.00E-01	5.00E-02	5.00E-02	x	2.40E+03	x	n	
Pyrene	129-00-0	x	2.40E+03	Empirical	Empirical	2.40E+03	x	2.40E+03	2.00E+01	2.00E-02	2.00E-02	x	2.40E+03	1.70E-01	n	
1,2,4-Trichlorobenzene	120-82-1	x	3.40E+01	2.90E-02	7.00E-05	3.40E+01	x	7.00E-05	1.00E-01	5.00E-02	5.00E-02	x	5.00E-02	ND	n	
Vinyl Chloride	75-01-4	x	6.70E-01	9.00E-05	6.20E-06	6.20E-06	x	6.20E-06	1.00E-02	2.00E-03	2.00E-03	x	2.00E-03	1.00E-03	n	
cPAHs																
Benzo(a)pyrene	50-32-8	1.00E-01	1.90E-01	1.90E-01	1.60E-05	1.60E-05	3.00E+01	1.60E-05	2.00E-02	5.00E-02	5.00E-02	x	5.00E-02	7.30E-02	n	
Benzo(a)anthracene	56-55-3	x	x	x	Empirical	x	x	x	2.00E-02	5.00E-02	5.00E-02	x	x	9.90E-02	n	
Benzo(b)fluoranthene	205-99-2	x	x	x	x	x	x	x	2.00E-02	5.00E-02	5.00E-02	x	1.20E-02	1.10E-01	n	See Soil Memo
Benzo(k)fluoranthene	207-08-9	x	x	x	Empirical	x	x	x	2.00E-02	5.00E-02	5.00E-02	x	x	4.60E-02	n	
Chrysene	218-01-9	x	x	x	Empirical	x	x	x	2.00E-02	5.00E-02	5.00E-02	x	x	6.30E-02	n	
Dibenz(a,h)anthracene	53-70-3	x	x	x	Empirical	x	x	x	2.00E-02	5.00E-02	5.00E-02	x	x	ND	n	
Indeno(1,2,3-cd)pyrene	193-39-5	x	x	x	Empirical	x	x	x	2.00E-02	5.00E-02	5.00E-02	x	x	6.40E-02	n	
cPAH Total	x	1.00E-01	1.90E-01	1.90E-01	1.60E-05	1.60E-05	x	1.60E-05	2.00E-02	5.00E-02	5.00E-02	x	5.00E-02	1.00E-01	n	See Soil Memo
Metals (mg/L)																
Arsenic	7440-38-2	2.00E+01	6.70E-01	1.50E-01	1.50E-01	1.50E-01	9.50E+01	1.50E-01	1.00E+00	4.50E+00	4.50E+00	2.00E+01	2.00E+01	5.40E+00	n	
Barium	7440-39-3	x	1.60E+04	Empirical	Empirical	1.60E+04	1.25E+03	1.25E+03	5.00E-01	3.00E-01	3.00E-01	x	1.25E+03	1.90E+02	n	See Soil Memo
Cadmium	7440-43-9a	2.00E+00	8.00E+01	Empirical	Empirical	8.00E+01	2.50E+01	2.50E+01	5.00E-01	1.00E-01	1.00E-01	1.00E+00	2.50E+01	1.30E+00	n	
Chromium III	16065-83-1	2.00E+03	1.20E+05	Empirical	Empirical	1.20E+05	4.20E+01	4.20E+01	5.00E-01	5.00E-01	5.00E-01	4.20E+01	4.20E+01	4.10E+01	n	
Chromium (Total)	7440-47-3	x	x	x	x	x	4.20E+01	4.20E+01	5.00E-01	5.00E-01	5.00E-01	4.20E+01	4.20E+01	4.10E+01	n	
Iron	7439-89-6	x	5.60E+04	7.59E+00	2.53E+01	7.59E+00	x	7.59E+00	5.00E+01	5.00E+00	5.00E+00	5.15E+04	5.15E+04	4.00E+04	n	
Lead	7439-92-1	2.50E+02	x	Empirical	Empirical	2.50E+02	2.20E+02	2.20E+02	5.00E-01	1.00E-01	1.00E-01	1.70E+01	2.20E+02	1.90E+02	n	
Magnesium	x	x	x	x	x	x	x	x	x	x	x	x	x	x	n	
Manganese	7439-96-5a	x	3.70E+03	3.26E+00	3.26E+00	3.26E+00	x	3.26E+00	5.00E-01	1.00E-01	1.00E-01	1.10E+03	1.10E+03	6.80E+02	n	
Mercury	7439-97-6	2.00E+00	x	Empirical	Empirical	2.00E+00	9.00E+00	2.00E+00	2.00E-02	2.00E-02	2.00E-02	7.00E-02	2.00E+00	2.30E-01	n	
Potassium	7440-09-7	x	x	x	x	x	x	x	x	x	x	x	x	x	n	
Sodium	7440-23-5	x	x	x	x	x	x	x	x	x	x	x	x	x	n	
Pesticides																
4,4'-DDD	72-54-8	x	4.20E+00	Empirical	Empirical	4.20E+00	1.00E+00	1.00E+00	1.00E-02	2.65E-03	2.65E-03	x	1.00E+00	4.50E-02	n	See Soil Memo
4,4'-DDE	72-55-9	x	2.90E+00	Empirical	Empirical	2.90E+00	1.00E+00	1.00E+00	1.00E-02	2.65E-03	2.65E-03	x	1.00E+00	2.20E-02	n	
4,4'-DDT	50-29-3	3.00E+00	2.90E+00	Empirical	Empirical	2.90E+00	1.00E+00	1.00E+00	1.00E-02	2.65E-03	2.65E-03	x	1.00E+00	3.20E-02	n	See Soil Memo
Endosulfan II (beta)	33213-65-9	x	x	x	Empirical	x	x	x	1.00E-02	2.65E-03	2.65E-03	x	x	x	n	
Endosulfan sulfate	1031-07-8	x	4.80E+02	9.70E-01	9.10E-02	9.10E-02	x	9.10E-02	1.00E-02	2.65E-03	2.65E-03	x	9.10E-02	5.30E-03	n	

Note: See Tables 9 and 10 – Based on the TMEQ Calculations and Tables 9 and 10 (leaching to soil), Benzo(b)fluoranthene has been eliminated as a COPC for this site.

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