



Interstate 82 Exit 33A Yakima City Landfill: Response and Resolution to Comments Regarding Groundwater and Surface Water PCULs

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Background and Scope

This memorandum represents a continued effort to come to agreement regarding Preliminary Cleanup Levels (PCULs) at the Interstate 82 Exit 33A Yakima City Landfill Cleanup Site (Facility Site ID – 1927, Cleanup Site ID – 3853). The information included in this memorandum is derived from previous correspondence:

- 1) Ecology Letter with Attached Memorandum: *Interstate 82 Exit 33A Yakima City Landfill Preliminary Cleanup Levels* (Ecology, 9/22/23).
- 2) Responses from Landau Associates: *Response to Ecology September 2023 Memorandum and Letter Regarding Preliminary Cleanup Levels and Contaminant of Potential Concern, Interstate 82 Exit 33A Yakima City Landfill, Yakima, Washington* (Landau, 10/20/23).
- 3) Ecology Letter with Attached Memorandum: *Interstate 82 Exit 33A Yakima City Landfill: Response to Comments Regarding Groundwater and Surface Water PCULs* (Ecology, 1/19/2024).
- 4) Responses from Landau Associates: *Response to Ecology January 19, 2024 Interstate 82 Exit 33A Yakima City Landfill: Response to Comments Regarding Groundwater and Surface Water PCULs* (Landau, 2/12/2024).
- 5) Email Correspondence - Ecology to Landau Associates (J. Lind to P. Roelen): *RE: Interstate 82 Exit 33A Yakima City Landfill – PCUL Letter and PCUL Memo (Regarding the upward adjustment of the PQL for DDD and DDT)* (Ecology, 3/4/2024).

- 6) Email Correspondence - Landau Associates to Ecology (P. Roelen to J. Lind): *RE: Interstate 82 Exit 33A Yakima City Landfill – PCUL Letter and PCUL Memo (Regarding the upward adjustment of the PQL for DDD and DDT)* (Landau, 3/8/2024).
- 7) Email Correspondence - Landau Associates to Ecology (P. Roelen to J. Lind): *RE: Brief update on Yakima landfill pCULs/COPCs (Regarding additional lines of evidence for removing benzo(b)fluoranthene as a COPC for surface water)* (Landau, 7/3/2024).
- 8) Meeting - Landau Associates and Ecology to discuss Soil PCULs/COPCs (7/22/2024).
- 9) Email Correspondence - Landau Associates to Ecology (P. Roelen to J. Lind): *RE: Brief update on Yakima landfill pCULs/COPCs (Regarding the depth of vadose vs. saturated zone and removing vinyl chloride as a COPC for surface water)* (Landau, 7/22/2024).
- 10) Email Correspondence - Landau Associates to Ecology (P. Roelen to J. Lind): *RE: Brief update on Yakima landfill pCULs/COPCs (Additional information regarding removing vinyl chloride as a COPC for surface water)* (Landau, 7/29/2024).

Ecology believes this memorandum concludes the discussion regarding PCULs for groundwater and surface water and can begin evaluating soil concentrations and PCULs. These were not done concurrently because the calculated PCULs for soil will be dependent on those that are agreed upon for both groundwater and surface water.

Discussion - (The tables referenced below can be found in the Ecology Memorandum: *Interstate 82 Exit 33A Yakima City Landfill Preliminary Cleanup Levels, dated 9/22/23.*)

1. Table 3 (Groundwater): Preliminary Cleanup Levels (PCULs) for groundwater for selected contaminants at the Interstate 82 Exit 33A Yakima City Landfill Site.

Ecology Comment (1/19/2024):

3,3'-Dichlorobenzidine: Please verify that all wells (either on source property, or down-gradient of source property) have at least four (4) consecutive quarters of concentrations of 3,3'-Dichlorobenzidine below 2.00 ug/L. If that information can be provided, then this contaminant may be removed from the Contaminants of Potential Concern (COPC) list for groundwater.

Please note: Information provided indicates this contaminant has been found in wells on-site or down-gradient of the site.

Response from Consultant (2/12/2024):

Consultant provided discussion, and both a table and figure showing groundwater monitoring results and locations for this contaminant.

Resolution:

3,3'-Dichlorobenzidine was detected at down-gradient monitoring well MW-15 during one (1) sampling event in 9/17/2014. Subsequently, there have been four (4) quarters of monitoring data with no laboratory detections. The lab detection limit was less than the PCUL for all sampling events. All sampling events except the 4th quarter were consecutive. Since this contaminant has never been detected at any other well within the Site boundary or down-gradient, the results are considered sufficient evidence.

3,3'-Dichlorobenzidine may be removed from the Contaminants of Potential Concern (COPC) list for groundwater.

2. Table 4 (Surface Water): Preliminary Cleanup Levels (PCULs) for groundwater protective of surface water for selected contaminates at the Interstate 82 Exit 33A Yakima City Landfill Site.

Ecology Comment (1/19/2024):

Diesel + Heavy Oil (HO): Please verify the specific well closest to a body of surface water, and downgradient of the contamination, has a measured value of Diesel + HO that is less than 5.00E+02 ug/L. If that information can be provided, then this contaminant may be removed from the COPC list for surface water.

Please note: It appears this analyte was detected downgradient of the source property.

Response from Consultant (2/12/2024):

Consultant provided discussion, and both a table and figure showing groundwater monitoring results and locations for this contaminant.

Resolution:

Diesel + HO were detected above the PCUL, during one (1) sampling event, at MW-106 within the footprint of the former landfill. Down-gradient wells, MW-109 and MW-8 have never had a lab detection in five (5) quarters of sampling.

Diesel + HO may be removed from the COPC list for surface water.

For Further Consideration:

The consultant has requested the removal of Diesel + HO as COPCs for groundwater after the replacement well MW-106R has been installed and post-construction monitoring events have occurred.

Note: This refers to monitoring events to document groundwater conditions after completion of Interim Action (IA) activities specific to the Interstate 82 Exit 33A Yakima City Landfill Site. Additional IA activities will occur in the City of Yakima Right-of-Way (ROW) at the adjacent Boise Cascade Mill Site.

Quoted text (Landau, 2/12/2024):

“Field screening and confirmation sampling confirmed that the petroleum-impacted soil had been removed and remaining soil did not contain TPH-D/O above pCULs. Based on the discovery of the contaminated soil, the City acknowledges that TPH-D/O should be retained as a COPC for groundwater (protective of drinking water) at the Landfill Site. However, based on the removal during the ROW excavation of the likely source of impact to groundwater upgradient of MW-106, it is anticipated that TPH-D/O will not be found above the pCUL in replacement well MW-106R during planned post-construction monitoring events. If this is the case, TPH-D/O will not have been detected above the pCUL of 500 µg/L at the Landfill Site in five consecutive groundwater sampling events and should be removed as a groundwater COPC.”

3. Table 4 (Surface Water): Preliminary Cleanup Levels (PCULs) for groundwater protective of surface water for selected contaminants at the Interstate 82 Exit 33A Yakima City Landfill Site.

Ecology Comment (1/19/2024):

3,3'-Dichlorobenzidine: See comment #1 above. Since the PCUL for 3,3'-Dichlorobenzidine is the same for surface water as groundwater, it may be removed if you can meet the requirements for this analyte above (in groundwater). If that information can be provided, then this contaminant may be removed from the COPC list for surface water.

Response from Consultant (2/12/2024):

Consultant provided discussion, and both a table and figure showing groundwater monitoring results and locations for this contaminant.

Resolution:

3,3'-Dichlorobenzidine has been removed from the COPC list for groundwater based on groundwater concentrations protective of surface water. See the resolution discussion in comment #1 above.

3,3'-Dichlorobenzidine may be removed from the COPC list for surface water.

4. Table 4 (Surface Water): Preliminary Cleanup Levels (PCULs) for groundwater protective of surface water for selected contaminants at the Interstate 82 Exit 33A Yakima City Landfill Site.

Ecology Comment (1/19/2024):

Benzo(b)fluoranthene: The Surface Water (Human Health) Applicable or Relevant and Appropriate Requirement (ARAR) (40 CFR 131.45) lists 1.60 E-04 as a protective value for Benzo(b)fluoranthene. This value may be upward adjusted to an agreed upon practical quantitation limit (PQL) (which has been listed at 0.02 ug/L).

However, the highest value detected is 0.08 ug/L, which is higher than the individual ARAR, with an upward adjustment to a PQL. It is important to note that under MTCA, both the carcinogenic Polycyclic Aromatic Hydrocarbon (cPAH) toxic equivalent quotient (TEQ) and individual cPAHs are required to be complied with for surface water. If that information can be provided, then this contaminant may be removed from the COPC list for surface water.

Response from Consultant (2/12/2024):

Consultant provided a table showing groundwater monitoring results for Benzo(b)fluoranthene, along with a figure, and the following discussion:

“...benzo(b)fluoranthene has not been detected at concentrations above the PQL of 0.02 µg/L in any of the Landfill Site monitoring wells or in any downgradient wells (except at MW-15 in the November 2020 sampling event at a concentration of 0.083 µg/L).¹ Note that no detections of benzo(b)fluoranthene above the PQL were identified in the previous four consecutive sampling events at MW-15. Because benzo(b)fluoranthene has not been detected in groundwater at the Landfill Site (i.e., there is no evident source of benzo(b)fluoranthene at the Landfill Site that would result in the detection at MW-15), benzo(b)fluoranthene should be removed as a groundwater COPC for the Landfill Site.”

Response from Consultant (7/3/2024):

“...benzo(b)fluoranthene has not been detected above the laboratory reporting limit (RL) or practical quantitation limit (PQL) in groundwater from any monitoring well within the landfill boundary (see attached Figure 3). Therefore, benzo(b)fluoranthene cannot be considered a contaminant of concern for groundwater at the Yakima Landfill site. In particular, with regard to the one-time detection of benzo(b)fluoranthene at downgradient monitoring well MW-15 in November 2022, note that MW-108, which is directly hydraulically upgradient of MW-15 and near the eastern boundary of the landfill is included in the list of wells within the landfill where there have been no detections of benzo(b)fluoranthene over the RL or PQL, providing clear and direct line of evidence that it is not originating from the Site.”

“...the following are offered as additional lines of evidence that that the benzo(b)fluoranthene detected in MW-15 did not originate from the landfill. Due to the chemical properties of benzo(b)fluoranthene, any detection in MW-15 would be incredibly unlikely to have originated from the landfill. Specifically:

- *The water solubility of benzo(b)fluoranthene is extremely low, having a value 0.0012 mg/L at 25°C (Suthersan et al., Remediation Engineering – Design Concepts, CRC Press – 2nd Edition, Boca Raton, Florida. 2017). As a point of comparison, trichloroethene (which is considered to have a low water solubility [Clu-In.org]) has a solubility of 1,100 ug/L (6 orders of magnitude higher than benzo(b)fluoranthene). Furthermore, groundwater temperatures at the Site have typically been measured between approximately 10 and 15°C, meaning that the solubility of benzo(b)fluoranthene under ambient conditions at the Site would be even lower than the 0.0012 mg/L value. This means that benzo(b)fluoranthene does not tend to dissolve in groundwater and that even if benzo(b)fluoranthene were at residual saturation concentrations at the landfill*

boundary (i.e., at or below 1.2 ug/L – which has not been observed at the landfill, as indicated above) there would be so little dissolved benzo(b)fluoranthene in groundwater it would be incredibly unlikely to be detected above the RL/PQL at MW-15, approximately 600 feet downgradient of the landfill boundaries due to natural diffusive and dispersive processes.

- *Benzo(b)fluoranthene is highly hydrophobic and highly organophilic, having a k_{oc} value of nearly 550,000 (log k_{oc} of 5.74; Suthersan et al, 2017). This means that benzo(b)fluoranthene has a high affinity for adsorption to soil and organic materials in the aquifer matrix and consequently an extremely low mobility. Again, as a point of comparison, trichloroethene (which is considered to be moderately hydrophobic and readily adsorbs to soil) has a k_{oc} value of approximately 83 (4 orders of magnitude lower than benzo(b)fluoranthene). This again means that even if present in groundwater at the Site (which it is not, based on the data from the five sampling events performed between 2014 and 2020), because benzo(b)fluoranthene has an extremely high affinity for adsorption to soil, it would be incredibly unlikely to migrate in groundwater approximately 600 feet downgradient of the landfill boundaries to MW-15.*

I am not aware of any known releases of benzo(b)fluoranthene between the Site and MW-15. However, PAHs in roadway runoff is a commonly known source of PAH contamination (Ecology). Therefore, runoff from Interstate Freeway I-82, located upgradient to the west of MW-15, is a likely potential source for the benzo(b)fluoranthene detection at MW-15.”

Resolution:

Benzo(b)fluoranthene was detected at down-gradient MW-15 at a concentration exceeding the PCUL during one (1) groundwater sampling event on 11/24/2020. The preceding four (4) sampling events had no detections above the laboratory RL. Exceedances of this contaminant have been detected in soil samples within the former landfill footprint; however, monitoring wells installed at the same sample locations have never had groundwater detections exceeding the RL.

Considering there have been no groundwater detections within the footprint of the former landfill and the chemical properties of benzo(b)fluoranthene (low water solubility and highly hydrophobic) making the presence of a dissolved groundwater plume extremely unlikely; the presence of benzo(b)fluoranthene during one (1) sampling event appears to be anomalous.

While the source is unknown, it could be related to several factors including: laboratory contamination, cross-contamination during sampling, or runoff from the adjacent asphalt interstate.

Benzo(b)fluoranthene may be removed from the COPC list for surface water.

5. Table 4 (Surface Water): Preliminary Cleanup Levels (PCULs) for groundwater protective of surface water for selected contaminants at the Interstate 82 Exit 33A Yakima City Landfill Site.

Ecology Comment (1/19/2024):

Barium: Please see WAC 173-340-730(3)(b)(ii) – *For hazardous 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....* If the value that is proposed is protective of aquatic receptors (with justification) and is above the highest value detected in the well closest to the surface water, it may be removed from the list.

Please Note: Ecology provided a limited list of protective values for Barium (Appendix A of Ecology’s 1/19/2024 memo). While you do not need to use a value (or statistical calculation) from this list, an estimated protective value must be provided to Ecology to meet WAC 173-340-730(3)(b)(ii).

Response from Consultant (2/12/2024):

The consultant proposed the PCUL for barium be set as the lower of the chronic (i.e., 220 µg/L) and acute (i.e., 2,000 µg/L) freshwater screening values for hazardous waste sites from the US Environmental Protection Agency (EPA) Region 4 Ecological Risk Assessment Supplemental Guidance (March 2018 update).

A discussion, table, and figure were provided in addition to documentation included as an attachment to the response.

Resolution:

The proposed PCUL of 220 µg/L for Barium is estimated to result in no adverse effects on the protection and propagation of wildlife, fish, and other aquatic life.

The surface water PCUL for Barium will be set at 220 µg/L, and this contaminant may be removed from the COPC list for surface water.

6. Table 4 (Surface Water): Preliminary Cleanup Levels (PCULs) for groundwater protective of surface water for selected contaminants at the Interstate 82 Exit 33A Yakima City Landfill Site.

Ecology Comment (1/19/2024):

4,4’ – DDD (dichlorodiphenyldichloroethane) and 4,4’ – DDT (dichlorodiphenyltrichloroethane): Based on the information provided, it appears appropriate to accept a PQL based off of method reporting limits (MRLs) of 3.00E-03 µg/L. Please verify the specific well closest to a body of surface water, and downgradient of the contamination, has measured values of 4,4’ – DDD and 4,4’ – DDT less than 3.00E-03 µg/L. If that information can be provided, then these contaminants may be removed from the COPC list for surface water.

Response from Consultant (2/12/2024):

Consultant provided a discussion, and both a table and figure showing groundwater monitoring results and locations for this contaminant. Additionally, the consultant proposed a further upward adjustment of the PQL to 0.005 ug/L.

Ecology Email (3/4/2024):

Ecology agreed to the proposal of 0.005 ug/L as a PQL for 4,4'-DDD and 4,4'-DDT with the following conditions:

- a. Verification the consultant is using SW8270D, which would match our Method Reporting Limit from Ecology Manchester Lab; or
- b. If using SW8081B/8082A, then the PQL should remain no higher than 0.003 ug/L unless the consultant can provide Ecology with two (2) labs that have MRLs 4,4'-DDD and 4,4'-DDT at (or above) 0.005 ug/L for that specific method.

Response from Consultant (3/8/2024):

The consultant clarified the laboratory method used was SW8081, and provided confirmation from two (2) labs that an MRL of 0.005 ug/L was appropriate for that method.

Resolution:

Sufficient information was provided to support the upward adjustment of the PQLs to 0.005 ug/L. Since the surface water PCUL is based on the PQL, the surface water PCUL will be upward adjusted to 0.005 ug/L.

4,4'-DDD and 4,4'-DDT were detected above the PCUL at MW-103 within the footprint of the former landfill. There have been no detections at any down-gradient wells.

The surface water PCUL for 4,4'-DDD and 4,4'-DDT will be upward adjusted to 0.005 ug/L, and these contaminants may be removed from the COPC list for surface water.

7. Table 2: Contaminants of Potential Concern in Surface Water (ug/L)

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Table 4 (Surface Water): Preliminary Cleanup Levels (PCULs) for groundwater protective of surface water for selected contaminates at the Interstate 82 Exit 33A Yakima City Landfill Site.

Background:

While revising the 9/22/2023 memo tables to reflect the aforementioned resolutions, Ecology identified an error in Table 2: Contaminants of Potential Concern in Surface Water. Vinyl chloride was mistakenly omitted as a COPC for surface water in Table 2. Vinyl chloride was identified as a surface water COPC with a PCUL exceedance in Table 4.

Note: Vinyl chloride was correctly identified as a COPC in groundwater in Tables 1 & 3.

Ecology notified the consultant of this error during a meeting on 7/22/2024 and informed them vinyl chloride would need to be included in a revised Interstate 82 Exit 33A Yakima City Landfill Preliminary Cleanup Levels memo.

The consultant provided the following explanation to support the removal of vinyl chloride as a COPC in surface water.

Response from Consultant (7/22/2024):

*“...based on the December 2014 vinyl chloride detection in MW-106 at 0.39 ug/L (above the drinking water pCUL of 0.29 ug/L and surface water pCUL of 0.06 ug/L). It should be noted, however, that MW-106 is the only monitoring well at or downgradient of the Yakima Landfill Site where vinyl chloride has been detected above the pCUL (or even the laboratory reporting limit). Because no exceedances of the vinyl chloride pCUL for protection of surface water (0.06 ug/L) have been identified in monitoring wells downgradient of MW-106 or the Yakima Landfill Site, **vinyl chloride should be removed as a groundwater protective of surface water COPC** (but kept as a COPC for groundwater protective of drinking water).”*

Ecology Comment (7/24/2024)

Ecology requested a figure showing well locations, direction of groundwater flow, and groundwater monitoring results.

Response from Consultant (7/24/2024):

Resolution:

Vinyl chloride was detected above the PCUL, during one (1) sampling event, at MW-106 within the footprint of the former landfill. Down-gradient wells, MW-109 and MW-8 have never had a lab detection in five (5) quarters of sampling.

Vinyl chloride may be removed from the COPC list for surface water.

REFERENCES

Ecology. (2023). Memorandum: *Interstate 82 Exit 33A Yakima City Landfill Preliminary Cleanup Levels*. Washington State Department of Ecology No Publication No.

Landau. (2023). Memorandum: *Response to Ecology September 2023 Memorandum and Letter Regarding Preliminary Cleanup Levels and Contaminant of Potential Concern, Interstate 82 Exit 33A Yakima City Landfill, Yakima, Washington*. Landau Associates. No Publication No.

Risk Assessment Information System. (2020).¹

¹ https://rais.ornl.gov/tools/eco_search.php