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MEMORANDUM | January 31, 2024

TO Erin McDonnell and David Lacey, Oregon Department of Environmental Quality (DEQ)

FROM Peter Shanahan, HydroAnalysis LLC (HALLC); Jennifer Hart and Gail Fricano, Industrial Economics, Inc. (IEc)

SUBJECT Five Tribe review of "Updated Groundwater Source Control Evaluation, Willamette Cove Upland Facility," dated December 5, 2023

This memorandum, submitted on behalf of the Five Tribes,[1] reviews the *Updated Groundwater Source Control Evaluation, Willamette Cove Upland Facility* (updated GW SCE) prepared by Apex Companies, LLC (Apex) on behalf of the Port of Portland (Apex 2023). We reviewed earlier versions of this document (Apex 2019a, 2020), and because portions of the updated GW SCE were found to be unchanged, we focused our review on the new and revised content.

Substantive Comments

1. Section 2.2 describes historical operations on the West Parcel "as a plywood mill and… wood products facility…" We recommend that a more detailed and specific description of historical operations be provided. In particular, boring logs for monitoring wells MW-1 and MW-2 report creosote odor and chemical analyses of groundwater have detected pentachlorophenol, both of which suggest that wood treating may have occurred on site. The report references former wood treatment operations associated with the adjacent McCormick & Baxter operations; however, we suspect that site is too distant to have caused creosote odors within Willamette Cove site borings. Since wood treating is associated with dense non-aqueous phase liquids (DNAPLs) and high concentrations of polycyclic aromatic hydrocarbons (PAHs), past wood-treating operations would be a potentially significant factor in evaluating contamination on site. Thus, a better understanding of historical operations could inform the investigation of the West Parcel.
2. Section 6.3.4 includes a discussion of the anomalous water levels in monitoring well MW-2. We recommend that this section also make reference to the water-level hydrographs in Appendix F. Those hydrographs show that water levels in MW-1, MW-3, MW-4, MW-5, and MW-9 track Willamette River water levels fairly closely, suggesting good hydraulic connectivity between the aquifer and the river. In contrast, water levels in MW-2 bear almost no resemblance to the river hydrograph and show only a muted and time-lagged reflection of the river's annual variation. The hydrograph data thereby suggest that MW-2 is installed in a pocket of water-bearing material that

[1] The five tribes are the Confederated Tribes of the Grand Ronde Community of Oregon, the Nez Perce Tribe, the Confederated Tribes of Siletz Indians, the Confederated Tribes of the Umatilla Indian Reservation, and the Confederated Tribes of the Warm Springs Reservation of Oregon.

is isolated from the rest of the on-site aquifer and which has virtually no hydraulic connectivity with the river. Site data are insufficient to determine the size of this “pocket aquifer,” which leaves uncertain the significance, if any, of water-level readings and chemical analyses from MW-2. For this reason, we recommend that the groundwater flow lines emanating from MW-2 in Figure 21 be shown in a qualified fashion (e.g., using dashed lines). Similarly, we question the validity of the ‘Time to Reach River’ estimate for MW-2 in Table 3, which is relatively rapid.

3. Section 6.3.4 also includes this description of the hydrogeology around MW-2: “Fundamentally, higher water levels will occur where local inflow exceeds local outflow. This may occur from either a larger inflow, smaller outflow, or both. Either of these factors could be impacted by local geology (e.g., shallow coarse-grained soil near the surface in the vicinity of MW-2 could act as a conduit for greater infiltration, or fine-grained soil downgradient of MW-2 could impede groundwater flow away from the vicinity of the well). However, observing the soil conditions at MW-2 relative to nearby wells (see Figures 7 and 8), neither of these conditions are observed.” We find this language to be speculative and recommend that it be removed. In particular, we do not believe that there are soil borings downgradient of MW-2 to support the last sentence of this quotation. MW-2 is screened within the former log pond, which was filled well after the remainder of the site. As such, the hydraulic properties in that area may be very different from elsewhere on site and could have given rise to the pocket aquifer in which MW-2 seems to be screened (see Comment #2). We believe that site data—and particularly the hydrographs in Appendix F—establish that MW-2 is hydrogeologically isolated and not representative of the site aquifer.

4. Section 6.3.6 analyzes seepage data and concludes “This figure shows that temperature is a good predictor of groundwater discharge, especially at locations of higher groundwater discharge.” We do not believe this conclusion is supported by the limited available data. In particular, most of the measured average specific discharge values in Figure 19 are near zero, and the relationship between specific discharge and temperature appears to be defined by the two leftmost points (i.e., two samples with the largest temperature contrast and co-located discharge). Because the specific discharge rates estimated from the temperature correlation are not well supported, we recommend removing these estimates from Figure 20.

5. Section 6.4 presents a groundwater discharge model based on a flow-net analysis of shoreline discharge. The flow-net analysis assumes isotropic and homogeneous soil, neither of which is valid for this site. The weakness of this model is revealed by the seepage measurements from the field. While the model predicts stronger groundwater discharge nearer to shore than further from shore (as shown by more closely spaced flowlines in Figure 22), the distributed seepage measurements offshore of the West Parcel (Figure 20) show no pattern of shoreline focusing. Indeed, with a layered mix of historically placed fill, one would expect a heterogenous pattern of groundwater discharge rather than the regular pattern predicted by the flow-net analysis. We recommend Section 6.4 be revised to report and draw conclusions from actual observations only.

6. Section 8.1 offers on page 30 that “Wood waste associated with the former log pond is likely present beneath the fill.” We recommend this speculative language be replaced by references to

the boring logs for B-7, DP-2, DP-5, and MW-3, all of which show wood in soil within the footprint of the former log pond.

7. Section 8.1 concludes with "This result is consistent with the hypothesis that reducing conditions in the West Parcel are responsible for the concentrations of arsenic in groundwater greater than background, but conditions become oxidized as groundwater migrates toward the river, returning arsenic concentrations to background." While we find this to be a reasonable hypothesis, it is untested. The additional groundwater monitoring proposed for the West Parcel in Section 8.8 should include samples for arsenic and measurements to determine the redox state of the groundwater to confirm the hypothesized redox gradient from the wells to the river.

8. Section 8.2 begins with the statement "PAHs are associated with petroleum hydrocarbons that do not occur naturally in the vicinity." We recommend that "wood-treating chemicals" be added to petroleum hydrocarbons in this statement. As indicated in Comment #1, the presence of wood-treating chemicals on site is strongly suggested by the creosote odors noted in the logs for MW-1 and MW-2.

9. Section 8.2 includes the statement that "These higher concentrations [of benzo(a)pyrene toxicity equivalent] are likely associated with historical releases from the wood products industries." We recommend that the vague reference to "wood products industries" be replaced with a more specific reference to "wood-treating operations," with qualifications as appropriate if historical review does not unequivocally establish such operations were on site.

10. With respect to polychlorinated biphenyls (PCBs), Section 8.4 includes the statement "The clusters of sediment samples above RALs [remedial action levels] do not spatially correlate with higher groundwater concentrations (two of the three clusters are not adjacent to areas of higher groundwater concentrations)." We strongly recommend that this sentence be deleted. Figures 29 and 30 make clear that there is a strong spatial correlation between the highest concentrations of PCBs in groundwater at MW-3 and the highest concentration of PCBs in sediment at WC-S005. Porewater samples near this location also show elevated concentrations of PCBs, implying a potential groundwater-to-sediment pathway for PCBs from the West Parcel. Accordingly, we recommend that the proposed additional monitoring (and new wells) on the West Parcel continue to be sampled for PCBs.

11. The table in Section 8.5 (page 36) reports dioxin/furan toxicity equivalent (TEQ) values that differ from those in Table A-6, leaving uncertain which concentrations are accurate. The table below contrasts the summary information in Section 8.5 with the reported concentrations in Table A-6 for wells MW-1, MW-2, MW-3, and MW-5.

    The maximum values for MW-1 and MW-2 do not match the reported values, and the minimum values do not match for any well. We recommend that these discrepancies be rectified and/or explained.

	Section 8.5			Table A-6		
	Minimum	Maximum	Mean	Concentrations		
Units	Reported in picograms per liter (pg/L)			Converted from micrograms per liter (µg/L) to pg/L		
MW-1	<11.8	12	7.0	3.512	1.293	0.268 U
MW-2	4.6	15	9.7	2.530	3.105	1.611
MW-3	2.4	10	5.8	4.54 T	10.1 T	3.235 J
				2.614 J	2.229	0.905
MW-5	<1.4	27	7.1	0.902 UT	0.487 UT	26.6 T
				3.05 U	1.289	

12. Section 8.6 states "…fill used to reclaim the West Parcel log pond may have contained DDT [dichlorodiphenyltrichloroethane]." In contrast, Apex (2019b) indicates that the fill was sourced from the Arkema Chemicals Company site, a chemical manufacturing plant that produced, among other products, DDT. We recommend that more specific information about the likely nature of the log pond fill be used in the updated GW SCE report.

13. Section 8.7 predicts an exceedance factor for dichlorodiphenyldichloroethane (DDD) based on the concentration in MW-2 and its subsequent attenuation. Given the problems with MW-2 as discussed above (Comments #2 and #3), we question the validity of predictions based on that particular well.

14. Section 8.8 states "We recommend collecting groundwater samples between the West Parcel upland monitoring wells and the porewater sampling locations offshore of the West Parcel and analyzing the samples for PAHs and DDD." We recommend the proposed sampling be described in more detail. There are no established sampling points between the monitoring wells and porewater sampling locations, so it is unclear if new monitoring wells or other sampling methods are being proposed. We strongly recommend that additional monitoring wells be installed to better understand the peculiar hydrogeology at MW-2. We also recommend that wells in the West Parcel be hydraulically tested through either an aquifer test or slug tests to further inform the understanding of the hydrogeology. Finally, as indicated in Comment #7, we recommend the monitoring program include measures of redox conditions in the West Parcel as well as additional sampling for arsenic.

Editorial Comments

15. Section 6.2.2 makes reference to the top of bank in discussing Figure 12. We recommend that the top of bank be labeled in Figure 12.

16. Section 6.2.2 also makes reference to a linear feature in Figure 13. We recommend that feature be labeled in Figure 13.

17. Section 8.7 discusses attenuation without clearly defining the term. We recommend a definition be included to avoid ambiguity.

18. Table A-6 reports dioxin and furan concentrations in µg/L, which leads to numerous leading zeroes and greatly reduces the legibility of the table. In addition, dioxin/furan TEQ is reported

variously in scientific notation and decimal notation. We recommend the table be reproduced in units of pg/L to match the units used in the text.

References

Apex. 2019a. Groundwater Source Control Evaluation and Alternatives Analysis, Willamette Cove Upland Facility, Portland, Oregon, Prepared for: Port of Portland. Apex Companies, LLC, Tigard, Oregon. June 21.

Apex. 2019b. Revised Feasibility Study and Source Control Evaluation, Willamette Cove Upland Facility, Portland, Oregon, Prepared for: Port of Portland. Apex Companies, LLC, Tigard, Oregon. March 7.

Apex. 2020. Revised Groundwater Source Control Evaluation and Alternatives, Analysis, Willamette Cove Upland Facility, Portland, Oregon, Prepared for: Port of Portland. Apex Companies, LLC, Tigard, Oregon. January 20.

Apex. 2023. Updated Groundwater Source Control Evaluation, Willamette Cove Upland Facility, Portland, Oregon, Prepared for: Port of Portland. Apex Companies, LLC, Tigard, Oregon. December 5.