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MEMORANDUM | February 28, 2025

TO	Wes Thomas 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 "Feasibility Study Report" for the Gasco upland site, dated December 16, 2024

This memorandum, submitted on behalf of the Five Tribes,[1] reviews the updated draft *Feasibility Study Report* for the Gasco upland site prepared by Anchor QEA; Ede Environmental, LLC; and Sevenson Environmental Services, Inc. on behalf of NW Natural (Anchor QEA et al. 2024). Our review focused on the main text of the report along with tables and figures. Although we relied upon certain appendices in reviewing the Feasibility Study Report, we did not review the appendices in their entirety.

General Comments

1. Overall, the Feasibility Study Report is well-prepared and appears to meet the stated objectives. Background information on the site, including the extent and distribution of contamination and risk profiles, is presented comprehensively and clearly; supporting data are provided and effectively summarized in graphical form. The conceptual site models are presented particularly clearly in the text and Figure 8-1. The site is subdivided into remedial alternative units (RAUs) logically and effectively. Remediation objectives are laid out clearly in Table 10-1. Remedial action alternatives are also described clearly and summarized very effectively in Table 14-1.

2. Our favorable opinion of the report notwithstanding, we are not fully comfortable with the approach for developing the remedial action alternatives (RAAs) and the recommended alternative RAA 4. In Section 14.2, the incremental additions of multiple remedial technologies in the steps between subsequent RAAs have the potential to skew the selection of remedial actions for particular areas on the site. For example, the step between RAA 4 and RAA 5 lumps a low implementation risk and low cost action at the Former Spent Gas Purifier Storage RAU (in-situ stabilization and solidification [ISS] mixing of shallow soils for $0.2 million) with more extensive and expensive actions at the Former Tar Pond RAU (deep ISS for $11.3 million) and Former Light Oil Plant/North Tank Farm RAU and Former Creosote Loading/South Tank Farm RAU (ISS mixing to 25 feet for $18.4 million). These latter additions decrease the implementation risk and cost reasonableness scores between RAA 4 and RAA 5 by 1.5 and 1.0 points respectively, a loss of 2.5 points from these two components alone (see Table 15-8).

[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.

Owing to these and other lesser changes, RAA 5 scores a total of 2.3 points lower than RAA 4, and RAA 4 is selected as the recommended alternative. However, RAA 4 includes no remedial action at the Former Spent Gas Purifier Storage RAU despite the comparatively minor cost to remediate the shallow soil contamination at this RAU. As shown in Figures 6-4a and 6-4b, shallow soils in this RAU pose an ecological risk. We recommend that the ISS bucket mix remedial action for the Former Spent Gas Purifier Storage RAU be included in RAA 3 to ensure that the ecological risk at this RAU is mitigated. A similar ISS bucket mix action is already included in RAA 3 for the Former Tar Pond RAU.

3. Shallow soils on other parts of the site will also not be remediated under RAA 4 although there is ambiguity as to the technologies prescribed for shallow soils. Figure 14-5 does not appear to be consistent with the description of the remedial technology "ISS bucket mix of accessible **human health and highly mobile surface soil** hot spots to 3.5 feet" that appears in Table 14-1 for several RAUs (emphasis added). In particular, Figure 14-5 includes substantial area identified in Figure 7-4 as "containing carbon pitch/lampblack" that does not meet the description above. Figure 7-4 distinguishes the carbon pitch/lampblack areas from human health hot spots and carbon black/lampblack would by its nature not qualify as "highly mobile." Thus, this remedial technology appears to include considerably more area than would the seemingly more limited technology for Doane Creek in RAA 2: "Focused Excavation of Surface Soil Hot Spots." We recommend that a "focused excavation/ISS bucket mix" technology be included in RAA 3 for the Gas Purifier Fill RAU, Former Light Oil Plant/North Tank Farm RAU and Former Creosote Loading/South Tank Farm RAU, General Operations RAU, and, as discussed in Comment 2, the Former Spent Gas Purifier Storage RAU. This would ensure that high concentrations in shallow soil on the site would be remediated.

4. RAA 4 relies upon barrier walls to contain dense non-aqueous phase liquid (DNAPL) rather than ISS to treat it. Barrier walls are proposed for the Gas Purifier Fill RAU and the Former Light Oil Plant/North Tank Farm RAU and Former Creosote Loading/South Tank Farm RAU; a containment cell bounded by barrier walls is proposed for the Former Tar Pond RAU. Unfortunately, these remedial technologies are insufficiently described. In particular, the Feasibility Study Report provides no description of the vertical containment that these barriers would provide. Absent those details, we lack confidence that the technologies will be adequate to remediate DNAPL on the site.

Technical Comments

5. Section 2.3.4 describes the historical operations of the Former Koppers/LNG Area. Many historical coal-tar operations also used pentachlorophenol. If that is definitely not the case at this site, we recommend that it be stated here.

6. Section 2.3.4.2 indicates there is an annual discharge of "non-contact cooling water." We presume this is in fact cooling tower blowdown, which would have different physical and chemical characteristics than non-contact cooling water. If it is indeed cooling tower blowdown, we recommend it be described as such. If it is not, we recommend it be described more completely.

7. Section 3.1.2 discusses the Upper Silt Unit and cross-references Figure F-2 in the appendices. The discussion mentions but does not elaborate on the fact that the Upper Silt Unit is absent in

some nearshore areas. The area in which the Upper Silt Unit is absent is not shown in Figure F-2 or other plan-view figures. This is an important aspect of the site's hydrogeology that potentially affects the viability of certain remedial actions; in particular, the proposed ISS barrier wall under the interim removal action measure (IRAM) will not be keyed into an underlying low-permeability layer where the Upper Silt Unit is absent. We recommend it be discussed in much greater detail.

8. Section 4.2.1 and Figures 4-1g through 4-1m depict manufactured gas plant (MGP) residuals below the Fill Water-Bearing Zone (WBZ). We question the choice of fixed depth intervals rather than hydrogeologic units to sort these data. DNAPL behavior in cohesive soil is much different than in non-cohesive soil and thus can be expected to present differently in field borings; Note 2 of Figure 4-2 captures the essence of these differences. At a minimum, we recommend that the text discuss why fixed-depth intervals are an appropriate scheme for sorting the DNAPL data. If such an argument cannot be made, we recommend the data be presented according to hydrogeologic unit.

9. Section 4.2.4 provides an unsatisfying description of Transitional DNAPL in that it fails to indicate whether it is immobile or mobile. We recommend a more complete definition be provided. In particular, the report should make clear whether Transitional DNAPL is considered to have any potential to migrate in non-aqueous form. A conservative approach would be to consider Transitional DNAPL to be potentially mobile in the face of uncertainty about its mobility.

10. We recommend Section 6.2.2 provide the dimensions of the pixel used in the raster analysis.

11. Figures 6-4a and b show anomalous results at the western corner of the Former Tar Pond Area. A low concentration at B-26 causes the high values at B-43, DG-17, and DG-18 to not connect to the high values at SD-2 and SD-3, resulting in an erroneous depiction of ecological risk. We recommend that B-26 be dropped from the raster analysis as it is an obvious outlier.

12. We recommend that Section 7.3.3 discuss the relative risk posed by the different types of MGP Residuals identified in Figure 7-4. Figure 7-4 implicitly equates MGP residuals of all types, ecological hot spots, and human health hot spots regardless of their specific risk profiles. This lumping of different types of hot spots carries into the selection of the remedy in that remedial technologies included under different RAAs do not distinguish the various types of hot spots.

13. Section 8.1 describes historical operations within the Former Office Area as "minimal;" however, a gas holder was situated in this area. Gas holders often collected tars from gas condensates and thus are potential sources. Moreover, gas holders were often demolished by simply collapsing the walls without regard to the presence of tar residuals in the bottom of the holder. Unfortunately, none of the soil borings shown in Figure 6-2 are within the footprint of the former gas holder. The Remedial Investigation (HAI 2007) shows soil boring H-19 within the gas holder's footprint, but we can find no corresponding well log or soil samples. We recommend that the report provide additional discussion of the nature of the gas holder in the Former Office Area, how it was demolished, and its potential to be a source of DNAPL. We also recommend that information on soil boring H-19, if available, be incorporated into the analysis. If such information is not available, we recommend that a new boring within the holder's footprint be considered.

14. Section 12.2.1 indicates that search radii as large as 1,000 feet were used in interpolating the spatial extent of DNAPL. A radius this large would incorporate the entire width of the site at its midpoint, which seems at odds with the physical phenomena affecting DNAPL distribution. The large radius thus seems likely to smooth distributions excessively. We recommend that the rationale for such a large radius be discussed in more detail as well as the sensitivity of the results to the selected radius.

15. Section 12.2.1 states "Following completion of IDW [inverse distance weighting] contouring, residual DNAPL polygons were manually adjusted to limit the extent of interpolated residual DNAPL in areas where data are sparser." We recommend this step be described in more detail. The criteria for reducing the extent and the methodology for the reduction should be explained, and the areal extent of such adjustments should be indicated.

16. Section 12.2.3 states "Soil samples were analyzed in the laboratory for soil porosity." We recommend that the laboratory method(s) be indicated. The porosity values are high compared to literature values. We recommend that the deviations from the literature be discussed and, if possible, explained.

17. Section 12.2.4 states that soil samples were "analyzed in the laboratory for DNAPL saturation." We recommend that the laboratory method(s) be indicated.

18. Section 12.2.5 shows the formulas used to calculate the volume of residual, transitional, and potentially mobile DNAPL volumes. The formulas appear to triple-count the potentially mobile area and double-count the transitional volumes. Please explain.

19. The DNAPL volume estimated in Section 12.2.6, at nearly 6 million gallons, is presented without context or discussion of the reasonableness of such a seemingly large number. We recommend that the text provide additional context rather than simply presenting the calculation methodology and its results. For example, we found that the estimated volume compares reasonably to the average annual tar production of 1,984,000 gallons per year reported by Eng (1973). Assuming this production rate applied to roughly 40 years of operation, the facility produced, in round numbers, 80 million gallons of coal tar. The estimated DNAPL volume of 5.8 million gallons represents about 7% of the total—a high loss rate but not excessively so.

20. Table 13-3 does not appear to be entirely consistent with Appendix L. For example, in-situ chemical oxidation is screened out in Table 13-3 because it is not applicable to all contaminants of concern (COCs). However, Section 5.11.2 of Appendix L makes no mention of this limitation. Ex-situ advanced oxidation treatment of groundwater is similarly screened out in Table 13-3, but Section 8.2.2 of Appendix L reports it is currently being used in the hydraulic control and containment (HC&C) system.

21. Review of Section 14 is hampered by the minimal descriptions provided for the individual remedial technologies assembled under each RAA. As one example, the "ISS Containment Cell to Approximately 70 Feet bgs [below ground surface] Around the Former Tar Pond RAU [remedial alternative unit]" is described in a single sentence. Absent is any discussion of how this cell will be situated in a hydrogeologic context and how it will provide containment at the bottom of the cell. The description of the three-sided barrier wall for the Former Light Oil Plant/North Tank Farm RAU and Former Creosote Loading/South Tank Farm RAU also lacks these specifics.

Without additional information, we are skeptical as to how these barrier walls would provide the intended containment of groundwater and DNAPL.

22. Section 14.1 includes numerous references to the "IRAM Area," but the area is not clearly defined. We recommend that the text and Figure 1-3 be revised to provide an explicit definition of the IRAM Area.

23. Section 14.1.5 states "Concentrations of COCs in the Deep Lower Alluvium WBZ are not significant." We recommend this statement be revised to be more precise and consistent with the determinations reported in Chapter 7.

24. Section 14.1.8 indicates that the Engineered Impermeable Cap will include an "impermeable geotextile fabric." It is unclear if this is intended to mean a flexible membrane liner. We recommend that the report specify the type of material and how it will be installed. We note that an asphalt "cap" provides only limited resistance to infiltration. Asphalt tends to crack, and the resulting gaps focus infiltration and enable deeper local penetration of water.

25. The meaning of "Deeper contamination managed as part of the General Operations RAU" for the Coal Tar Disposal RAUs in RAA 6 is not clear. We recommend that the type of contamination and depth be specified.

26. Appendix P does not include cost estimates for the Gas Purifier Fill RAU for the remedial technologies added to RAA 4, RAA 5, and RAA 6 or for the Coal Tar Disposal RAUs remedial technology added to RAA 6.

Editorial Comments

27. Section 3.1.2 uses the terminology "Lower Silt Unit," but many figure keys call this the "lower aquitard." We recommend that the first reference to "Lower Silt Unit" in the text include the parenthetical "(also called the lower aquitard)."

28. Section 3.1.2 includes numerous references to "the silt unit." Since there are two silt units beneath the site, we recommend that all references to silt units write out the full name so as to avoid potential ambiguity.

29. Section 4.1.1 provides a list of "MGP and hydrocarbon-related COIs [contaminant of interest]" and describes it as "a small subset of the COCs identified in the Gasco OU." We found this language confusing and recommend that the report explain the difference between and significance of COIs and COCs.

30. Section 4.1.5 states "DEQ instructions included removal of all soil and groundwater samples collected outside of the Siltronic GSA [geographic subarea] and removal of the data gap COIs from the Lower and Deep Lower Alluvium WBZs." The meaning of this sentence is unclear—presumably "removal" means "not including in the Feasibility Study database," and "removal of data gap COIs" means "not including the results of sample analyses for data-gap COIs." We recommend clearer phrasing be used.

31. We recommend that the meaning of "X" be added to the notes in Tables 5-2 through 5-6.

32. Several topics are raised in Section 5 that appear to be incomplete; however, these issues are addressed in Section 6. For example, Section 5 identifies COCs based on exceedance ratios (ERs) and hazard quotients (HQs) without revealing any numerical values, which are further described in Section 6. Similarly, Section 5 identifies certain GSAs as ecological exposure areas implying that non-exposure areas (such as the LNG Operations Area, the Former Koppers Area, and the "refined" Former Office Area as shown in Figure 5-5) will not be evaluated for ecological risk. In contrast, Table 5-2c shows ecological COCs for the Former Office Area and Table 5-6c shows ecological COCs for the Former Koppers/LNG Area. This seeming contradiction is further explained in Section 6. We recommend that Section 5 be revised to include cross references to related information provided in Section 6.

33. Footnote 14 states "Also, incidental ingestion of water through recreation is not included in ambient water quality criteria and not considered significant by EPA." While this may be true for site COCs, the statement is not strictly true. EPA's recreational water quality criteria (https://www.epa.gov/wqc/recreational-water-quality-criteria-and-methods) are based largely on incidental ingestion.

34. On Figures 8-1b and 8-1c there appears to be a mismatch between the legend (which shows Former Effluent Discharge Areas bounded by yellow lines) and the illustration (which shows area bounded by purple lines but none bounded by yellow lines).

35. Section 14.1.4 indicates there will be a Fill WBZ Barrier Wall but without reference to a figure that shows its location. We recommend that this feature be added to Figure 1-3. The text description of the Fill WBZ Barrier Wall is prone to misinterpretation because "upstream" (to the southeast) is easily confused with "upgradient" (to the southwest); a figure would help avoid misinterpretation.

References

Anchor QEA. 2023. Revised Source Control Addendum Report, Prepared for NW Natural. November 2.

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