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June 5, 2025

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via electronic delivery (email)

Re: DEQ Comments on the Gasco OU – Feasibility Study Report
Former Gasco Manufactured Gas Plant Operable Unit
Portland, Oregon
ECSI# 84 and # 183

Bob Wyatt:

The Oregon Department of Environmental Quality (DEQ) reviewed the *Feasibility Study Report*[1] (draft Gasco OU FS) for the Former Gasco Manufactured Gas Plant Operable Unit (Gasco OU) submitted by Anchor QEA, Ede Environmental, and Sevenson Environmental Services on behalf of NW Natural. The draft Gasco OU FS was prepared under the Voluntary Agreement for Remedial Investigation/Feasibility Study, as amended[2,3,4] (Upland Cleanup Agreement).

NW Natural previously submitted the *Interim Feasibility Study*[5] (Interim FS), which DEQ conditionally approved[6]. Our conditional approval of the Interim FS included final replies to NW Natural's responses to DEQ's comments[7] (RTCs) on the Interim FS. DEQ's final replies to NW Natural's RTCs provided direction for the Gasco OU FS and identified several deliverables required to precede the draft Gasco OU FS. After conditionally approving the Interim FS, DEQ issued the *Contaminants of Concern, Risk-Based Criteria, and Preliminary Remediation Goals Memorandum*[8] (PRG Memo), which identified an approach for selecting preliminary remediation goals (PRGs) in the Gasco OU FS for contaminants of concern (COCs). On November 22, 2022, DEQ met with NW Natural to discuss the path forward for the Gasco OU FS. During the meeting DEQ agreed to replace the deliverables required in our conditional approval of the Interim FS with a series of meetings. Meeting topics included finalizing PRGs, dense non-aqueous phase liquid (DNAPL) mobility characteristics, identifying hot spots, and remedial technologies and development of remedial action alternatives (RAAs). Following the Gasco OU FS meeting, DEQ

[1] Anchor QEA, Ede Environmental, Sevenson Environmental Services. 2024. Feasibility Study Report, Gasco OU, ECSI No. 84. Prepared for NW Natural. December 16.
[2] DEQ. 1994. Voluntary Agreement for Remedial Investigation/Feasibility Study. DEQ No. WMCVC-NWR-94-13. August 8.
[3] DEQ. 2006. First Addendum to Voluntary Agreement for Remedial Investigation/Feasibility Study. DEQ No. WMCVC-NWR-94-13. July 19.
[4] DEQ. 2016. Second Addendum to Voluntary Agreement for Remedial Investigation/Feasibility Study. DEQ No. WMCVC-NWR-94-13. October 11.
[5] Anchor QEA, LLC. 2018. Draft *Interim Feasibility Study*. Gasco OU. Prepared for NW Natural. November 18 (final content received January 11, 2019).
[6] DEQ. 2021. Letter to: Bob Wyatt (NW Natural), Regarding: DEQ's Final Replies to the Draft Interim Feasibility Study Response to Comments, Former Gasco Manufactured Gas Plant Operable Unit, Portland, Oregon, ECSI#84. November 18.
[7] DEQ. 2019. Letter to: Bob Wyatt (NW Natural), Re: Draft Interim Feasibility Study, Former Gasco Manufactured Gas Plant Operable Unit, Portland, Oregon, ECSI #84. August 15.
[8] DEQ. 2021. Contaminants of Concern, Risk-Based Criteria, and Preliminary Remediation Goals, Former Gasco Manufactured Gas Plant Operable Unit, Portland, Oregon, ECSI# 84. December 16.

conditionally approved[9] the 2019 *Remedial Investigation/Human Health and Ecological Risk Assessment Addendum for the Siltronic GSA* (RI/HERA Addendum)[10] as revised, modified, or amended by DEQ's April 11, 2022 comments[11], NW Natural's RTCs and revised materials provided on July 8, 2022[12], September 13, 2022[13], and November 16, 2022[14], and DEQ's Replies to NW Natural's RTCs and revised materials provided with our conditional approval. To address data gaps identified in DEQ's conditional approval of the RI/HERA Addendum, NW Natural completed additional investigation according to the *Feasibility Study Comprehensive Data Gaps Work Plan*[15]and *Feasibility Study Comprehensive Data Gaps Work Plan DEQ Comment and Response Matrix*[16]. The data from this investigation are incorporated into the Gasco OU FS, except for samples collected from Doane Creek bank soils and sediments. DEQ understands that NW Natural will incorporate these data into the revised Gasco OU FS. The draft Gasco OU FS includes information intended to resolve DEQ's comments on the Interim FS and Draft RI/HERA Addendum, consistent with the conditions for approval of those documents, and presents new evaluations that include the identification of remedial technologies, assembly and evaluation RAAs, summarizing a recommended RAA, and presenting a residual risk assessment for the recommended RAA.

In parallel with developing the draft Gasco OU FS, NW Natural developed an alternative remedial action concept for the Gasco Sediments Site under the *Administrative Settlement Agreement and Order on Consent for Removal Actio*n[17] (ASAOC). NW Natural's alternative remedial action concept included an in-situ stabilization and solidification (ISS) barrier wall at the top of the riverbank that extended across portions of the Gasco OU. During a meeting with NW Natural, EPA, and DEQ on September 29, 2022, DEQ proposed that NW Natural prepare a Source Control Focused Feasibility Study Addendum, to include the proposed upland remedial measures as a new source control alternative. On November 10, 2022, NW Natural submitted the *Source Control Addendum Report*[18] to DEQ. Our comments[19] on the Source Control Addendum included conditions for progressing through the ISS barrier wall design, one of which was that the Gasco OU FS recommend a RAA consisting of removal and/or treatment of hot spots to the extent feasible. DEQ's expectations for addressing hot spots in the Gasco OU FS, regardless of the presence of the ISS barrier wall, was further memorialized in NW Natural's proposed *Framework for EPA Sediment Design and DEQ Source Control Measure FFS and IRAM Design*[20,21,22]. After receiving

[9] DEQ. 2022. Letter to: Robert Wyatt, NW Natural. Regarding: DEQ Approval of the Draft Remedial Investigation/Human Health and Ecological Risk Assessment Addendum – Siltronic Geographic Subarea, Former Gasco Manufactured Gas Plant Operable Unit, Portland, Oregon, ECSI #84 and #183. November 28.
[10] Anchor QEA, LLC and Hahn and Associates, Inc. 2019. Remedial Investigation/Human Health and Ecological Risk Assessment Addendum for the Siltronic GSA. Gasco OU. Prepared for NW Natural. November 22.
[11] DEQ. 2022. Letter to: Robert Wyatt, NW Natural. Regarding: Draft Remedial Investigation/Human Health and Ecological Risk Assessment Addendum for the Siltronic Geographic Subarea, Former Gasco Manufactured Gas Plant Operable Unit, Portland, Oregon, ECSI #84. April 11.
[12] Anchor QEA. 2022. Email to Wesley Thomas, DEQ. Subject: Gasco OU RI/HERA Addendum Responses to Comment Matrix and Requested Materials (First Submittal). July 8.
[13] Anchor QEA. 2022. Email to Wesley Thomas, DEQ. Subject: Gasco OU RI/HERA Addendum Responses to Comment Matrix Requested Materials (Second Submittal). September 13.
[14] Anchor QEA. 2022. Email to Wesley Thomas, DEQ. Subject: Gasco OU RI/HERA Addendum Responses to Comment Matrix Requested Materials - Revised response to DEQ Comment #11. November 16.
15 Anchor QEA, LLC. 2022. Feasibility Study Comprehensive Data Gaps Work Plan. Gasco OU. Prepared for NW Natural. September 13 (Revised/Supplemental Tables and Figures provided January 25, 2023).
16 Anchor QEA, LLC. 2023. Feasibility Study Comprehensive Data Gaps Work Plan DEQ Comment and Response Matrix. Gasco OU. Prepared for NW Natural. January 25.
[17] EPA. 2009. Administrative Settlement Agreement and Order on Consent for Removal Action, U.S. Environmental Protection Agency Region 10, CERCLA Docket No. 10-2009-0255. September 9.
[18] Anchor QEA, LLC. 2022. Source Control Addendum Report, NW Natural Gasco Site, ECSI No. 84. Prepared for NW Natural. November 10.
[19] DEQ. 2022. Letter to: Bob Wyatt, NW Natural. Regarding: DEQ Comments on the Source Control Addendum Report, Former Gasco Manufactured Gas Plant Operable Unit, Portland, Oregon, ECSI #84 and #183. February 13.
[20] NW Natural. 2023. NW Natural's Framework for EPA Sediment Design and DEQ Source Control Measure FFS and IRAM Design. June 29.
[21] DEQ. 2023. DEQ Comments on NW Natural's Framework for EPA Sediment Design and DEQ Source Control Measure FFS and IRAM Design. July 6.
[22] NW Natural. 2023. NW Natural's Framework for EPA Sediment Design and DEQ Source Control Measure FFS and IRAM Design. July 21.

NW Natural's *Revised Source Control Addendum Report*[23] (Revised SCA) and *Source Control Interim Remedial Action Measure Concept and Agreement to Move into Design*[24] (IRAM Concept letter), DEQ issued our *Gasco OU Interim Removal Action Decision*[25] (IRAM Decision). The IRAM Decision outlines the scope of an IRAM and reiterates DEQ's requirement that the Gasco OU FS recommended a RAA that removes and/or treats hot spots to the extent feasible. DEQ will not approve the IRAM final design or IRAM implementation without a Gasco OU FS that identifies and recommends a RAA that removes and/or treats hot spots to the extent feasible.

DEQ acknowledges and appreciates the considerable effort that NW Natural put into the development of the draft Gasco OU FS. However, the draft Gasco OU FS does not meet the requirements of Oregon cleanup regulations and policies, or satisfactorily address our comments on previous deliverables and discussions. Further, DEQ questions the methodology and conclusions of certain technical evaluations included in the draft Gasco OU FS. DEQ requires that NW Natural revise and resubmit the draft Gasco OU FS to address our comments herein no later than April 3, 2026 (approximately 10 months from the date of this letter). DEQ recommends that NW Natural revise and resubmit the *Site-Wide Groundwater Flow Model Update and Feasibility Study Simulations* (draft Gasco OU FS Appendix E) as a standalone deliverable in advance of the revised Gasco OU FS to support the IRAM design.

Our comments on the draft Gasco OU FS are provided below. We note that the revisions necessary to address our comments will substantially alter the information in the draft Gasco OU FS. Therefore, DEQ only performed a cursory review of portions of the draft Gasco OU FS that will require substantive or fundamental revisions to address our comments. NW Natural should not interpret the absence of a comment as agreement or approval. DEQ has also attached comments received from EPA and other members of the Portland Harbor Technical Coordination Team.

General Comments

1) **Hot Spots**. DEQ requires the removal and/or treatment of hot spots to the extent feasible consistent with ORS 465.315(1)(e) and OAR 340-122-0090(1)(c). DEQ has the following comments related to the draft Gasco OU FS consideration of hot spots:

   a) The draft Gasco OU FS does not recommend a RAA that removes and/or treats hot spots to the extent feasible.

   b) The draft Gasco OU FS does not establish the feasible limit for hot spot removal and/or treatment. To establish the feasible limit for hot spot removal and/or treatment, Gasco OU FS must apply DEQ's feasibility balancing factors to gradations of RAAs that provide increasing levels of hot spot removal and/or treatment. Since cost may control the feasible limit of hot spot removal and/or treatment in many circumstances, the Gasco OU FS must assess hot spot cost feasibility by 1) quantifying the hot spot removal/treatment (and quantifying untreated hot spots left in-place) for each RAA, and 2) estimating the cost associated with the removal and/or treatment of the hot spots described in each RAA. Revise the draft Gasco OU FS to include charts comparing hot spot removal/treatment quantities versus the associated cost to establish where costs become significantly disproportionate to the hot spot removal and/or treatment quantity. Consistent with NW Natural's Framework Document, the Gasco OU FS shall not assume that hot spot treatment does not result in risk reduction due to the presence of the ISS barrier wall. For the

[23] Anchor QEA, LLC. 2023. Revised Source Control Addendum Report, Gasco OU, ECSI No. 84. Prepared for NW Natural. November 2.
[24] Ede Environmental, LLC. 2024. Letter to Wes Thomas (DEQ), Subject: Source Control Interim Remedial Action Measure Concept and Agreement to Move into Design, NW Natural Gasco Site, 7900 NW St. Helens Road, Portland, Oregon. May 9.
[25] DEQ. 2024. Letter to Bob Wyatt (NW Natural), Regarding: Gasco OU Interim Removal Action Decision, Former Gasco Manufactured Gas Plant Operable Unit, Portland, Oregon, ECSI #84 and #183. July 3.

purposes of the Gasco OU FS, DEQ requires the Gasco OU FS to assume that risk reduction scales proportionally to the quantity of hot spot removed and/or treated.

c) The draft Gasco OU FS misunderstands and misapplies DEQ's hot spot priorities (the draft Gasco OU FS refers to DEQ's hot spot priorities as a hot spot hierarchy). The Gasco OU FS should use DEQ's hot spot priorities to inform gradations of RAAs that increasingly remove and/or treat hot spots. The Gasco OU FS should use these RAA gradations to identify the hot spot removal and/or treatment feasible limit with the objective of achieving the most risk reduction possible. The hot spot prioritization approach should identify those hot spots that contribute to the highest risks and include those in the lowest RAAs (excepting No Action). DEQ's expectation is that the lowest RAA would include a substantial amount of hot spot removal and/or treatment. DEQ's hot spot priorities should not be interpreted to imply that there are any hot spots that do not warrant removal and/or treatment. DEQ expects that the feasible limit for hot spot removal and/or treatment will include hot spots that fit the definition of all five DEQ hot spot priorities. DEQ notes that several hot spots fit into multiple hot spot priorities. For example, DNAPL and other source materials in the Former Koppers/LNG geographic subarea (GSA): 1) are proximate to sensitive receptors (e.g., human health direct contact, dissolved benzene plume to the Willamette River), 2) contain DNAPL (both potentially mobile, transitional, and residual), 3) pose a high magnitude of unacceptable risk to human health, 4) contribute to a highly mobile pathway (i.e., resulted in a necessary removal action to address risk pathway on a temporary basis), and 5) contain substantial contaminant mass.

d) The draft Gasco OU FS must evaluate the benefits of hot spot removal and/or treatment on both a site-wide and GSA- or Remedial Action Unit (RAU)-specific basis.

e) The draft Gasco OU FS quantifies DNAPL but does not quantify the volumes of other manufactured gas plant (MGP) residuals. MGP residuals represent highly concentrated (direct contact) and/or highly mobile hot spots. DEQ requires that the Gasco OU FS quantify all hot spots and indicate the quantities of all hot spots treated and/or removed by each RAA (and the quantities of untreated hot spots remaining in-place for each RAA).

f) The draft Gasco OU FS does not correctly evaluate or identify groundwater hot spots. DEQ disagrees that it is infeasible to restore the beneficial use(s) of groundwater across large portions of the Gasco OU. For example, where DNAPL is absent in the Alluvium water bearing zones (WBZs), hazardous substances in groundwater are either already below applicable PRGs or can feasibly be restored within a reasonable timeframe. DEQ expects that the beneficial use of groundwater can also be restored within a reasonable timeframe in many portions of the Gasco OU following removal and/or treatment of MGP residuals. For example, the simplistic evaluation presented in Appendix R reflects achievement of PRGs in hypothetical downgradient monitoring wells after in-situ stabilization/solidification (ISS) treatment of DNAPL.

g) DEQ disagrees that the IRAM protects the beneficial use of groundwater. The protectiveness of the IRAM requires removal and/or treatment of upland hot spots the extent feasible. The Gasco OU FS must evaluate and select technologies that restore the groundwater beneficial uses to the extent feasible. Each RAA should describe and quantify the areas and WBZs where groundwater beneficial use will be restored versus areas where restoration will not occur over a reasonable timeframe.

2) **Balancing Factor Criteria Scoring Approach**. DEQ does not approve the balancing factor criteria scoring approach presented in Tables 15-2 through 15-6. DEQ has the following comments:

   a) The draft Gasco OU FS scoring rubrics for effectiveness, long-term reliability, and implementability artificially constrain the range of potential scores. This approach creates bias in the RAA scoring that inappropriately overvalues RAAs that provide lesser degrees of removal and/or treatment and undervalues RAAs that provide greater degrees of removal and/or treatment. Given the substantial separation between the effectiveness and long-term reliability of the RAAs, balancing factor scoring should use a larger scoring range (e.g., 0-10) and should not constrain the range over which the RAAs are scored (e.g., only using a score of 5 for a sub-criterion across all RAAs). RAA effectiveness and long-term reliability scores should scale proportionally with the extent (i.e., quantity) of hot spot removal and/or treatment. In addition, the effectiveness of each RAA should consider the degree to which the RAA restores the groundwater beneficial use (e.g., by quantifying the areas within the site where groundwater has or can be feasibly restored by each RAA).

   b) DEQ does not approve the hot spot scoring and weighting approach, which appears to represent a misunderstanding and misapplication of DEQ's hot spot priorities (refer to General Comment #1c). Remove the hot spot scoring and weighting approach from the draft Gasco OU FS. Revise the draft Gasco OU FS to evaluate the degree to which each RAA removes and/or treats hot spots as part of the effectiveness and long-term reliability balancing factors.

3) **Balancing Factor Evaluations**. DEQ has the following comments regarding the evaluation of RAAs against DEQ's balancing factors:

   a) Evaluation of long-term reliability should include the nature, degree, and uncertainty associated with any necessary long-term operation and maintenance (O&M). These include the ability to operate and maintain hydraulic controls in perpetuity.

   b) Evaluation of implementability should consider the monitoring requirements necessary to demonstrate that each RAA will achieve remedial action objectives (RAOs).

   c) Evaluation of implementation risk should include the estimated timeline for implementing each RAA, with consideration of individual GSAs/RAUs and WBZs.

   d) Consistent with DEQ's *Green Remediation Policy*[26], revise the draft Gasco OU FS to evaluate green remediation as an element of the implantation risk balancing factor and not as a standalone criterion.

   e) Since cost is a quantitative measure of cost reasonableness, DEQ does not approve numerical scoring for cost reasonableness. Consideration of cost reasonableness should include the cost to remove and/or treat hot spots, the total capital cost, and the total capital cost plus the net present value (NPV) of O&M costs for controlling impaired groundwater in perpetuity.

4) **Contaminant Inaccessibility**. The draft Gasco OU FS introduces the concept of "inaccessibility" in the technology screening, RAA development, and RAA evaluation steps. However, the draft Gasco OU FS never defines inaccessibility, and DEQ questions whether the draft Gasco OU FS correctly identifies certain areas as inaccessible. Further, the draft Gasco OU FS incorrectly assumes that areas

[26] DEQ. 2011. Green Remediation Policy. November 2.

inaccessible to large equipment are inaccessible to all remedial technologies. DEQ has the following comments:

a) The Gasco OU FS must define inaccessibility.

b) Since the draft Gasco OU FS was submitted, Siltronic has notified DEQ and NW Natural of their intention to demolish the Fab 1 building. Revise the draft Gasco OU FS to consider the Fab 1 building footprint accessible.

c) Since the draft Gasco OU FS was submitted, NW Natural has notified DEQ that they may demolish the petroleum above ground storage tanks (ASTs) on their property. Revise the draft Gasco OU FS to consider the petroleum ASTs and any associated infrastructure accessible.

d) Provide rationale for why the draft Gasco OU FS considers the liquid natural gas (LNG) basin inaccessible. DEQ notes that NW Natural recently lined the LNG basin, which involved the use of heavy construction equipment within the basin.

e) An area inaccessible to large construction equipment may not be inaccessible for all remedial technologies. The Gasco OU FS should identify and include remedial technologies for limited access locations. These could include smaller excavation equipment, specialized ISS mixing methods (e.g., jet grouting), or horizontal wells for DNAPL recovery and/or treatment.

5) **Geographical Subareas and Remedial Action Units**. The draft Gasco OU FS screens remedial technologies and assembles RAAs based on RAUs. Some of these RAUs encompass entire GSA, some extend across multiple GSAs, and some subdivide GSAs. Revise the draft Gasco OU FS based on the following comments:

a) The RAU framework imposes unnecessary limitations on the Gasco OU FS where geographical boundaries do not separate unique forms of contamination and/or where RAUs constrain the layout and configuration of remedial technologies (e.g., the Former Koppers/LNG Basin GSA). DEQ does not approve the Coal Tar Disposal RAUs, the Former Light Oil Plant/North Tank Farm RAU, the Former Creosote Loading/South Tank Farm RAU. Remove these RAUs from the draft Gasco OU FS and develop remedial alternatives for the entire GSA.

b) The RAU concept should not extend across multiple GSAs. DEQ does not approve the General Operations RAU as continuous across multiple GSAs.

c) RAUs that encompass entire GSAs (e.g., Former Tar Pond GSA) are unnecessary. Remove these RAUs from the draft Gasco OU FS.

d) The draft Gasco OU FS relies on limited data or poorly delineated MGP residuals as the basis for certain RAU boundaries (e.g., the Gas Purifier Fill RAU, Former Spent Gas Purifier Storage RAU). These RAU boundaries have limited value for informing the conceptual layout of RAAs. However, the Gasco OU FS may retain these RAUs in the Gasco OU FS with the acknowledgement that their boundaries are conceptual and subject to change based on the results of pre-design investigations.

e) The Gasco OU FS must assemble, compare, and evaluate RAAs on the GSA/RAU scale, before assembling site-wide RAAs.

f) The draft Gasco OU FS states that RAUs were delineated based on the distribution and depth of MGP residuals, with a focus on DNAPL and tar. It is unclear how RAUs considered the distribution of MGP residuals, or why the consideration was limited to DNAPL and tar.

6) **Data Interpolation**. While DEQ considers MGP residual and COC interpolations presented in the draft Gasco OU FS acceptable for evaluating and comparing RAAs, these interpolations are uncertain, particularly in areas with lower data density. In some cases, MGP residuals distributions are based on one or two distant borings. In many instances, maps show the absence of MGP residuals in areas between borings with contain MGP residuals without a 'clean' boring in between them. DEQ does not consider the inverse distance weighting (IDW) contours or existing data density to be sufficient to support remedial design or to establish firm or fixed layouts, boundaries, or configurations of specific remedial technologies associated with each RAA. The final layouts, boundaries, and configurations of remedial technologies are subject to remedial design, including additional pre-design investigations. DEQ anticipates the need to develop a 3-dimensional (3D) model depicting MGP residuals site-wide (like the DNAPL model NW Natural is developing for the IRAM) to better depict the nature and extent of MGP residuals during remedial design. Revise the Gasco OU FS to acknowledge the uncertainty associated with the IDW interpolation methodology.

7) **DNAPL Mapping and Volume Estimates**. DEQ has the following comments:

a) DEQ considers the methodology for estimating DNAPL volumes to be uncertain, and we disagree that the estimates are conservative. The estimated DNAPL volumes presented in the draft Gasco OU FS differ significantly from those presented in the Interim FS. The differing DNAPL volume estimates appear to be primarily driven by differences in calculation methodology, and not new information. These differences illustrate the high level of uncertainty in the DNAPL volume estimates.

i) The IDW methodology and data availability contribute to uncertainty regarding the lateral extent of DNAPL (and different DNAPL mobility classifications). Refer to General Comment #6.

ii) The draft Gasco OU FS relies solely on TarGOST data (and excludes other important lines of evidence) to estimate DNAPL thickness. Many of the TarGOST borings were intentionally collected from areas where DNAPL was absent or areas representing the fringe of a DNAPL body. NW Natural has not completed a systematic DNAPL investigation using TarGOST with the goal of characterizing DNAPL thicknesses across the Gasco OU. DEQ does not approve relying solely on TarGOST data to estimate DNAPL thicknesses. Revise the draft Gasco OU FS to estimate DNAPL thickness estimates using all available lines of evidence, and acknowledge the uncertainty associated with limited data.

Delete the statements throughout the draft Gasco OU FS describing the DNAPL volume estimates as conservative.

b) DEQ recommends adding a new DNAPL depth interval that further separates the 0-25 feet below the base of the Fill WBZ interval that identifies DNAPL associated with the upper silt unit versus DNAPL beneath the upper silt unit. DEQ believes this subdivision of the 0-25 feet below the base of the Fill WBZ interval will be useful for developing RAA gradations.

8) **DNAPL Mobility Classification**. The draft Gasco OU FS presents a lines-of-evidence review of available DNAPL mobility data to develop four DNAPL mobility classifications: residual DNAPL;

transitional DNAPL; potentially mobile DNAPL; and mobile DNAPL. DEQ has the following comments:

a) DNAPL composition and physical properties vary across the Gasco OU. These variations are often unique to GSAs (e.g., the Former Koppers/LNG GSA, Siltronic GSA, Former Tar Ponds GSA) and likely result in potential DNAPL mobility at different saturation levels. There are not enough data to develop mobility classifications for each unique DNAPL composition at the Gasco OU; therefore, the Gasco OU FS aggregated site-wide DNAPL data to support the assignment of generic DNAPL mobility classifications. While these DNAPL classifications are useful for FS-level DNAPL quantity estimates, potential DNAPL recoverability volume estimates, and for comparing RAAs, DEQ does not consider these classifications suitable for remedial design. DEQ will require additional DNAPL characterization to support remedial design. Further refinement of DNAPL mobility classifications may be required, depending on the scope of DEQ's selected remedial action.

b) There is not enough information available to segregate DNAPL observations between potentially mobile and mobile DNAPL classifications, nor do we agree that a DNAPL saturation of 35% represents an appropriate or accurate distinction between the two DNAPL mobility classifications. DEQ does not approve making a distinction between these two DNAPL mobility classifications in the draft Gasco OU FS.

c) For the purposes of the Gasco OU FS, DEQ considers transitional DNAPL to be potentially mobile.

d) DEQ identified errors in the DNAPL classification assigned to individual borings and depth intervals. NW Natural should review the DNAPL classifications at each boring to ensure they present the correct DNAPL classification.

9) **Remedial Technology Screening**. DEQ has the following comments related to remedial technology screening:

a) DEQ disagrees that a process option should be applicable to multiple GSAs to warrant consideration and inclusion in RAAs.

b) DEQ disagrees that a process option necessarily must be proven at other MGP or MGP-like sites. Some of the contamination within the Gasco OU is not derived from historical MGP operations.

c) The GSA- and RAU-specific remedial technology screening tables would benefit from further subdivision by applicable media (e.g., soil, groundwater, DNAPL) to ensure that remedial technologies are considered for each potentially applicable media.

d) Given the breadth and complexity of contamination in the GSAs/RAUs (and consistent with our comments on the Interim FS) DEQ believes that more than one primary remediation technology, implemented alone or in combination with complementary technologies, will be required to treat different contaminated media and MGP residual types in the different GSAs comprising the Gasco OU. Therefore, DEQ disagrees that a process option must be applicable to all COCs within a treatment area to warrant consideration and inclusion in RAAs.

e) The technology screening process removes potentially viable remedial technologies based on the assumption that these technologies are equally effective, reliable and implementable, but less cost effective compared to ISS. However, this approach relies on the simplifying assumption that ISS

is equally effective, reliable and implementable for all types of hot spots and site settings. While ISS is a proven technology for treating MGP DNAPL, certain contaminants (e.g., high volatile organic compound [VOC] concentrations, spent oxidizes) may reduce ISS effectiveness and long-term reliability compared to more characteristic MGP DNAPL. In addition, implementability limitations specific to ISS (e.g., accessibility) may not apply to these other technologies. Cost-effectiveness should not be the sole basis for screening out remedial technologies. For hot spots or site settings that pose effectiveness or reliability uncertainty for ISS, DEQ recommends that the Gasco OU FS couple source-area ISS treatment with other technologies aimed at reducing groundwater impacts. For example, air sparging could also be coupled with other remedial technologies in a treatment train approach for contamination in the Fill WBZ within the Former Koppers/LNG GSA.

f) DEQ requires the Gasco OU FS to include excavation as a process option for all GSAs and RAUs.

g) DEQ requires the Gasco OU FS to include at least one groundwater treatment technology to address groundwater hot spots (for occupational use and aquatic life beneficial uses) within a reasonable timeframe. Monitored natural attenuation (MNA) can only be considered as treatment if it can be demonstrated to be effective within a reasonable timeframe. The draft Gasco OU FS does not establish whether MNA is appropriate for restoring the occupational beneficial use of Deep Lower Alluvium WBZ groundwater. Therefore, DEQ does not approve MNA as a presumptive remedy for Deep Lower Alluvium WBZ groundwater.

h) DEQ recommends further consideration of enhanced MNA for groundwater hot spots.

i) DEQ believes that permeable reactive barriers could effectively treat groundwater hot spots in the Fill WBZ, particularly for groundwater discharging to Doane Creek or to the Willamette River. We note that the EIB program on the Siltronic GSA consists of a permeable reactive barrier. DEQ considers permeable reactive barriers applicable to hot spot treatment.

j) The Gasco OU FS provides a simplified discussion of institutional controls without considering the likely scope of these controls or the need to negotiate and implement institutional controls on property not owned by NW Natural (i.e., Siltronic, BNSF). Where contamination is left in place, particularly untreated MGP residuals and other hot spots, DEQ-required restrictions and servitudes will be extensive. These will include the need for DEQ approval of any new construction or site use and the potential need to implement additional remediation prior to site development. Implementation of these highly restrictive institutional controls on property not owned by NW Natural presents an implementability challenge that should be considered in the Gasco OU FS.

10) **Remedial Action Alternatives**. DEQ has the following comments regarding specific RAAs:

a) RAAs with limited hot spot removal and/or treatment do not achieve DEQ's regulatory requirement for treatment to the extent feasible and therefore should be minimized. RAA 2 does not include a meaningful amount of hot spot removal and/or treatment, and DEQ does not find RAA 2 useful for establishing the feasible limit for hot spot removal and/or treatment. Therefore, DEQ does not approve inclusion of RAA 2 in the Gasco OU FS.

b) The Gasco OU FS should develop RAAs with a focus on determining the feasible extent of hot spot removal and/or treatment. The only difference between RAA 2 and RAA 3 is the ISS

treatment of occupational direct contact hot spots in the Tar Ponds GSA. RAA does not include treatment of occupational direct contact hot spots in other GSAs or human health construction worker and excavation worker hot spots in any GSA. DEQ does not find RAA 3 useful for establishing the feasible limit for hot spot removal and/or treatment. Therefore, DEQ does not approve inclusion of RAA 3 in the Gasco OU FS.

c) RAA 6 is the first RAA that includes removal and/or treatment of all accessible direct contact (human health and ecological) hot spots. DEQ considers removal and/or treatment of accessible direct contact hot spots to represent a minimum requirement for the recommended RAA.

d) The draft Gasco OU FS does not present information to support the conclusion that RAA 8 is infeasible. Consistent with NW Natural's evaluation of deep ISS implementability and implementation risk presented in the Revised SCA, DEQ considers deep ISS treatment of hot spots to be reasonably implementable in areas accessible by ISS equipment and carry acceptable levels of implementation risk that can be mitigated. None of the technologies required to accomplish RAA 8 are different than those proposed for the IRAM. In addition, DEQ disagrees that RAA 8 would not reduce risk compared to RAA 7. Complete removal and/or treatment of all accessible hot spots would result in substantially reduced risk and improve the feasibility of groundwater beneficial use restoration over reasonable timeframes compared to RAA 7. Refer to General Comment #1b.

e) Several RAAs include limited and largely passive DNAPL recovery. The draft Gasco OU FS estimates 508,000 gallons of recoverable DNAPL (although DEQ finds this estimate uncertain – refer to General Comment #7). To-date, interim measures implemented at the Gasco OU have removed less than 2% of estimated recoverable DNAPL volume over more than a decade[27]. Given the DNAPL recovery quantities to-date and the widespread distribution of DNAPL across the Gasco OU, DEQ considers passive DNAPL recovery, as described in the RAAs, to have a very low effectiveness and low long-term reliability compared to removal and/or treatment. Further, DEQ does not consider passive DNAPL recovery adequate for addressing DNAPL hot spots. Any RAA that relies on passive DNAPL recovery must identify the number and conceptual spacing of DNAPL recovery wells that reflects the heterogeneity of DNAPL distribution and demonstrate the ability to fully remove the theoretically recoverable DNAPL within a reasonable timeframe.

f) Revise the Gasco OU FS to describe, in detail, the remediation material management strategies for each RAA. At minimum, the discussion should include the type, quantities, handling approach and sequence, and transport and disposal approach for each potential waste stream.

g) Any RAA that relies on contaminant technologies requires O&M of engineering controls in perpetuity. Revise the draft Gasco OU FS to describe O&M requirements for each RAA and the anticipated methods for verifying attainment of and maintaining RAOs, including the potential need for contingency actions if engineering controls are unable to achieve or maintain RAOs. Further, revise the draft Gasco OU FS to describe financial assurance requirements for performing O&M in perpetuity and consider how these O&M requirements affect the long-term reliability and cost reasonableness of engineering controls.

[27] The *DNAPL Monitoring Semiannual Summary Report (July 1 through December 31, 2024)* indicates that to-date, HC&C system operation has recovered 4,903 gallons of DNAPL (77% of which was recovered from PW-2L). Fill WBZ monitoring wells MW-6-32 and MW-13-30 have produced an additional 4,048 gallons of DNAPL, and operation of the T-50 Trench has recovered 655 gallons of DNAPL.

11) **ISS Barrier Wall Breaching Scenario**. The IRAM scope includes ISS barrier wall breaching in portions of the Gasco OU where the groundwater beneficial use for aquatic life is unimpaired or restored. During meetings with NW Natural related to the scope of the IRAM, DEQ identified the benefits to breaching the ISS barrier wall, where possible, including reducing costs and improving remedy sustainability compared to operating hydraulic controls for clean groundwater. The breaching scenario could include one or multiple WBZs. The Gasco OU FS should incorporate the ISS wall breaching scenario into every RAA that includes the ISS barrier wall and evaluate different potential post-breaching scenarios. For example, where the beneficial use of Alluvium WBZ groundwater was restored, but the beneficial use for the overlying Fill WBZ remained impaired. Suitable remedial approaches for the Fill WBZ after breaching the wall could include a replacement ISS barrier wall with hydraulic controls, a permeable reactive barrier, or hydraulic controls alone.

12) **Consistency with Upland Cleanup Agreement Scope of Work**. The draft Gasco OU does not appear to include all the elements required by the Upland Cleanup Agreement Scope of Work (SOW). Please review the SOW and revise the Gasco OU FS as necessary.

13) **Interim FS Comments**. Several Interim FS comments remain unresolved. In our conditional approval of the Interim FS, DEQ requested that the Gasco OU FS map the content of future submittals to the relevant Interim FS comment(s) and RTCs to facilitate our review of how the comments had been incorporated into, and addressed by, the Gasco OU FS. DEQ repeats our request for the Gasco OU FS transmittal to include a matrix that 1) confirms that our comment has been resolved, and 2) identifies the relevant section of the Gasco OU FS. Examples of unresolved Interim FS comments include, but are not necessarily limited to:

    a) Consistent with several Interim FS comments, DEQ disagrees that the HC&C system prevents Alluvium WBZ discharge to the river. Revise the Gasco OU FS to remove and replace all statements that the HC&C system prevents discharge to the river or prevents contaminant migration to the river with a statement that "the HC&C operational figures are used to demonstrate that the HC&C system controls the groundwater transport pathways via the Upper and Lower Alluvium WBZs to the river by comparing groundwater elevations in these WBZs to the river elevations."

    b) Consistent with several Interim FS comments, DEQ acknowledges that the HC&C system partially captures the Deep Lower Alluvium WBZ. However, we disagree that the HC&C system is fully capturing the Deep Lower Alluvium WBZ. Delete statements about fully capturing the Deep Lower Alluvium WBZ.

    c) Consistent with Interim FS Comment #8, the Gasco OU FS should discuss protocols for addressing discovery of previously unknown utilities. Confirm that Figure 2-3 includes all derelict utilities.

    d) Consistent with Interim FS Comment #40, the Gasco OU FS should not refer to the lower silt unit as an aquitard.

    e) Consistent with Interim FS Comment 60, revise references to tar below the Fill WBZ to "weathered DNAPL."

Specific Comments

1) **Section 1.3, Coordination with the Portland Harbor Superfund Site Sediment Cleanup and Upland Source Controls**. DEQ has the following comments:

   a) The fourth paragraph states that NW Natural is working on an IRAM design that includes the elements described in the IRAM Concept letter. Revise this statement to clarify that the IRAM design will include the elements described in DEQ's IRAM Decision. Update the description of the IRAM in DEQ's IRAM Decision and revise the scope of the IRAM described in the IRAM Concept letter.

   b) DEQ's IRAM Decision provides revised source control and removal action objectives (SC/RAOs) assigned to the IRAM to ensure its effectiveness and long-term reliability. Revise this section to include the SC/RAOs assigned to the IRAM.

2) **Section 2.3.2.2, Current Uses**. Revise this section to discuss the future removal the existing petroleum ASTs.

3) **Section 2.4, Source Control Measures**. This section identifies five potential pathways for sources of contamination from the Gasco OU uplands to reach the Willamette River. Revise this list to include DNAPL in the Fill WBZ.

4) **Section 2.4.2, Groundwater and DNAPL**. The fourth paragraph states that data included within HC&C system annual reports confirm that the HC&C system continues to meet its design objectives and achieve source control RAOs for the Alluvium WBZs. However, recent DNAPL observations in PW-06L indicate that HC&C system operation may have mobilized DNAPL to the Lower Alluvium WBZ. DEQ notes that the IRAM will address DNAPL migration near PW-06L.

5) **Section 2.4.2.3, IRAM Source Control Expansion**. The first sentence states that the IRAM will limit the potential for future dissolved phase or DNAPL migration from upland areas to Portland Harbor. As we stated in our comments (provided as Attachment 2 to the DEQ IRAM Decision) on the Revised SCA, conceptually, the IRAM could be an effective long-term DNAPL source control measure "if its constructable and coupled with other necessary upland remedial measures" and that the IRAM effectiveness relies "on future DNAPL removal to the extent feasible." Revise this section to clarify that the hot spot removal/treatment to the extent feasible across the Gasco OU is a requirement for the IRAM to achieve source control requirements.

6) **Section 4.2.1, Manufactured Gas Plant Residuals by Depth**. The last paragraph in this section states that only very isolated occurrences of DNAPL remain at depths greater than 75 feet below the base of the Fill WBZ. Revise this paragraph indicate to what extent the IRAM will ISS treat DNAPL at these depths.

7) **Section 4.2.2, Manufactured Gas Plant Residuals by Geographic Subarea**. The last sentence in the Former Koppers/LNG Area bullet states that no MGP residuals have been observed. However, DEQ notes that only one (1) boring was advanced to these depths, suggesting that DNAPL may not be well characterized at depths greater than 50 feet below the base of the Fill WBZ in the Former Koppers/LNG Area. Revise the draft Gasco OU FS to discuss uncertainty associated with data density/scarcity in certain depth intervals.

8) **Section 5, Summary of Risk Assessments**. DEQ has the following comments:

   a) The fourth bullet states that cleanup standards for the riverbank are established in the *Portland Harbor Superfund Site Record of Decision*[28,29,30] (ROD). Cleanup levels provided in the Portland Harbor ROD do not include risks associated with terrestrial exposure scenarios. These terrestrial exposure scenarios were evaluated in the Gasco Site *Human Health and Ecological Risk Assessment Report*[31] as modified by DEQ's May 22, 2015 letter[32] (Gasco Site HERA) and RI/HERA Addendum. The Gasco Site HERA and RI/HERA Addendum identified unacceptable exposure risks to human and ecological receptors by contaminated riverbank soil (birds, mammals, plants, invertebrates) and seeps of contaminated groundwater onto the unsubmerged riverbanks (birds, mammals). Section 3.4.1.3 of the Gasco Sediments Site ASAOC Statement of Work requires NW Natural to incorporate the upland risk assessments into the riverbank remedy designed under the ASAOC. Consistent with the requirements of the Amended ASAOC, and our comments on the Interim FS and RI/HERA Addendum, revise the draft Gasco OU FS to clarify that the upland risk assessments identified unacceptable risk to terrestrial receptors in the riverbanks (in addition to exceedances of Portland Harbor cleanup standards), and that the riverbank remedy designed under the Amended ASAOC includes excavation and/or ISS and capping of the full extent of the areas of unacceptable human health and ecological risk identified in the upland risk assessments.

   b) DEQ disagrees with the fifth bullet, which states that the Alluvium WBZ contaminant migration pathway to the Willamette River is currently incomplete. Revise the draft Gasco OU FS to clarify that while an engineering control currently controls the contaminant migration pathway, the potential future exposure scenario remains complete.

   c) The sixth bullet states that there is no foreseeable future use of the Alluvium WBZ groundwater by occupational workers. Revise the draft Gasco OU FS to clarify that occupational use of Alluvium WBZ groundwater represents a complete potential future exposure scenario. Consistent with Interim FS Comment #102, DEQ does not approve characterizing occupational use of the Alluvium WBZ as a low-priority pathway.

9) **Section 5.1, Risk Assessment Process**. DEQ has the following comments:

   a) This section notes that DEQ's approval of the HERA and RI/HERA Addendum were conditional. Revise this section to summarize the conditions of these approvals and how and where NW Natural satisfied those conditions.

   b) The third paragraph of this section discusses DEQ's previous direction to evaluate potential ecological risks from upland groundwater that may be transported to the Willamette River. These exposure scenarios must be addressed by an upland remedy. DEQ clarifies that nothing in the Portland Harbor ROD preempts DEQ's authority to oversee and require groundwater remedies

[28] EPA. 2017. Record of Decision, Portland Harbor Superfund Site, Portland, Oregon. United States Environmental Protection Agency Region 10, Seattle Washington. January.
[29] EPA. 2020. Errata #2 for Portland Harbor Superfund Site Record of Decision ROD, Table 17. Memorandum from Sean Sheldrake to Portland Harbor Site File. January 14.
[30] EPA. 2022. Errata #3 for Portland Harbor Superfund Site Record of Decision ROD, Table 6 and Table 21. Memorandum from Hunter Young to Portland Harbor Site File. September 7.
[31] Anchor QEA, LLC. 2014. Human Health and Ecological Risk Assessment Report. NW Natural Gasco Site. Prepared for NW Natural. December 14.
[32] DEQ. 2015. Letter to: Robert Wyatt, NW Natural. Regarding: Revised Human Health and Ecological Risk Assessment Report, NW Natural "Gasco Site," Portland, OR, ECSI No. 84. May 22.

for plumes originating in the uplands. DEQ requires the Gasco OU FS to clearly reflect this comment.

10) **Section 5.2, Risk Assessment Data**. DEQ disagrees that baseline groundwater conditions are not representative of current conditions due to HC&C system operation, nor do we believe this statement is supported by empirical data. The HC&C system was not designed for the purpose of removing or destroying contaminant mass. While some contaminant mass is removed coincident to its operation, the contaminant mass is negligible relative to the mass of contamination at the Gasco OU. DEQ expects that baseline conditions are representative of current conditions, except for chlorinated volatile organic compounds (cVOCs) associated with the trichloroethene (TCE) release on the Siltronic GSA that is subject to an enhanced in-situ bioremediation (EIB) removal action. Revise the draft Gasco OU FS accordingly.

11) **Section 5.3, Human Health Risk Assessment**. Revise this section to clarify that the information presented reflects the conclusions of the HERA and RI/HERA Addendum and excludes consideration of data collected after the development of the HERA and/or RI/HERA Addendum (i.e., additional data described in Sections 4.1.3 through 4.1.5). Clarify that Section 6 of the draft Gasco OU FS discusses these additional data, and that Appendix J incorporates these additional data to identify COCs, screen data, and map data.

12) **Section 5.4, Ecological Risk Assessment**. Revise this section to clarify that the information presented reflects the conclusions of the HERA and RI/HERA Addendum and excludes consideration of data collected after the development of the HERA and/or RI/HERA Addendum (i.e., additional data described in Sections 4.1.3 through 4.1.5). Clarify that Section 6 of the draft Gasco OU FS discusses these additional data, and that Appendix J incorporates these additional data to identify COCs, screen data, and map data.

13) **Section 5.3.3, Upland Soil Risk Characterization**. DEQ clarifies that we have recently updated vapor intrusion risk-based concentrations (RBCs). Any future risk screening of vapor risks must screen data against the most current RBCs. DEQ anticipates an institutional control will memorialize this requirement. DEQ will require institutional controls in areas with significant potential future vapor intrusion risk (e.g., Former Koppers/LNG GSA) to include land use restrictions commensurate with potential risk. The Gasco OU FS should include this understanding when discussing institutional controls.

14) **Section 5.3.7, Summary of Uncertainties Associated with the Human Health Risk Assessment**. DEQ has the following comments:

    a) The second bullet describes the occupational exposure scenario for Alluvium WBZ groundwater as a ‘hand washing’ scenario. DEQ clarifies that the exposure scenario was based on dermal contact and inhalation, but not necessarily use of groundwater for hand washing. Revise the draft Gasco OU FS to clarify the nature of the exposure scenario.

    b) The second bullet states that institutional controls are expected to mitigate risks associated with the occupational exposure scenario for Alluvium WBZ groundwater. DEQ clarifies that occupational use of groundwater constitutes a beneficial use and hazardous substances that impair this beneficial use represent hot spots. Use of institutional controls is only allowed after treatment of contaminated groundwater to the extent feasible. Delete the last sentence of the second bullet.

15) **Section 5.4.8, Summary of Uncertainties Associated with the Ecological Risk Assessment**. The third bullet identifies use of baseline groundwater data as a source of uncertainty. Refer to Specific Comment #10. Delete statements that HC&C system operation creates uncertainty about the representativeness of baseline data for characterizing groundwater to surface water risk pathways.

16) **Section 6.1, Feasibility Study Dataset and Screening Approach**. DEQ has the following comments:

    a) The third paragraph concludes that higher resolution analytical methods were preferred over lower resolution methods for all data based on agreements from the Gasco Site HERA and RI/HERA Addendum. In our replies to NW Natural's RTCs on the RI/HERA Addendum, DEQ commented that NW Natural's data handling approach was not consistent with previous direction. Revise the data handling rules for the Gasco OU FS to align with previous DEQ direction, including our February 14, 2017 approval[33] of the *Upland Feasibility Study Data Gaps Investigation Work Plan*[34] and data handling rules listed in DEQ's *Risk-Based Decision Making for the Remediation of Contaminated Sites*[35] and the *Portland Harbor Superfund Site Remedial Investigation*[36,37].

    b) This section indicates that the current condition groundwater dataset includes available data through March 2023. Please confirm that the groundwater dataset includes data collected by Siltronic under the *Order Requiring Remedial Investigation and Source Control Measures*[38] (Joint Order).

17) **Section 7, Identification of Hot Spots**. The second sentence states that having large portions of the site identified as hot spots would limit the usefulness of the hot spot evaluation in informing the development of RAAs and remedial decision making. While DEQ agrees that large portions of the Gasco OU contain hot spots, we disagree that hot spots have limited usefulness for informing development of RAAs and remedial decision making. Rather, DEQ believes that widespread hot spots indicate the need for substantial removal and/or treatment of contamination and that hot spot evaluations can and should focus on defining the feasible limit of hot spot removal and/or treatment to support development of RAAs and remedial decision making.

18) **Section 7.3.1.1, Identification of Significant Adverse Effect for Beneficial Uses**. The third paragraph states that the comparison of groundwater quality to PRGs in Appendix J2 was performed to evaluate impairment of groundwater beneficial uses. However, not all the screening scenarios provided in Appendix J2 relate to beneficial use impairment. For clarification, only the occupational use of Alluvium WBZ groundwater and aquatic life scenarios correspond to beneficial uses. Further, only COCs identified as hazardous substances according to OAR 340-122-115(30) represent beneficial use impairments for these pathways.

19) **Section 7.3.1.3, Identification and Assessment of Remediation Alternatives**. DEQ has the following comments:

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[33] DEQ. 2017. Letter to Bob Wyatt (NW Natural). February 14.
[34] Anchor QEA, LLC. 2016. Upland Feasibility Study Work Plan, NW Natural Operable Unit 1. August 17.
[35] DEQ. 2017. Risk-Based Decision Making for the Remediation of Contaminated Sites. October 2.
[36] EPA. 2016. Final Remedial Investigation Report, Portland Harbor RI/FS, U.S. Environmental Protection Agency Region 10, Seattle, WA. February 8.
[37] Lower Willamette Group. 2004. Guidelines for Data Reporting, Data Averaging, and Treatment of Non-Detected Values for the Round 1 Database. June 10.
[38] DEQ. 2000. Order Requiring Remedial Investigation and Source Control Measures. DEQ No. ECVC-NWR-00-27. October 4.

a) DEQ disagrees that source control elements are fully protective of relevant beneficial use scenarios. The protectiveness of the IRAM requires removal and/or treatment of upland hot spots the extent feasible. Revise the draft Gasco OU FS accordingly.

b) DEQ disagrees that the draft Gasco OU FS demonstrates that it is infeasible to restore the Alluvium WBZ occupational groundwater use scenario within a reasonable timeframe. Revise the draft Gasco OU FS accordingly.

c) The last sentence of this section states that RAAs may be compared to determine which attains the greatest and most effective risk reduction, considering cost proportionality. DEQ clarifies that the recommended RAA must remove and/or treat hot spots to the extent feasible. Revise the draft Gasco OU FS accordingly.

20) **Section 7.4.2.1, Highly Concentrated Soil Hot Spots (Subsurface Soil – Human Health).** Delete the statement that hot spot threshold exceedance ratios were low. Any hot spot threshold exceedance indicates high COC concentrations.

21) **Section 7.4.2.2, Highly Mobile Hot Spot**s. DEQ has the following comments:

a) The draft Gasco OU FS does not provide adequate analysis to support the last sentence under the "Presence of MGP Residuals Below the Water Table" subsection heading (that the presence of MGP residuals other than DNAPL does not reliably predict groundwater impacts). Support for this conclusion would require robust analysis to individually assess the dissolved-phase groundwater contamination contribution of each MGP residual in each WBZ. Either include adequate support for this conclusion or delete this sentence from the draft Gasco OU FS.

b) The second to last sentence under the "Presence of DNAPL in Alluvium WBZs" states that DNAPL is only observed at 100 to 150 feet below the Fill WBZ in wells in the Siltronic GSA. Revise this paragraph indicate to what extent DNAPL at these depths will be treated via ISS as part of the IRAM.

22) **Section 7.4.2.3, DNAPL Hot Spots**. DEQ has the following comments:

a) Delete "residual and potentially mobile" from the second sentence of this section.

b) The second to last paragraph incorrectly states that the presence of DNAPL does not coincide with potential highly concentrated soil hot spots. The presence of DNAPL represents a highly concentrated direct contact hot spot. Delete this sentence from the draft Gasco OU FS.

c) Delete the last paragraph of this section from the draft Gasco OU FS, as it does not relate to DNAPL hot spots and DEQ disagrees with its content.

23) **Section 7.5.1, Degree of Cleanup Required**. DEQ has the following comments:

a) Revise the bullet list associated with the first paragraph to include removal and/or treatment of hot spots to the extent feasible, per ORS 465.315(1)(e).

b) The last paragraph emphasizes a paraphrase from OAR 340-120-0090; however, the paraphrase does not appear to reflect the meaning of the Rule. For clarification, 1) a higher threshold shall be applied in evaluating cost reasonable for treating hot spots of contamination, and 2) given the nature and extent of hot spots of contamination at the Gasco OU (e.g., more than 6 million gallons of DNAPL, widespread MGP residuals), treatment of all or a portion of hot spots translates directly into a substantial risk reduction. Only where removal and/or treatment of hot

spots yields a substantially higher cost for removing/treating hot spots, will DEQ consider increased cost to be disproportionate to the greater benefits associated with one or more of the other balancing factors.

24) **Section 7.5.3, Application of Hot Spot Hierarchy**. DEQ has the following comments:

a) DEQ disagrees with the statement in the first paragraph that using a hierarchy for hot spot treatment is typical for cleanup sites in Oregon. Delete this statement.

b) The first paragraph states that using DEQ's hot spot priorities is critical for the Gasco OU, "where full removal or treatment of hot spots is not technically or economically feasible." The draft Gasco OU FS does not establish the feasible limit for hot spot removal and/or treatment. Revise this sentence to state where full removal or treatment of hot spots may not be technically feasible due to their large magnitude and wide-spread distribution. (emphasis added).

c) The third bullet states that RAA development considers incrementally greater degrees of DNAPL hot spot treatment. DEQ disagrees that the draft Gasco OU FS effectively presents incrementally greater degrees of hot spot treatment.

d) Delete the last paragraph of this section. DEQ disagrees that draft Gasco OU FS evaluates hot spots of contamination in a manner consistent with discussions with DEQ or with decisions DEQ has made at other sites (which are irrelevant to the Gasco OU).

25) **Section 8.2, FAMM/Former Spent Oxide Area**. The last sentence of this section does not appear to be accurate based on the information presented in Appendix J2-8b. Revise this paragraph for clarity.

26) **Section 10.1, Remedial Action Objectives**. Revise the first bullet to also reference ORS 465.315.

27) **Section 10.2.1, Preliminary Remediation Goals**. Revise the first sentence to state that the goal of the remedial action is to address a release or threat of release of hazardous substances in a manner that assures protection of present and future public health, safety, and welfare, and the environment.

28) **Section 12.2, Estimated Volume of DNAPL**. For clarification, the 0 to 12/20 feet below ground surface (bgs) interval poses direct contact risks for construction workers and excavation workers. Revise the draft Gasco OU FS accordingly.

29) **Section 12.2.1, Lateral Extent of DNAPL**. DEQ has the following comments:

a) The last sentence under the "Power" bullet states that a power of 3 was used for the DNAPL the IDW interpolation (as opposed to a power 2 used for COC raster maps) because the output surfaces were considered by be unrealistic and a consequence of having sparse data in certain areas. Refer to General Comments #6 and #7.

b) The second to last paragraph states that residual DNAPL polygons were manually adjusted using professional judgement and the conceptual site model in areas with relatively sparce data. Where manual adjustments are made to figures showing DNAPL extent in future deliverables, revise the draft Gasco OU FS to provide representative examples and supporting rationale for the manual adjustments.

30) **Section 12.2.6, Summary of DNAPL Volume Estimates**. DEQ has the following comments:

a) The second paragraph notes the relative magnitude of residual DNAPL compared to transitional and potentially mobile DNAPL. DEQ considers the methodology too uncertain to support this

statement. Refer to General Comments #6 through #8. Revise the draft Gasco OU FS to delete this statement and to acknowledge the degree of uncertainty in establishing representative footprints for each DNAPL classification. While these footprints may be useful for comparing RAAs, DEQ does not believe the methodology supports an accurate estimate of DNAPL volumes by mobility classification.

b) This section includes three notable conclusions regarding DNAPL volumes, including that 80% of all DNAPL is present within the 12/20 foot to base of Fill WBZ and 0 to 25 feet below the base of the Fill WBZ depth intervals. DEQ agrees that each of these three notable observations are useful for establishing additional gradations in RAAs for the purpose of establishing the feasible limit for hot spot removal and/or treatment.

31) **Section 12.2.7, Recoverable DNAPL Fraction**. DEQ has the following comments:

a) Delete the third paragraph (including the bullets/subbullets). These bullets are either highly speculative based on uncertain methodology or out of place.

b) Delete the second bullet of "important considerations." DEQ does not consider ITRC recommendations about LNAPL transmissivity ranges to apply to DNAPL or to represent an acceptable endpoint for DNAPL recovery.

c) Revise the third bullet of "important considerations" to clarify that none of the existing pumping wells or trenches have been designed for the purpose of DNAPL recovery. DNAPL recovery from wells or trenches designed for that purpose may not compare to the existing Fill WBZ trenches/wells, and the HC&C system pumping and monitoring wells.

d) Delete the last bullet in this section. Groundwater pumping associated with the IRAM is not intended to remove contaminant mass. Any contaminant mass removed by IRAM pumping wells is coincidental to their operation as an engineering control.

32) **Section 13.1.1, No Action**. Delete the reference to principal indicator compounds. NW Natural elected not to develop principal indicator compounds to support the draft Gasco OU FS.

33) **Section 13.1.3, Containment and Isolation**. DEQ has the following comments:

a) The last paragraph states that physical diversion may be used to protect resources by preventing flow of contaminated groundwater beyond a barrier. Revise the draft Gasco OU FS to clarify that barriers can also be used to divert clean groundwater around contaminated areas.

b) Revise the last sentence of this section to clarify that the existing HC&C system **controls** (not prevents) migration of contaminants in the Alluvium WBZ. Delete the portion of the last sentence that states that the HC&C system removes groundwater contaminants.

34) **Section 13.1.5, Removal**. Delete the portion of the last paragraph that state the HC&C system and shallower recovery trenches remove DNAPL and contaminated groundwater. These systems were not designed for the purpose of contaminant removal, and the coincidental removal of contamination with their operation does not constitute the removal and/or treatment of these hot spots.

35) **Section 14, Development of Site-Wide Remedial Action Alternatives**. DEQ has the following comments:

a) The third bullet states that the number of RAAs must be limited to maintain an efficient evaluation process. DEQ appreciates the desire to limit the number of RAAs, with the caveat that

the number of RAAs must also provide enough gradations to establish the feasible limit of hot spot removal and/or treatment.

b) Delete "containment" from the parentheses after the word 'active' in the fifth bullet. DEQ does not consider containment an active technology, even if it includes hydraulic controls.

c) The sixth bullet states that RAAs will consider integration with existing or planned source control measures and the in-water remedy. The draft Gasco OU FS does not discuss how RAAs are integrated with these measures. Planned or existing source control measures shall not limit or constrain implementation of additional remedial actions.

36) **Section 14.1.2, Source Control IRAM Elements**. DEQ has the following comments:

a) Revise the description of the IRAM to include a future ISS barrier wall breaching scenario.

b) Delete "and implementation" from the second sentence of the second paragraph. DEQ's IRAM Decision identifies IRAM design as the next step but does not approve IRAM implementation.

37) **Section 14.1.3, Former Tar Pond Area Surface Water Exposure Area Removal**. As we stated in our final relies to NW Natural's RTCs for the Interim FS, we understand that NW Natural has committed to develop RAAs that would include a post-remedy condition that permanently removed elements that would identify the Former Tar Ponds GSA as an ecological exposure area. However, this commitment is not limited to the seasonal ponds on the Former Tar Ponds GSA. Clarify that the final remedy will remove all elements that identify the Former Tar Ponds GSA as an ecological exposure area (e.g., trees and other habitat features). Otherwise, evaluate the entire Former Tar Ponds GSA as an ecological exposure area.

38) **Section 14.1.4, Fill WBZ Source Control Upstream of IRAM Area**. Delete the first sentence of this section. DEQ has not agreed that the draft Gasco OU FS should presume a Fill WBZ source control measure consisting of an ISS barrier wall with associated hydraulic controls source controls across the full length of the Gasco OU shoreline. As we commented[39] on the *Gasco OU Segment 3 – Alluvium WBZs Source Control Evaluation*[40], the Gasco OU FS should evaluate Fill WBZ source control alternatives upstream of the IRAM area. Revise the draft Gasco OU FS to 1) delete any presumed remedial approach for the Fill WBZ upstream of the IRAM, and 2) include different RAAs for addressing the groundwater to surface water pathway for the Fill WBZ upstream of the IRAM.

39) **Section 14.1.7, Institutional Controls**. DEQ does not approve broad statements that groundwater beneficial uses will not be restored within reasonable timeframes. The nature of intuitional controls will depend on the level of hot spot removal and/or treatment and the extent of contamination left in-place.

40) **Section 14.1.8, Engineered Impermeable Cap.** DEQ does not approve incorporating an engineered impermeable cap as a common element to all RAAs. The need for a cap, and the type of cap, depends on several factors and the nature of contamination left in-place after hot spot removal and/or treatment to the extent feasible. Impermeable caps may not be implementable or desired in several portions of the Gasco OU. RAAs should evaluate different cap types and configurations unique to the needs of each RAA. Further, the Gasco OU FS must discuss stormwater collection and management

[39] DEQ. 2024. Letter to Bob Wyatt (NW Natural), Re: DEQ Comments on the Gasco OU Segment 3 – Alluvium WBZs Source Control Evaluation, Former Gasco Manufactured Gas Plant Operable Unit, Portland, Oregon, ECSI# 84 and # 183. October 4.
[40] Anchor QEA. 2024. Gasco OU Segment 3 – Alluvium WBZs Source Control Evaluation, Gasco OU, ECSI No. 84. Prepared for NW Natural. August 13.

procedures where RAAs include impermeable caps (and/or ISS) and describe measures to mitigate flooding risks.

41) **Section 14.1.9, Siltronic EIB System**. Revise this section to clarify what continued operation of the EIB system includes, and what goals the EIB system is intended to achieve as part of the final selected remedy. The EIB removal action was intended to address risks posed by cVOCs via the groundwater to surface water pathway; however, EIB may not address potential human health risk pathways.

42) **Section 14.1.11, Green Remediation and Beneficial Reuse of Materials**. NW Natural has recently requested DEQ to allow placement of excess ISS swell in the existing AST basins within the FAMM/Former Spent Oxide GSA. Revise the draft Gasco OU FS to reflect this request and state that on-site placement of ISS swell is subject to DEQ approval. The Gasco OU FS cost estimates should include the cost savings associated with on-site placement of upland ISS swell.

43) **Section 14.2, Assembly of Site-Wide RAAs**. DEQ has the following comments that apply to most of the following subsections:

    a) Clarify whether highly concentrated sediment hot spots will be removed from Doane Creek.

    b) None of the RAAs assign a remedial technology for addressing ecological direct contact risks to Doane Creek bank soils and sediments with COC concentrations above PRGs but below hot spot thresholds.

    c) The draft Gasco OU FS limits consideration of groundwater restoration via MNA to upstream of the IRAM. The Gasco OU FS must also include remedial technologies to restore groundwater beneficial uses everywhere MGP residuals are absent or can be feasibly removed and/or treated.

    d) Delete statements throughout the draft Gasco OU FS that the HC&C system removes COCs from the subsurface. The HC&C system was not designed for COC mass removal and has not meaningfully reduced COC concentrations in groundwater since its operation began.

    e) The RAA descriptions summarize how each RAA addresses RAOs. However, most of the discussions are focused on the portions of RAOs that relate to preventing exposure and/or preventing migration. RAOs have three parts: preventing exposure, preventing migration, and removing/treating hot spots. Revise the following sections to discuss how each RAA addresses all three parts of the RAOs.

    f) Many of the RAAs include extraction of relatively clean groundwater (i.e., without a beneficial use impairment or groundwater that could be treated and restored within a reasonable timeframe) from along the shoreline. Total simulated groundwater extraction rates should separate the removal rates for groundwater that would otherwise not impair a beneficial use (after removal and/or treatment of hot spots) from groundwater removal rates associated with a potential beneficial use impairment.

    g) Annual long-term O&M costs should be separated into 1) annual costs for controlling groundwater with a beneficial use impairment, and 2) annual costs for controlling groundwater without a beneficial use impairment (after removal and/or treatment of hot spots).

h) RAA costs used to compare RAAs should be based on capital cost plus the NPV of O&M costs for controlling groundwater. NPV discount rates must be consistent with DEQ's *Guidance for Conducting Feasibility Studies*[41].

44) **Section 14.2.4, RAA 4**. DEQ has the following comments:

a) RAA 4 includes an ISS containment cell to approximately 70 feet bgs. DEQ questions why the ISS containment cell is based on the Tar Ponds GSA boundary, and not the boundary of DNAPL within the Alluvium WBZs. DEQ does not consider it beneficial to clip remedial technologies strictly to boundaries of GSAs or RAUs. Revise RAA 4 to better encompass Alluvium WBZ DNAPL within the containment cell or provide rationale for why such an approach would be infeasible.

b) RAA 4 should clarify where and to what depths untreated DNAPL within the Tar Ponds GSA exists below the base of the containment cell and why the containment cell is not proposed to the full depth of DNAPL.

c) The title of the second and eighth bullets and suggest that RAA 4 will include active DNAPL recovery from the Tar Ponds and Siltronic GSAs. However, the description suggests that DNAPL removal will only occur coincident with the operation of hydraulic controls or limited to a small area (i.e., upgradient of PW-2L), which DEQ does not consider a meaningful effort to hydraulically remove DNAPL. Delete these bullets if RAA 4 does not include a complete and meaningful effort to hydraulically remove DNAPL.

d) The summary of RAO attainment states that the extraction of groundwater will reduce COC concentrations in the Fill WBZ, although DEQ did not find any evaluation in the draft Gasco OU FS to support this statement. To date, groundwater extraction at the Gasco OU has not reduced COC concentrations.

e) Clarify that RAA 4 eliminates ecological exposure areas, except for Doane Creek.

45) **Section 14.2.4.2, RAA 4 Groundwater Modeling Results**. DEQ has the following comments:

a) The second bullet includes DNAPL recovery/extraction wells and trenches. The description of RAA 4 elements does not clearly indicate whether this RAA includes DNAPL recovery outside of the Fill WBZ within the Former Koppers/LNG GSA or coincident with HC&C system groundwater extraction. Figure 14-4 shows seven Alluvium WBZ recovery wells. DEQ does not believe that seven DNAPL recovery wells installed within the Alluvium WBZ will result in any meaningful amount of DNAPL recovery. Refer to General Comment #10e.

b) The second to last subbullet references hydraulic gradients within Segment 1. However, Segment 1 is not identified on the RAA figures.

c) It is not clear to what extent upward gradients are sufficient for controlling long-term DNAPL migration.

d) The last subbullet states that RAA 4 results in an inward gradient towards the center of the Gasco OU. However, it is not clear what represents the center of the Gasco OU, and how the ISS

[41] DEQ. 2017. Guidance for Conducting Feasibility Studies. December 1.

containment wall around DNAPL in the former Tar Ponds GSA affects hydraulic gradients toward the Gasco OU center.

46) **Section 14.2.5, RAA 5**. DEQ has the following comments:

a) It is not clear why the focused deep ISS treatment below the containment cell only targets potentially mobile DNAPL and excludes transitional DNAPL. DEQ considers transitional DNAPL to be potentially mobile.

b) The second sentence of the second bullet states that "the majority" of soil contamination and hot spots are within the proposed ISS treatment zone (i.e., 25 feet bgs). RAA 5 should include ISS treatment of the full depth of hot spots in the Former Koppers/LNG Basin GSA.

c) It is not clear why human health occupational direct contact hot spots outside of the Former Tar Ponds GSA are first introduced in RAA 5. These high priority hot spots should be addressed in a lower RAA.

d) The passive gravel trench installed on the upgradient end and sides of the ISS treated areas would divert clean groundwater into DNAPL contaminated areas.

e) Clarify that RAA 5 eliminates ecological exposure areas, except for Doane Creek.

47) **Section 14.2.5.2, RAA 5 Groundwater Modeling Results**. Refer to Specific Comment #45.

48) **Section 14.2.6, RAA 6**. DEQ has the following comments:

a) DEQ disagrees that there are no accessible subsurface hot spots within the TCE Management RAU.

b) Clarify that RAA 6 eliminates ecological exposure areas, except for Doane Creek.

49) **Section 14.2.6.2, RAA 6 Groundwater Modeling Results**. Refer to Specific Comment #45.

50) **Section 14.2.7.2, RAA 7 Groundwater Modeling Results**. Refer to Specific Comment #45.

51) **Section 15, Evaluation of Site-Wide Remedial Action Alternatives**. DEQ has the following comments:

a) Revise this section to clarify that protectiveness is not a FS balancing factor. Rather, all RAAs (except the No Action alternative) must achieve protectiveness per OAR 340-122-0040.

b) Revise this section to include the full definition of protectiveness per OAR 340-122-0040.

52) **Section 15.2, Balancing Factors**. Revise the last sentence of the first paragraph to state that DEQ must select the RAA that removes and/or treats hot spots to the extent feasible.

53) **Table 4-1, Types of MGP Residuals**. DEQ does not approve the addition of the "Mobile DNAPL" column. Revise this table to only include the approved MGP residuals and descriptions consistent with DEQ's comments on Table 4-1 of the Interim FS.

54) **Table 4-3, Summary of Historical DNAPL Recovery Rates**. Add a column that lists the total volume of DNAPL recovered for each row.

55) **Table 7-1, Hot Spot Evaluation**. DEQ has the following comments:

a) Add "MGP residuals" to the hot spot thresholds column for RAO numbers 1b, 1a/2a, and 3.

b) Consistent with our comments on the Interim FS, revise the highly mobile hot spot row to state that highly mobile hot spots will be identified based on the presence of MGP residuals. Highly mobile hot spots are not limited to the presence of DNAPL.

c) This table inappropriately excludes highly mobile hot spots from DEQ's hot spot priorities. Highly mobile hot spots fit within all 5 hot spot priority categories.

d) All groundwater hot spots fit within hot spot priority level 1 and 3.

e) Hot spots may fit within hot spot priority level 5, depending on the specific nature and extent of contamination within the individual GSAs.

f) Revise the table to note that DNAPL (residual and mobile) fits within all 5 hot spot priority levels.

g) Revise the table to state that DNAPL (residual and mobile) constitute highly concentrated **and/**or highly mobile hot spots.

56) **Table 7-2, Groundwater Hot Spot Designation**. DEQ has the following comments:

a) The draft Gasco OU FS does not demonstrate that treatment will not restore any potential beneficial use within 100 years.

b) DEQ considers the presence of hazardous substances impairing the occupational use in the Alluvium WBZ to be hot spots. Revise the table accordingly.

57) **Table 7-3, Records of Decision – Hot Spots in Oregon**. Remove this table from the draft Gasco OU FS. The feasible limit for hot spot removal and/or treatment is site-specific, and DEQ does not consider remedial action selection at other sites with different characteristics, nature/extent/magnitude of contamination, and conceptual site models to be relevant or comparable to the Gasco OU. Therefore, we do not consider the information presented in the table to be applicable to hot spot determinations at the Gasco OU. DEQ notes that RAA 8 would likely leave more untreated hot spots in-place than any of the sites listed in this table.

58) **Table 12-1, Estimated Remedial Volumes – Soil**. Provide totals for each column.

59) **Table 12-2a, Estimated DNAPL Areas by GSA**. Provide totals for each GSA and each DNAPL classification category.

60) **Table 12-2b, Estimated DNAPL Areas by RAU**. Since the RAU framework has limited use and several RAUs are not approved, DEQ recommends removing this table, as it does not add value to the draft Gasco OU FS. If NW Natural elects to retain the table, provide totals for each RAU and each DNAPL classification category.

61) **Table 12-2c, Estimated DNAPL Areas by Accessibility**. Provide totals for each accessibility rating and each DNAPL classification category.

62) **Table 12-4a, Estimated DNAPL Volumes by GSA**. Provide totals for each GSA.

63) **Table 12-4b, Estimated DNAPL Volume by RAU**. Since the RAU framework has limited use and several RAUs are not approved, DEQ recommends removing this table, as it does not add value to the draft Gasco OU FS. If NW Natural elects to retain the table, provide totals for each RAU.

64) **Table 12-4c, Estimated DNAPL Volume by Accessibility**. Provide totals for each accessibility rating.

65) **Table 12-5, Estimated Recoverable DNAPL Volumes by GSA**. DEQ considers the methodology for estimating recoverable DNAPL to be highly uncertain. The uncertainty associated with the recoverable volume estimates should be acknowledged in a footnote.

66) **Table 13-1, MGP Site Remedy Review**. DEQ has the following comments:

    a) DEQ understands that this table includes information largely obtained by reviewing RODs for other sites. We understand that the final implemented remedies for many of these sites differ from the information in the table.

    b) DEQ questions whether many of the sites listed in this table have enough similarity to the nature and extent of contamination at the Gasco OU. Most of the MGP sites listed in Table 13-1 are much smaller than the Gasco OU and/or contain significantly shallower contamination.

    c) DEQ notes that many of the sites listed on Table 13-1 employed excavation as a remedial action component. However, the RAAs presented in the draft Gasco OU FS propose very little excavation.

67) **Table 13-2, Preliminary Remedial Technology Screening**. DEQ has the following comments:

    a) DEQ disagrees that excavation is impractical in the FAMM/Former Spent Oxide GSA and large portions of the Former Office GSA.

    b) This table should not limit excavation to hot spots.

    c) DEQ disagrees that large portions of the Siltronic GSA are inaccessible to excavation equipment.

68) **Tables 13-4a through 13-4i, RAU-Specific Remedial Technology Screening**. DEQ has the following comments:

    a) DEQ considers engineering and institutional controls to have low effectiveness and low long-term reliability where hot spots are present. Revise any technology screening accordingly.

    b) DEQ considers long-term hydraulic containment (i.e., more than 30 years) to have a medium effectiveness and low long-term reliability. Revise any technology screening accordingly.

    c) Given the planned scope of the in-river remedy and the IRAM, DEQ disagrees that ISS via bucket mixing methods is more implementable than ISS using auger methods. Both methods are highly implementable at the Gasco OU. Revise any technology screening accordingly.

69) **Figure 3-3 Series**. Include shading identifying wells with DNAPL entry (past or present).

70) **Figure 4-1i, Interpolated Area Containing DNAPL within 50 to 75 feet Below Base of Fill WBZ**. Revise this figure to indicate DNAPL entry in PW-06L.

71) **Figure 6-6a, Maximum Exceedance Ratios for Lower Alluvium WBZ Groundwater – Human Health (Current Conditions)**. This figure should note the significance of the hatching encompassing the entire Lower Alluvium WBZ extent.

72) **Figures 6-8a through 6-11b**. These figures indicate widespread impairment of beneficial use of groundwater. However, it is unclear which screening levels and COCs are included in the figures. For

clarification, these figures should only include 1) COCs that are hazardous substances, as defined by OAR 340-122-0115(30), and 2) PRGs that correspond to specific beneficial use scenarios. Revise the draft Gasco OU FS to map hot spots for the aquatic life beneficial use and the occupational beneficial use separately.

73) **Figures 7-1 through 7-3, Highest Exceedance Ratios for Highly Concentration Soil Hot Spots**. These figures should include MGP residuals present within the applicable depth intervals.

74) **Figures 7-4 and 7-5, Hot Spots**. DEQ has the following comments:

a) Revise the second note on these figures to state that hot spot designations are based on exceedances of hot spot PRGs and/or the presence of MGP residuals.

b) The lateral extent of hot spots should not be clipped by the LNG Basin boundary. MGP residuals beneath the LNG basin represent hot spots.

75) **Figure 9-4, Remedial Alternative Units: Gas Purifier Residuals in Surface and Subsurface Soils.** Explain why the Gas Purifier Fill RAU does not fully encompass the estimated extent of spent oxides.

76) **Appendix D, Feasibility Study Data Exports**. DEQ has the following comments:

a) Confirm that the groundwater dataset includes groundwater data collected by Siltronic under the Joint Order.

b) Provide a notes tab for each database export that defines qualifiers and summarizes the totals summing rules.

c) DEQ appreciates the development of separate databases specific to different exposure scenarios. DEQ requests a complete soil database (including data from beneath the human health exposure depths) for completeness.

77) **Appendix E, Site-Wide Groundwater Flow Model Update and Feasibility Study Simulations**. DEQ has the following comments:

a) **General**. Currently, information about the model is distributed across several documents. Revise the appendix to consolidate the description of model development, current model status, and the model's application to the Gasco OU FS into a single report.

b) **General**. Revise the appendix to include a 3D depiction of the updated model. At minimum, the appendix should be revised to include figures depicting the following information model layers corresponding to geologic layers, and cross-sections, both along the river and perpendicular, and plan views for each layer clarifying the updated grid discretization, hydraulic conductivity values and boundary conditions.

c) **General**. Revise the appendix to include an updated water balance. The water balance should include the information presented in the *Gasco Groundwater Modeling Report*[42] (2017 Model Report) plus Deep Lower Alluvium WBZ water flow away or towards the site beneath the barrier, and vertically through the lower silt unit.

d) **General**. This appendix provides simulation results for the RAAs; however, no present-conditions (calibrated model) equivalent is presented in the same systematic format. Add a

[42] Anchor QEA. 2017. Gasco Groundwater Modeling Report, NW Natural Gasco Site, Prepared for NW Natural. ECSI No. 84. February 17.

present-conditions model output in same format and completeness as is provided for the RAAs (output contours, particle flow lines, water balance, etc.).

e) **General**. Particle tracking figures show no lateral offsite migration; however, the density of particles does not allow evaluation of other metrics, such as potential bypass beneath the shoreline barrier, effects of upland remedial components in deflecting groundwater, effect of deep general head boundaries on flow. DEQ requests additional particle tracking plots like those presented in the 2017 Model Report to depict deflection around and beneath ISS and barrier walls; capture zones, influence of recharge trenches; effectiveness along Doane Creek.

f) **Section 3.1, Upgradient Boundary Conditions**. Figure E-5 shows head boundary locations representing flux from bedrock. Revise the appendix to include computed general head boundary fluxes in water balance and particle tracking to show the general head boundary influence, especially where general head boundaries are nearly directly beneath the shoreline and other deep remedial components.

g) **Section 3.6, Model Bottom Depth**. Section 3.6 notes the model bottom (top of bedrock) was deepened locally to accommodate Deep Lower Alluvium WBZ calibration targets. Clarify whether the piezometer bedrock depths appear locally anomalous, or whether they suggest larger-scale trends. Re-contour bedrock surface and model bottom if warranted.

h) **Section 4.4.2, Recharge**. The recharge rate applied to a topographic low area (136 inches [in]/year [yr]) represents a recharge rate that is many times higher than annual precipitation and would thus require a large catchment area. The high recharge area is surrounded by other relatively high recharge areas (28.5 and 36 in/yr). Since most precipitation surrounding the 136 in/yr zone would be absorbed directly by the 28.5 and 36 in/yr zones, the 136 in/yr area would have to be vastly larger. DEQ recommends potentially limiting the PEST recharge-rate search range to estimates of water availability.

i) **Section 5.2.1.1, Barrier Walls.** This section discusses the shoreline IRAM ISS barrier wall but lacks discussion of other groundwater barriers proposed in the RAAs. Revise this section to more comprehensively discuss barrier walls included in RAAs.

j) **Figure E-9, Cross Plot of Residuals – Details for Lowest Portion of Head Range**. The calibration statistical plot indicates potential spatial bias, which was previously apparent in the 2017 Model Report (Fig. 3-20). The bias may result in RAA system extraction rates being over- or underpredicted, depending on whether the head or gradient bias has more influence. Revise the appendix to clarify if or how calibration bias may influence predicted extraction rates. DEQ recommends further calibration to refine Alluvium WBZ gradients and/or inclusion of a sensitivity analysis. Calibration bias may be improved based on resolution of other comments herein related to flow contribution from bedrock general head boundaries, continuity of the lower silt unit, and correlation to an overall water balance.

k) **Figure E-17b through 22b, Cross Section of Flow Model Simulation Results for Remedial Alternatives**. DEQ has the following comments:

   i) These cross sections depict the lower silt unit as predominantly continuous, and the modeled continuity of the lower silt unit could affect predictions of the Deep Lower Alluvium WBZ's influence on shallower groundwater. Cross-sectional depictions depict upward flow through the lower silt unit, despite its low vertical permeability (3^{-7} centimeters/second) where it is

present. While Deep Lower Alluvium WBZ heads may be greater than in the overlying Lower Alluvium WBZ, predominant Deep Lower Alluvium WBZ flow is expected to be horizontal if the lower silt is modeled as an aquitard. Alternately, and more importantly, clarification is needed to compare the lower silt unit's interpreted and modeled extent and continuity. The stratigraphic interpretation shows an inferred continuity amidst some observed gaps and assumed presence between widely spaced borings (particularly below the Former Tar Ponds GSA and Siltronic GSA shorelines). Revise the appendix and these cross sections to clarify how the lower silt unit is represented in model where it is known to thin or absent. In addition, revise the appendix to include model cross-sections perpendicular to river with accompanying equivalent geologic cross sections.

ii) The model cross sections show approximately 1 foot of drawdown in the Fill WBZ along the upland side of the ISS barrier wall; however, predicted post-remedy heads in the Fill WBZ on the upland side of the ISS barrier wall remain above river levels. Clarify whether the high groundwater elevation heads along the upland side of the ISS barrier wall are due to artificial recharge buildup in the low-permeability ISS-treated soils. Clarify whether the proposed impermeable cap overlaps with the ISS barrier wall.

78) **Appendix G, Groundwater Redox Conditions and Estimated Biodegradation Rates**. DEQ has the following comments:

a) DEQ questions the purpose of this appendix and its role in supporting draft Gasco OU FS evaluations. Clarify how the information presented in this appendix are used in the draft Gasco OU FS or remove it.

b) DEQ finds the methodology presented in this appendix appears to be overly simplistic without consideration of the varying nature of contamination in each GSA and WBZ. Further, the evaluation is speculative, and the results are highly uncertain.

c) The biodegradation evaluation appears to focus solely on benzene and naphthalene. DEQ does not consider these COCs sufficiently representative of groundwater contamination at the Gasco OU to reliably estimate biodegradation for all COC chemical classes (e.g., cyanide, higher molecular weight PAHs).

79) **Appendix H, Summary of DNAPL Data Collection and Evaluations, Section 3.1.4, Comparison Between DNAPL Mobility Classification and DNAPL Saturation**. The description of DEQ's review of DNAPL mobility results is incorrect. DEQ did not interpret the transition between residual and potentially mobile DNAPL using data from the 1,000xG tests. Revise this section to correctly describe DEQ's DNAPL data assessment. As shown in Figure H-3, DEQ has not required NW Natural to interpret results showing DNAPL movement during a 1,000xG test as potentially mobile.

80) **Appendix J, General.** The draft Gasco OU FS excludes screening of groundwater COCs against source control PRGs. This approach is inconsistent with agreements reached during PRG discussions in 2023 and documented in our approval[43] of the Gasco OU PRGs. Revise the draft Gasco OU FS to include data screening and mapping relative to the approved source control PRGs.

[43] DEQ. 2023. Email to Taku Fuji (Anchor QEA), Subject: RE: Gasco OU FS PRGs – Final Ecological COC-PRG Tables for Review/Approval. November 3.

81) **Appendix J2, Feasibility Study Spreadsheet-Based Database Screening**. DEQ has the following comments:

   a) Clarify which groundwater exposure scenarios and COCs constitute groundwater hot spots. Note that COCs that are not defined has hazardous substances by OAR 340-122-0115(30) (e.g., aluminum, iron) are not hot spots, even if they apply to a beneficial use scenario.

   b) Appendix J2 excludes aquatic life PRGs developed for individual PAHs. DEQ requires screening of individual PAHs in addition to the total PAH hazard quotient (toxic unit).

   c) Revise the text of the draft Gasco OU FS to explain the calculation of total PAH hazard quotients (toxic units).

82) **Appendix J3, GIS-Based Spatial Analysis of Concentrations and Exceedance Ratios in Groundwater and Soil**. DEQ has the following comments:

   a) Revise all groundwater interpolations for ecological risk pathways to include the entire Gasco OU, and not just areas adjacent to the Willamette River shoreline or Doane Creek. Including interpolations across the Gasco OU will better identify potential source(s) of contamination contributing to ecological groundwater beneficial use impairments, and these source(s) of contamination can inform development of RAA gradations using DEQ's hot spot priorities with the objective of identifying the feasible limit of hot spot removal and/or treatment.

   b) DEQ requires interpolations for individual PAHs in addition to the total PAH hazard quotient.

   c) DEQ does not require interpolations for COCs that are not hazardous substances, as defined by OAR 340-122-0115(30).

83) **Appendix K1, Hot Spot Screening Tables.** Clarify that Appendix K only identifies soil hot spots based on soil concentrations and that the presence of MGP residuals within the relevant human health and ecological direct contact scenarios also constitute highly concentrated hot spots.

84) **Appendix K2, GIS-Based Hot Spot Maps**. Revise these figures to include MGP residuals.

85) **Appendix P, Detailed Cost Estimates**. The Gasco OU FS should include cost savings associated with on-site placement of upland ISS swell.

86) **Appendix Q, Remedial Action Alternative Sustainability Evaluation**. The RAA sustainability evaluation does not appear to include operation of the HC&C system. Where groundwater beneficial reuses are not restored, the HC&C system must operate in perpetuity. The Gasco OU FS must quantify the resources consumed to support HC&C system operation over these timeframes. DEQ notes that operation of the HC&C system at 200 gallons per minute over a 100-year period requires treatment of more than 10 billion gallons of groundwater. Ensure that the sustainability evaluation anticipates materials and waste streams associated with treatment of these quantities of groundwater.

87) **Appendix R, Groundwater Remediation Time Frame Modeling**. DEQ has the following comments:

a) **General**. Appendix R makes a simplifying assumption that if it is infeasible to restore a groundwater beneficial use anywhere at the Gasco OU, then there are no groundwater hot spots. DEQ does not approve this simplifying assumption. Identification of groundwater hot spots should consider spatial variability (e.g., individual GSAs/RAUs) and hydrogeological variability (e.g., individual WBZs). For example, groundwater restoration timeframes in the Lower Alluvium WBZ below the FAMM/Spent Oxide area will be different than the Fill WBZ in the Former Tar Ponds GSA. These timeframes may result in different hot spot determinations for these GSAs and WBZs.

General. Appendix R presents a simplistic evaluation benzene and naphthalene dissolution from DNAPL and potential attenuation of these two COCs in groundwater to assess whether restoration of groundwater beneficial uses may be restored within a reasonable timeframe. Based on the information presented in Appendix R, DEQ find that **it is feasible** to restore the aquatic life beneficial use within a reasonable timeframe where DNAPL (and potentially other MGP residuals) are absent, removed and/or treated. DEQ's conclusion about the feasibility of groundwater restoration, based on benzene and naphthalene concentrations downgradient from Modeling area 1, is further supported by empirical evidence. Modeling area 1 represents DNAPL observed in the Upper Alluvium WBZ within the FAMM/Former Spent Oxide GSA, close to the Former Tar Ponds GSA. The DNAPL observation used for the evaluation 25 to 50 feet below the base of the Fill WBZ depth interval; however, DEQ notes that the overlying depth interval (also in the Upper Alluvium WBZ; 0 to 25 feet below the base of the Fill WBZ) contains a higher DNAPL saturation. The downgradient edge of modeling area is located approximately 200 feet upgradient of the top of riverbank.

As shown in Appendix J3-15b-50, the only Upper Alluvium WBZ monitoring well with benzene concentrations above the aquatic life PRG is MW-21U. It is important to note that elevated benzene concentrations measured in MW-21U are a result of contaminant drag down from the overlying Fill WBZ immediately after the LNG basin retrofit in 2018. NW Natural has since implemented a Removal Action that includes two groundwater intercept trenches in the Fill WBZ. Since the Removal Action was implemented, benzene concentrations along the riverbank have declined in the Fill WBZ (MW-21-12) and in MW-21U. Benzene concentrations in MW-21U was below the aquatic life PRG during the last 3 groundwater monitoring events. Based on this information, benzene does not currently pose a beneficial use impairment in the Upper Alluvium WBZ downgradient of Modeling area 1.

The draft Gasco OU FS does not include isoconcentration maps for naphthalene in the Upper Alluvium WBZ in Appendix J3. However, current conditions naphthalene isoconcentration maps included in the Interim FS show that naphthalene concentrations in Upper Alluvium WBZ monitoring wells near the top of the riverbank downgradient of Modeling area 1 range between 0.24J µg/L (PZ5-20; below the PRG) to 200 µg/L (PW-15U; 16.7 times the PRG). Based on this information, naphthalene in the Upper Alluvium WBZ currently poses a beneficial use impairment in the Upper Alluvium WBZ downgradient of Modeling area 1. However, DEQ considers it feasible to reduce Upper Alluvium WBZ naphthalene concentrations along the top of the riverbank to below the aquatic life PRG within a reasonable timeframe after treatment of DNAPL within Modeling area 1.

b) **General**. Portland Harbor ROD Table 17 cleanup levels do not represent a beneficial use scenario applicable to groundwater hot spot identification. The aquatic life beneficial use scenario should be based on the presence of hazardous substances above their respective aquatic life PRG. Aquatic life PRGs for naphthalene and benzene are 12 µg/L and 130 µg/L, respectively.

c) **Section 2.1, Purpose**. This section states that a secondary purpose for predicting remediation time is to compare remediation timeframes achieved by different RAAs. DEQ request that the Gasco OU FS discuss restoration timeframes on a GSA/RAU-basis for each RAA.

d) **Section 3.1, Generic Modeling Approach**. DEQ has the following comments:

   i) The first bullet only applies to a scenario where DNAPL is left untreated. Treated DNAPL (regardless of its saturation) would result in different COC dissolution rates to groundwater.

   ii) Limiting the model period to 100 years does not serve to accomplish the secondary objective of the evaluation.

   iii) DEQ disagrees that it is infeasible to remediate the lower portion of the Fill WBZ in a reasonable timeframe. Revise the last paragraph of this section to clarify that the Fill WBZ groundwater could be feasibly restored where DNAPL is absent, removed, and/or treated.

e) **Section 3.2, Simulated Remedial Technologies**. DEQ has the following comments:

   i) DEQ did not approve specific methodology during the May 9, 2024 meeting. DEQ clarifies that during our May 9, 2024 meeting, DEQ believed that modeling the 'no action' RAA would represent a useful baseline for comparing other RAAs. The simulation of other technologies should reflect the proposed RAAs.

   ii) Containment via barrier walls does not represent an 'active' remediation approach.

   iii) Revise the last sentence to clarify that the range of simulations is intended to assess whether groundwater beneficial use(s) restoration is possible after DNAPL removal and/or treatment.

f) **Section 3.3, Selected Target Zones**. Revise the first sentence to clarify that Anchor QEA identified the target zones for generic DNAPL dissolution modeling. DEQ did not approve specific methodology during the May 9, 2024 meeting.

g) **Section 3.4, Multicomponent DNAPL Dissolution**. While DEQ understood NW Natural's intention to simulate groundwater contaminant fate and transport based on naphthalene and benzene, DEQ did not specifically approve this approach.

h) **Section 4.1, Selected Modeling Areas**. The DNAPL characteristics for the two modeling areas were limited to the 25 to 50 feet below the base of the Fill WBZ depth interval, which is located within the Upper Alluvium WBZ. DEQ notes that the DNAPL characteristics in both locations are significantly different in the 0 to 25 feet below the base of the Fill WBZ depth interval, which is also located in the Upper Alluvium WBZ. The modeled DNAPL dissolution should consider all DNAPL characteristics in the Upper Alluvium WBZ and validate the results based on actual COC concentrations in the Upper Alluvium WBZ along the riverbank.

i) **Section 4.2, Modeling Code and General Setup**. Clarify why DNAPL model domains were constrained to a 1-foot-thick layer instead of actual DNAPL thicknesses.

j) **Section 5.1, Example Figures**. DEQ has the following comments:

i) Include the hypothetical monitoring well locations on Figures R-3 through R-5.

ii) Discussion about groundwater restoration timeframes should be based on the downgradient monitoring well (monitoring well location 3). Monitoring well location 3 should be set at a downgradient distance representative of the exposure scenario (conservatively based on the top of riverbank).

iii) Replace Figure R-7 through R-9 with plots of naphthalene concentrations at the monitoring well 3 location.

k) **Section 5.2, Predicted Groundwater Cleanup Times**. DEQ has the following comments:

i) The second sentence states that the results for all three modeled scenarios indicate only a slight or no discernible decrease in groundwater concentrations over 100 years. DEQ clarifies that this conclusion only applies to the DNAPL body, and not the downgradient monitoring well location 3. Restoration of groundwater should be assessed based on monitoring well location 3.

ii) The third paragraph states that neither compound was predicted to approach the PRG for any of the simulated remedial technologies in Modeling Area 2. However, the results do not consider the appropriate evaluation location (i.e., monitoring location 3).

Please contact me at (971) 263-8822 or Wesley.Thomas@deq.oregon.gov if you have questions regarding this letter.

Sincerely,

Wesley A. Thomas
Project Manager
NWR Cleanup Section

Attachments
Attachment 1: EPA comments on Gasco OU Feasibility Study Report
Attachment 2: Five Tribe review of "Feasibility Study Report" for the Gasco upland site
Attachment 3: Yakama Nation Comments: Draft Feasibility Study Report

EC: Dan Hafley, DEQ
Heidi Nelson, DEQ
Sarah Van Glubt, DEQ
Amber Lutey, DEQ
Dave Lacey, DEQ
Mike Poulsen, DEQ
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Carissa Mason, GEI Consultants
Dave Terry, GEI Consultants
Matt O'Neil, GEI Consultants
Paul Jensen, GEI Consultants

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Patty Dost, Pearl Legal Group
Halah Voges, Anchor QEA
Ryan Barth, Anchor QEA
Matt Davis, Anchor QEA
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Rob Ede, Ede Environmental
Mike Crystal, Sevenson Environmental Services
Hunter Young, EPA
Laura Hanna, EPA
Elizabeth Bingold, Siltronic Corporation
Samantha Hopman, Siltronic Corporation
Mike Murray, MFA
Courtney Savoie, MFA
Audrey Hackett, MFA
David Rabbino, Jordan Ramis
ECSI No. 84 File
ECSI No. 183 File

REGION 10
SEATTLE, WA 98101

March 17, 2025

MEMORANDUM

SUBJECT: EPA comments on Gasco OU Feasibility Study Report
Gasco Facility, Portland, Oregon
ECSI #84
December 16, 2024

FROM: Eva DeMaria, Remedial Project Manager
Superfund and Emergency Management Division

EVA DEMARIA Digitally signed by EVA DEMARIA Date: 2025.03.17 13:01:25 -07'00'

TO: Wesley Thomas, Project Manager
Northwest Region Cleanup Program, Oregon Department of Environmental Quality

The following are the U.S. Environmental Protection Agency's (EPA's) comments on the document titled *Gasco OU Feasibility Study Report* (Report). The Report was prepared by Anchor QEA, Ede Environmental, LLC, and Sevenson Environmental Services, Inc. on behalf of NW Natural for the former Gasco Facility (site). The site is located at7900 NW St. Helens Rd. in Portland, Oregon, and is listed as Environmental Cleanup Site Information (ECSI) #84. The site is located upland of Willamette River mile 6 west, which is upland of the in-water Gasco project area within the Portland Harbor Superfund Site (PHSS). This *Feasibility Study Report* (FS Report) for the Former Gasco Manufactured Gas Plant (MGP) Operable Unit (OU) summarizes remedial investigation (RI) data that characterize environmental conditions at the Gasco OU, evaluates risk to potential receptors, updates the conceptual site model, and presents remedial action objectives (RAOs) and preliminary remediation goals (PRGs). This information informs identification and evaluation of applicable remedial technologies capable of meeting the RAOs and applies the technologies to develop eight site-wide remedial action alternatives (RAAs).

EPA understands the primary objective of the investigation was to evaluate the RAAs for protectiveness including a semi-quantitative balancing of Oregon Department of Environmental Quality (DEQ)-defined remedy selection factors (effectiveness, long-term reliability, implementability, implementation risk, and reasonableness of cost). EPA's comments are categorized as "Primary," which identify concerns that must be resolved to achieve the objective; "To Be Considered," which, if addressed or resolved, would reduce uncertainty, improve confidence in the document's conclusions, and/or best support the objectives; and "Matters of Style," which substantially or adversely affect the presentation of the technical information provided in the report.

Primary Comments

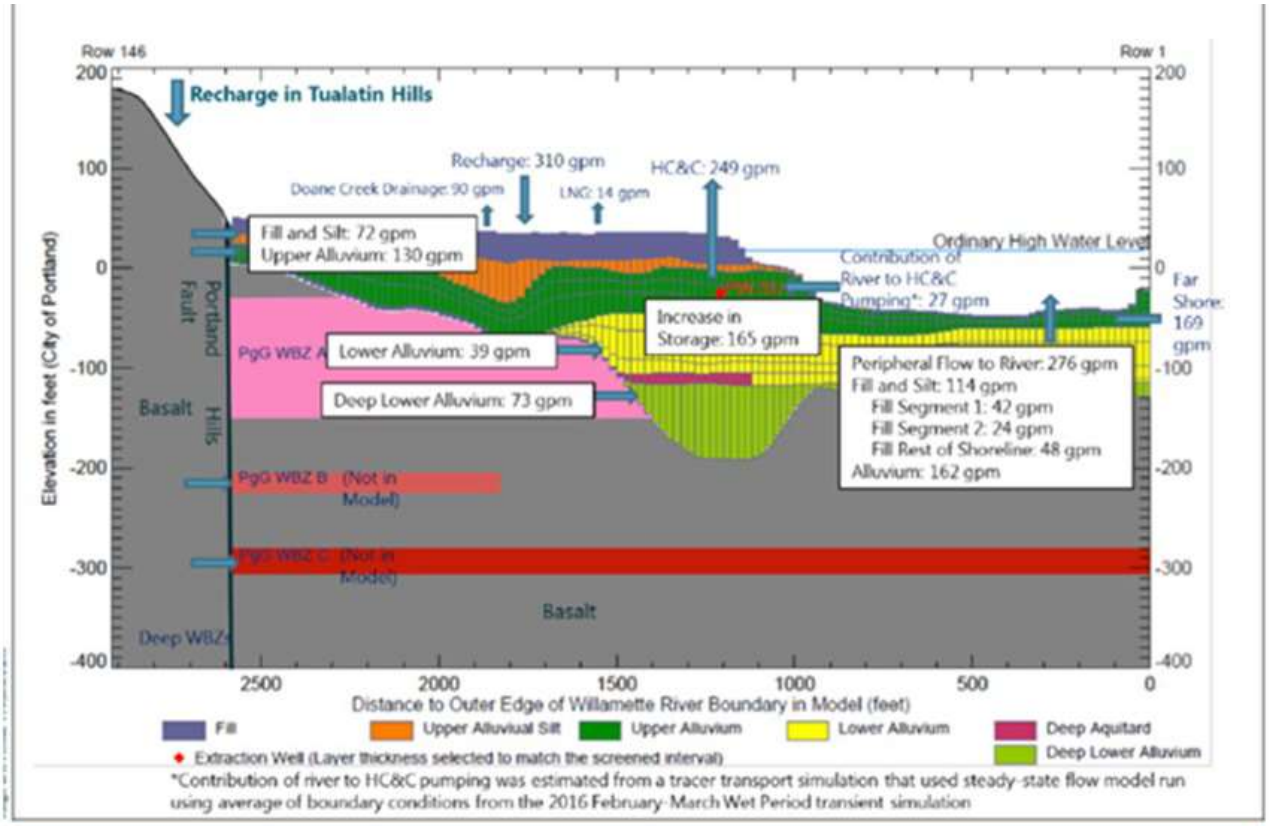
EPA did a high-level review of the Gasco OU FS Appendix E (Site-Wide Groundwater Flow Model Update and Feasibility Study Simulations) and discussed what would be most helpful to understand and verify Gasco's conclusions about calibration and their simulated barrier wall/extraction rate scenario. NW Natural should update Appendix E and include the following:

1. A table or cross section figure showing the water budget for the final calibrated model simulation. This table or cross section figure would include all elements of the inputs/outputs identified previously in the Gasco Groundwater Modeling Report calibration (**see example figure 3-26 below from an earlier NW Natural modeling report**).

2. Additional groundwater model water budget quantities added to Table E-6 to understand the full water budget input/outputs simulated under each remedial alternative. For example, adding a row to Table E-6 for precipitation recharge (which would show it be 2 gpm based on an assumed reduction of areal recharge due to added impervious surface if we've interpreted the text correctly) for alternatives 2 through 8. Without having these values either tabulated or discussed in the text, it is difficult to follow. Our interpreted reduction from 310 gpm of recharge to 2 gpm of recharge is based on one sentence on page E-17 that states "Ground-surface capping will minimize groundwater recharge (simulated as 0.5 inch per year, which is equivalent to approximately 2 gpm over the entire Gasco OU)." A row should be added for each component included in figure 3-26 below.

EPA has asked for this groundwater model budget to be provided with their simulations (in cross section, or table format) for the past 3 years. EPA is still waiting for a response to this request.

Example Water Budget in cross-section format from earlier modeling report (*Anchor QEA. February 17, 2017. Gasco Groundwater Modeling Report, NW Natural Gasco Site.)*



ANCHOR QEA

Figure 3-26
Water Budget for the 2016 February-March Wet Period Transient Simulation
Gasco Groundwater Modeling Report
NW Natural Gasco Site

IEc

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.

Anchor QEA, Ede Environmental, LLC, and Sevenson Environmental Services, Inc. 2024. Feasibility Study Report, ECSI No. 84, Gasco OU. Prepared for NW Natural. December 16.

Eng, R. 1985. Survey of Town Gas and By-Product Production and Locations in the U.S. (1880-1950). Report Number EPA/600/7-85/004. NTIS Number PB85-173813. Office of Research and Development, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina. February.

Hahn and Associates, Inc. (HAI). 2007. Remedial Investigation Report, NW Natural – Gasco Facility, 7900 NW St. Helens Road, Portland, Oregon. Hahn and Associates, Inc., Portland, Oregon. April 30.

March 3, 2025

Via Electronic Mail –wesley.thomas@deq.oregon.gov
Wesley Thomas, P.E.
Project Manager/Environmental Engineer
Oregon Department of Environmental Quality
Northwest Region Cleanup Program
700 NE Multnomah Street, Suite 600
Portland, OR 97232

RE: Yakama Nation Comments: Draft Feasibility Study Report, Former Gasco Manufactured Gas Plant Operable Unit OU); ECSI No. 84.

Dear Wesley Thomas:

Yakama Nation has reviewed the draft Feasibility Study (Draft FS) Report, Former Gasco Manufactured Gas Plant OU (Former GMGP OU). It is our understanding that this document was prepared as part of the source evaluation and source control processes and actions required for the Former GMGP OU. Yakama Nation's overarching concern about the draft FS is that adverse effects of remedy construction on physical habitat conditions and of potential future aquatic habitat on the site and on adjacent property to the south is not given appropriate consideration. We understand that the state's process for site remediation is focused on addressing chemical hazards. We do not believe that this focus needs to exclude consideration of physical habitat functionality.

Our foremost concern with the Portland Harbor cleanup in general, including Gasco's upland source control/remedy, is that not enough is being done to ensure the survival and recovery of Yakama Nation's treaty-reserved fisheries, most of which are also listed under the Endangered Species Act (ESA). We are concerned about disregard for the negative impacts of changes to the Willamette River tributaries and nearshore environment. Our concerns are for both these protected species and aquatic resources on which they depend. The health and survival of these fisheries rely on effectively planning remedial action in feasibility studies to properly include mitigation. We also object to remedial action that will preclude possibilities for restoration of aquatic habitat. At the Former GMGP OU, placement of a large impermeable cap will affect wetlands and their hydrological relationship with Doane Creek, but mitigation of these adverse effects is not discussed. Cleanup must advance recovery of threatened and endangered treaty-reserved fish and functioning critical habitat in the Lower Willamette River, as required under the Endangered Species Act and treaty fish habitat rights.

Our concern goes beyond remedial alternatives and any specific design elements to the overall quality of habitat that will be present following remediation, including riparian, nearshore and

aquatic habitat that supports salmonids and other tribally important species. Habitat restoration should be considered early and throughout all phases of remedial design to allow for overall improvement of the environment. The near silence of the Draft FS on aquatic habitat, ESA-listed and tribally important species–salmon, steelhead–diminishes the importance of these considerations. The result is that potential habitat restoration opportunities and indeed any planning at all for habitat restoration have been lost. Delaying incorporation of habitat considerations any longer at this project area (as well as site-wide at other project areas) is irresponsible. Such delays reduce potential for meaningful habitat evaluation and planning among the remedial alternatives considered.

Yakama Nation submits the following general comments which address means to correct the lack of consideration for loss of habitat or habitat functionality via remedy construction:

- **Section 7.1, Beneficial Use Determination**. The beneficial water use determination presented in Section 7.1 should be expanded. Although the list of beneficial uses is presented as if it is a final statement following an iterative process across multiple years, the beneficial uses as presented do not appear to conform to ODEQ guidance[1]. ODEQ guidance provides for specific categories of beneficial use, and these specifications are not reflected in the text of Section 7.1. Although we agree that recharge of surface waters is a beneficial use of groundwater, that beneficial use is not listed anywhere in the ODEQ guidance. Moreover, the "aquatic life" beneficial use which *is* in the guidance is not mentioned in Section 7. In general, the listed beneficial uses in Section 7.1 involving recharge of Doane Creek or the Willamette River should clearly state "aquatic habitat."

  - Appropriately naming the potential future beneficial use in this case is important because beneficial uses for site waters are a basis and focal point for remedial action objectives. Doane Creek and the surrounding wetlands on the southeast corner of the site (to be covered by an impermeable surface under Alternative 4) and on the neighboring Siltronic property constitute an aquatic habitat complex. The preferred alternative in the Draft FS will likely result in disconnection of important physical and biological processes and inputs to Doane Creek, its downstream areas, and the Lower Willamette River.

  - The Doane Creek habitat complex (Attachment 1) was identified in 2011 by the Portland Harbor Natural Resource Trustee Council's *Ecological Restoration Portfolio* as an area for potential restoration. In 2020, the lower portions of Doane Creek including associated seeps, were identified as cold water refuge by ODEQ[2]. Satellite imagery and documents developed for in water remedial design show many habitat opportunities within or near this habitat complex, particularly the downstream reaches of Doane Creek and around its confluence with the Willamette and the cove it creates (Attachment 1).

[1] ODEQ. 2017. Guidance for Conducting Beneficial Water Use Determinations at Environmental Cleanup Sites. Environmental Cleanup Program, Portland, Oregon. November. 26 pp.
[2] ODEQ. 2020. Lower Willamette River Cold-Water Refuge Narrative Criterion Interpretation Study. Oregon Department of Environmental Quality – Division of WaterQuality Standards and Assessment. March.

- Several listed and tribally important species, their federally designated critical habitat, and essential fish habitat are supported by the Willamette River: Chinook, coho, chum, and sockeye salmon; steelhead trout and bull trout, eulachon, sturgeon, and Pacific lamprey. According to USEPA (2021)[3], the Gasco project area and surroundings support one or all of the following habitat for these species: migration, rearing, foraging and/or adult habitat (Attachment 2). Forage and rearing habitat are present in the shallow water zone out from the shoreline along the Gasco project area (USEPA 2021). Mitigation and habitat enhancement in Doane Creek such as vegetation treatments and the addition of large wood are possible and should be fully considered. A restored Doane Creek would serve as salmonid migration and rearing habitat and as a cold-water refuge for salmonids. Moreover, if the ultimate remedy sacrifices the opportunity for restoration in Doane Creek without appropriate mitigation, the loss will extend to loss of necessary habitat connectivity within the Willamette River.

- **Section 15.3, Additional Factors**. Given that chemical risks to fish are often exacerbated by warmer water temperatures, Yakama Nation submits that the potential loss of habitat functionality in Doane Creek and surrounding wetlands due to any remedial alternative involving a site-wide impermeable cap should be addressed in the "Green Remediation" section of Section 15.3, Additional Factors. **Post-remediation monitoring** should include water temperatures in Doane Creek, both upstream and downstream of the remedy. Evidence that the water temperatures are higher in the portion downstream of the remedy than they are currently or than they are upstream of the road crossing would indicate a further need for habitat mitigation by the PRP.

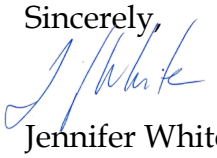
- **Section 11. Regulatory Permits, Approvals and Substantive Requirements.** Section 11.2 lists specific federal permits and general plans to obtain them. The discussion of the U.S. Army Corps of Engineers (Corps) permit requirements states that the potentially responsible party (PRP) does not consider the wetlands and ponds on the site to be wetlands. It is our understanding of the Clean Water Act Section 404 permitting process that the permit application is filed first, then the Corps makes a determination as to the stature of any wetlands potentially affected by the action. The fact that these areas are delineated as wetlands by the U.S. Fish and Wildlife Service's method should be reason enough to initiate the permit process. It is not appropriate for the PRP to declare the issue of wetlands and related mitigation requirements moot based on how the wetlands came into existence. This text should be revised to state that the PRP will apply to the Corps for a Section 404 permit in its planning for construction.

This is not a comprehensive list of ways to address habitat mitigation. Yakama Nation relies on ODEQ to identify all areas and opportunities where remediation of the Gasco Uplands OU can be shaped to more properly address the habitat needs of fish and aquatic communities.

[3] USEPA 2021. Programmatic Biological Assessment, Portland Harbor Superfund Site. 247 pp.

Please contact me with questions or for further discussion. I can be reached at (509) 830-8247 or whij@yakamafish-nsn.gov.

Sincerely,



Jennifer White
Yakama Nation Fisheries

Attachments (2)

cc:

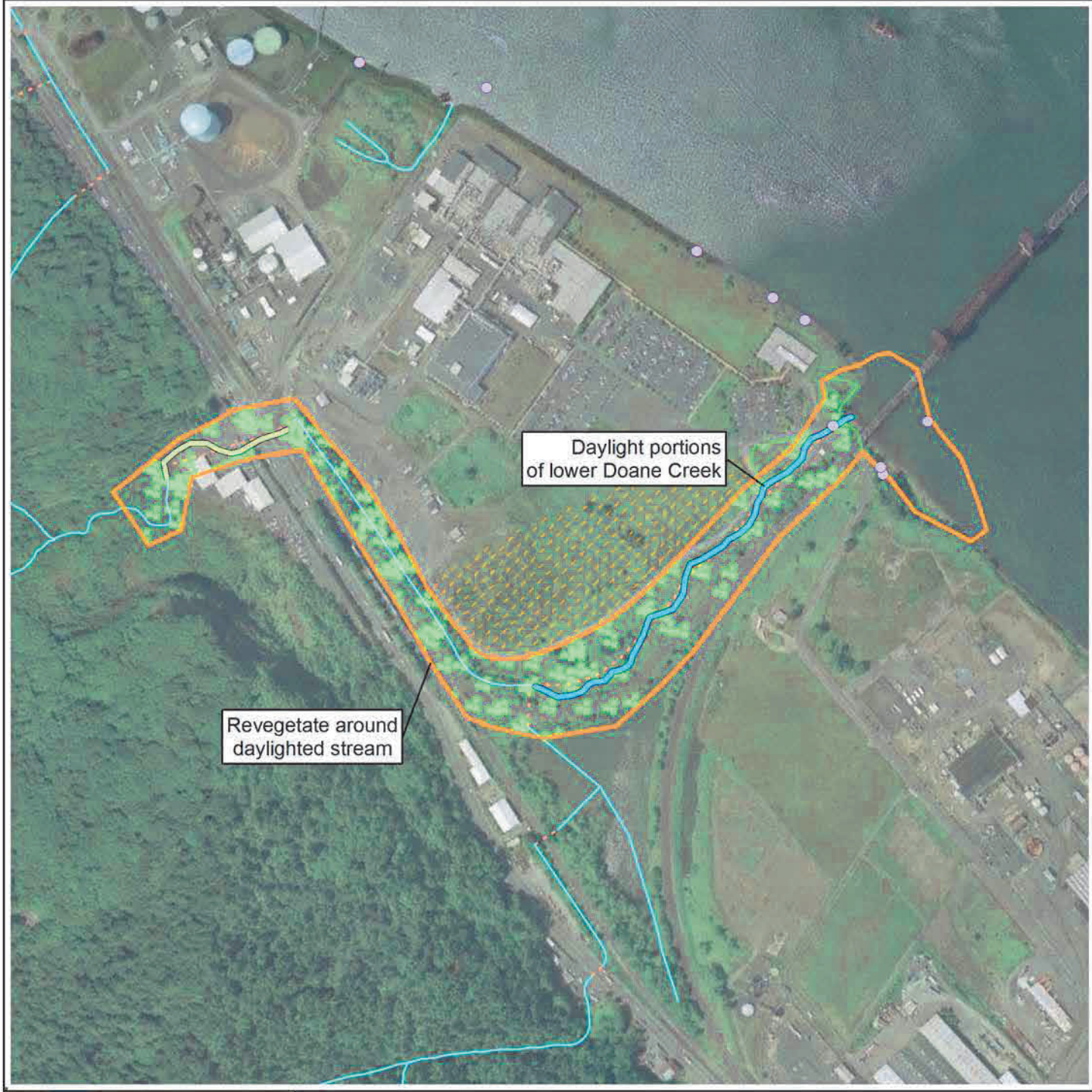
L. Shira, Yakama Nation Fisheries

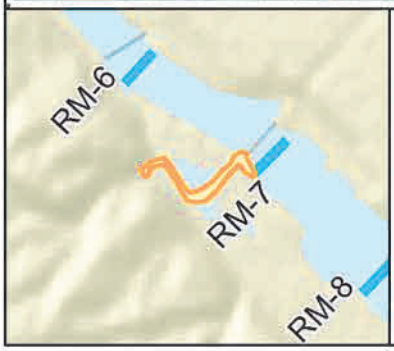
S. Duncan, Yakama Nation Fisheries

H. Young, U.S. Environmental Protection Agency

Doane Creek-Railroad Corridor

Map prepared for Portland Harbor Natural Resource Trustees





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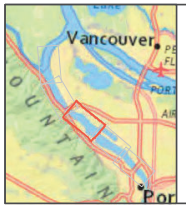
Feet

- Outfall
- Stream
- Piped Stream Segment
- Restoration Site
- Potential Revegetation Area
- Potential Channel Restoration
- Alternate Channel Routing
- Revegetation
- Riparian Shrubs and Trees
- Wetland Creation

This map represents conceptual fish and wildlife habitat restoration opportunities which have been screened against criteria developed by the Portland Harbor Natural Resource Trustees. Further analysis of this site will occur to determine the feasibility, cost, and habitat value of the restoration concepts on a finer scale. This map was prepared using a geospatial database provided by the City of Portland's Bureau of Environmental Services.



Presence of Natural Cover in Study Area

Absence of Natural Cover in Study Area

River Flow

Navigation Channel

NOTES:

1. **Free of artificial obstructions** PBF is not mapped as the entire study area contains the PBF. As with the other PBFs, the free of artificial obstructions baseline condition is described in the text of the Programmatic BA.
2. **Natural cover:** the presence of natural cover PBF is indicated by the presence of a riparian area with mature trees/shrubs with woody stems that overhang the ACM (0 to -15 CRD) and the presence of large woody debris (LWD) accumulations as determined from the photo-interpretation of 2005 aerial photographs (LWG 2012).
3. **Water quality** PBF presence/absence is not mapped. As with the other PBFs, the water quality baseline is described in the text of the Programmatic BA using water quality indicators including ecological risk exceedances and benthic toxicity areas and the DEQ 303(d) list.
4. **Water quantity** PBF is not mapped as the entire study area has impacted flow and the hydrology due to the operation of upstream dams.
5. Aerial photo: NAIP 2020.

N

0 500 1,000

Feet

Figure 4-1c. Presence of Salmonid Freshwater Migration PBFs
River Mile 6 to 8