2021 Hydraulic Control and Containment System Annual Report
DEQ Comment and Response Matrix – DEQ's Replies

ID No.	Section Name/Topic	Section/Table/ Figure No.	Page No.	DEQ Comment	NW Natural Response	DEQ's Reply
General Comments						
1.	General	--	--	Several sections of the draft 2021 Annual Report state that, based on a 2008 comment letter[1] regarding the Groundwater/DNAPL Focused Feasibility Study, DEQ considers the portion of Segment 1 downgradient of the Former Tar Pond Area as the highest priority for source control. Section 3.1.2 implies that the requirement to maintain upward vertical hydraulic gradients along Segment 1 are limited to the area downgradient from the Former Tar Pond Area based on the language in DEQ's 2008 letter. These statements misrepresent DEQ's statements in the 2008 letter. For clarification, our 2008 letter states: "Based on work completed by NW Natural and Siltronic, DEQ determined that the shoreline of the Gasco Site and the northern portion of the Siltronic Property are high priorities for source control. The portion of the shoreline identified as the highest priority for source control (Segment 1) extends from downstream of the "Tar Body Removal Area" (TBRA) on the NW Natural Property, to upstream of the ["effluent pond overflow area"] EPOA on the Siltronic Property. This segment coincides with the heaviest MGP-related impacts identified near the river, including DNAPLs, impacted riverbank soils, and contaminated groundwater. It also includes the portion of the Siltronic Property where groundwater contamination caused by Siltronic has commingled with MGP-related DNAPL and groundwater contamination resulting from the former operations of the Gasco Facility." Revise the draft 2021 Annual Report to accurately represent DEQ's source control priorities, as described in the cited 2008 letter.	Anchor QEA proposes to incorporate DEQ's comments into the 2022 HC&C Annual Report to clarify DEQ's source control priorities.	DEQ accepts NW Natural's response.
2a.	General	--	--	With respect to upward vertical gradients, our April 25, 2022 approval[2] of the revised *2020 Hydraulic Control and Containment System Annual Report* (Revised 2020 Annual Report) states that "DEQ considers the requirement to maintain upward vertical gradients between the Upper and Lower WBZs to apply to the portion of the Siltronic GSA shoreline where DNAPL is present." The goal of these upward vertical gradients is to minimize ongoing downward DNAPL migration from the Upper Alluvium WBZ to the Lower WBZ, and through the Lower Alluvium WBZ. As shown in Appendix E of the draft 2021 Annual Report, DNAPL is present over most of Segment 1, including in both the Upper and Lower Alluvium WBZs between the Gasco property boundary and PW-2L, and in the Lower WBZ between PW-2L and TG-1S. Based on these observations, the HC&C system should, at minimum, be operated to maintain upward vertical gradients for the portion of Segment 1 downgradient from the Tar Ponds GSA, and the portion of the Siltronic GSA between the Gasco property boundary to the southeast of PW-2L. DEQ observes the following: a. Since PW-2L is a pumping well, upward vertical gradients in this area should be based on groundwater elevations at WS-21-112 and MW-36U, which are the closest monitoring well pairs to the southeast of PW-2L. Downward gradients were observed at these wells for much of 2021 (Appendix B, Figure 7.13). DEQ will consider an alternative weight-of- evidence evaluation to demonstrate that upward vertical gradients are maintained at PW- 2L. If NW Natural proposes a weight-of-evidence evaluation for demonstrating upward vertical gradients are maintained at PW-2L, we recommend that the evaluation consider results from the recently completed DNAPL data gaps investigation.	It is important to note that these wells are not a clustered pair. As a result, comparing gradients may not accurately or fully represent vertical gradients in this area. Gradients are assessed by subtracting the Upper Alluvium WBZ potentiometric surface from the Lower Alluvium WBZ potentiometric surface. The line of evidence we believe is more appropriate is to evaluate a change in the operation of the PW-2U and PW-2L extraction well pair to maintain upward vertical gradients more consistently without losing reversals from the river toward the upland. On January 4, 2023, we changed the base flow rate of PW-2L from 10 gpm to 5 gpm and raised the shutoff/restart operation range by approximately 18 feet so that pumping at PW-2L will shut off at an elevation of -60 feet relative to COP and restart at -50 feet COP to effectively reduce the volume of water pumped and associated drawdown of PW-2L relative to PW-2U. We will assess the effects to vertical gradients in the following months of operation. Also see our response to Specific Comment No. 6.	DEQ accepts NW Natural's response. While WS-21-112 and MW-36U are not a clustered well pair by design, they are close together and adequately representative of the area between PW-2U/L and PW-1U/L within the Lower and Upper Alluvium WBZs, respectively, to be used as a line of evidence for assessing vertical gradients. NW Natural has routinely compared groundwater elevations at these locations as a pair (Appendix B, Figure 7.13) for this purpose in the past, and groundwater elevations from these wells should be evaluated for this purpose in future HC&C System Annual Reports. That said, DEQ recognizes that other lines of evidence, including comparison of the potentiometric surface, are also appropriate for assessing vertical gradients. We appreciate the adjustment made to pumping rates at PW-2L and PW-2U and look forward to reviewing the outcome of this adjustment.

[1] DEQ. 2008. Letter to Bob Wyatt, NW Natural. Regarding Groundwater/DNAPL Focused Feasibility Study. March 21.
[2] DEQ. 2022. Letter to Bob Wyatt, NW Natural. Regarding Revised 2020 Hydraulic Control and Containment System Annual Report, Former Gasco Manufactured Gas Plant Operable Unit, Portland, Oregon, ECSI# 84. April 25.

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2b.	General	--	--	b. Upward vertical gradients were temporarily lost at the MW-19-125 and MW-30U well cluster (Appendix B, Figure 7.3). This location is within the former Tar Ponds GSA.	Anchor QEA acknowledges this temporary loss of upward vertical gradient. However, this is only a temporary loss, and upward vertical gradients are maintained for the vast majority of the time. Corrective action is not recommended.	DEQ accepts NW Natural's response.
2c.	General	--	--	c. Differences in groundwater elevations used to assess vertical gradients were within the margin of transducer error (+/- 0.1 foot) at the MW-31L and MW-31U (Appendix B, Figure 5.17) and MW-34L and MW-34U (Appendix B, Figure 5.18). These locations are located within the Former Tar Ponds GSA.	Consistent upward vertical gradients are measured between MW-31L and MW-31U, but the magnitude of the measurements is within the margin of transducer error. With the installation of PW-11Ub in early 2022, the upward vertical gradient between MW-34L and MW-34U has increased and is well above the margin of transducer error.	DEQ accepts NW Natural's response.
2d.	General	--	--	d. The proportion of groundwater extracted from the Upper Alluvium WBZ has declined from 33% to 16% over the past six years of operation. Reduction of the proportion of extraction from the Upper Alluvium WBZ may be contributing to periodic loss of upward vertical gradient control. Revise the draft 2021 Annual Report to 1) acknowledge where and when upward vertical gradients were lost or uncertain, 2) propose corrective actions to ensure that upward vertical gradient control is improved, and 3) include a summary table that correlates which monitoring wells are used to control pumping rates at individual pumping wells.	Anchor QEA proposes to implement these changes and include the requested summary table in the 2022 HC&C Annual Report.	DEQ accepts NW Natural's response.
3.	General	--	--	Several sections of the draft 2021 Annual Report state that DEQ has determined that capture of groundwater and demonstration of gradient reversal within the Deep Lower Alluvium WBZ are not necessary elements with regard to achieving source control objectives. Consistent with our January 19, 2022 comment letter, DEQ clarifies that we "do not require the HC&C system to **fully capture** groundwater from the Deep Lower Alluvium in order to achieve groundwater source control RAOs" (**emphasis added**). As shown in Appendix D, concentrations of certain constituents in the Deep Lower Alluvium exceed Portland Harbor Superfund Site Record of Decision (ROD) Table 17 cleanup levels (CULs). For clarification, DEQ considers the Deep Lower Alluvium WBZ source control to be a lower priority compared to the Upper and Lower WBZ and that partial hydraulic capture in this zone, as achieved by the HC&C system, is adequate for achieving source control objectives. Our prioritization is based on the lower contaminant concentrations measured in Deep Lower Alluvium WBZ shoreline monitoring wells relative to the Upper and Lower Alluvium WBZs. Furthermore, DEQ understands that portion of groundwater flow from the Deep Lower Alluvium WBZ not captured by the HC&C system will interact with higher levels of contamination in sediments prior to discharge to the Willamette River, and that the in-water remedy (assumed to be dredging and capping) would treat residual contaminant flux associated with groundwater discharges from the Deep Lower Alluvium WBZ prior to discharging to the Willamette River. A Deep Lower Alluvium WBZ Source Control Evaluation, provided under separate cover, would be necessary to justify a decision that no capture of the Deep Lower Alluvium WBZ would achieve source control objectives. Revise the draft 2021 Annual Report to make the distinction between "capture" and "full capture," consistent with the language in our January 19, 2022 letter.	Anchor QEA proposes to incorporate this comment into the 2022 HC&C Annual Report to make the distinction between the terms "capture" and "full capture" to be consistent with the language in DEQ's January 19, 2022, letter. Based on receipt of this comment, a "Deep Lower Alluvium WBZ Source Control Evaluation" was prepared and submitted to DEQ for review as part of the November 10, 2022, *Source Control Addendum Report*.	DEQ accepts NW Natural's response. For additional clarification, DEQ reviewed the "Deep Lower Alluvium WBZ Source Control Evaluation" and provided verbal feedback about the evaluation to Anchor QEA, LLC and Hahn and Associates, Inc. during a meeting on February 2, 2023. We understand that NW Natural plans to revise the "Deep Lower Alluvium WBZ Source Control Evaluation" consistent with our recommendations. DEQ will review the revised "Deep Lower Alluvium WBZ Source Control Evaluation" once it is resubmitted.

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4.	General	--	--	The draft 2021 Annual Report references DNAPL Monitoring Semiannual Summary Reports (DNAPL Monitoring Reports) and includes the two 2021 DNAPL Monitoring Reports as Appendix D. DEQ reviews and comments on these DNAPL Monitoring Reports separately from the HC&C system annual reports and including these reports in an appendix is unnecessary and we recommend removing them from future reports and incorporating them via reference. Furthermore, DEQ provided comments on the 2021 DNAPL Monitoring Reports on December 27, 2021 and June 7, 2022, respectively. Please cite these comment letters in the draft 2021 Annual Report, where appropriate.	Anchor QEA proposes to implement these changes in the 2022 HC&C Annual Report.	DEQ accepts NW Natural's response.
5.	General	--	--	DEQ would like to revisit the deliverable schedule for future Annual Reports. Currently, these reports are submitted to DEQ in late August, or about 8 months after the operational period discussed in the reports. Submitting the Annual Reports so long after the close of the applicable operational period reduces the relevance of the reported information to ongoing HC&C system operations.	Anchor QEA understands DEQ's request to speed up the delivery of the HC&C Annual Reports. Receiving validated data from fourth quarter sampling caused significant delays in the submittal of the 2021 HC&C Annual Report. Anchor QEA will set a goal of annual report delivery within 6 months of the end of the reporting period subject to laboratory analysis and validation performance. Anchor QEA already submits the operational figures ahead of time for DEQ to evaluate in a more real-time setting.	DEQ accepts NW Natural's response. In addition, DEQ will work with NW Natural to find ways to achieve an even speedier delivery of the HC&C Annual Report in the future. We note that NW Natural submitted a proposed modification of the groundwater monitoring program to DEQ on February 7, 2023[3]. DEQ review of NW Natural's proposal is ongoing. Adjustments to the groundwater monitoring program will likely avoid 4th quarter sampling at groundwater monitoring wells in the Alluvium WBZs (currently only Fill WBZ wells are sampled in the 4th quarter), and further contribute to an earlier deliverable.
Specific Comments						
1.	Report Organization	Section 1.4	4	The last row of the table included in this section indicates that DNAPL Monitoring Reports are discussed in Section 6 of the report. DEQ notes that DNAPL Monitoring Reports are discussed in Section 4.	Anchor QEA proposes to implement these changes in the 2022 HC&C Annual Report.	DEQ accepts NW Natural's response.
2.	Hydraulic Containment Monitoring	Section 3	9	The last sentence of this section notes that the MODFLOW groundwater model is referenced in this report because it will be an important part of evaluating the Gasco Sediments Site Project Area sediment remedy in coordination with the U.S. Environmental Protection Agency (EPA). DEQ has not reviewed the MODFLOW groundwater model to determine its suitability for supporting the in-water project overseen by EPA, and it is unnecessary to reference the model for this purpose in the draft 2021 Annual Report. DEQ notes that the MODFLOW groundwater model will also be an important part of evaluating remedial alternatives in the Gasco OU Feasibility Study, and in the subsequent design of the Gasco OU selected remedy.	Anchor QEA proposes to implement this change (strike reference to the MODFLOW model relative to the sediment remedy) in the 2022 HC&C Annual Report.	DEQ accepts NW Natural's response.
3.	Continuous Data Collection and Appendix B: HC&C System Operational Figures	Section 3.1 and Appendix B	9	The last sentence of Section 3.1 states that wells beyond the alignment of the HC&C system are included in Appendix B to provide a complete dataset. DEQ appreciates that Appendix B represents a complete dataset. Please include a table in this and future annual reports that clarifies which wells/piezometers are included in Appendix B for informational purposes or completeness. Please also included notes on Appendix B figures to indicate plots that are included for informational purposes or completeness.	Anchor QEA proposes omitting the wells that are either outside of the HC&C radius of influence or do not serve a specific purpose from future figure set deliverables. As we discussed in a December 12, 2022, meeting, DEQ will provide a list of figures that are most important to retain. This will also help to expedite the HC&C annual reporting process (subject to laboratory analysis and validation performance).	DEQ accepts NW Natural's response. For clarification, DEQ will provide feedback about those figures that are most useful for evaluating HC&C system performance and will work with NW Natural, and their technical team, to refine the Appendix B figure set for future deliverables.

[3] Anchor QEA, LLC. 2023. Email to Wesley Thomas, DEQ. Subject: Proposed groundwater monitoring program modification. February 7.

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4a.	Continuous Data Collection and Appendix B: HC&C System Operational Figures	Section 3.1 and Appendix B	9	A number of upland wells screened in the Upper Alluvium WBZ reflect weak hydraulic control and may not be representative of HC&C system performance. These include MW-16-45 (Appendix B, Figure 4.29), MW-5-32 (Appendix B, Figure 4.43), and WS-8-59 (Appendix B, Figure 4.51). DEQ notes the following: a. MW-16-45 is partially screened in the upper silt unit and that MW-26U (located near MW-16-45) is more representative of hydraulic gradients between the river and Upper Alluvium at this location.	Anchor QEA proposes to omit plots that are not representative of system performance in an effort to streamline the figure set. As we discussed in a December 12, 2022, meeting, DEQ will provide a list of figures that are most important to retain. Anchor QEA agrees that water levels in MW-16-45 may not be reliable.	DEQ accepts NW Natural's response. Refer to DEQ's reply to NW Natural's response to Specific Comment #3.
4b.	Continuous Data Collection and Appendix B: HC&C System Operational Figures	Section 3.1 and Appendix B	9	b. MW-5-32 is partially screened in the upper silt unit and that MW-32U and MW-33U (located near MW-5-32) are more representative of hydraulic gradients between the river and Upper Alluvium at this location.	Anchor QEA agrees.	DEQ accepts NW Natural's response.
4c.	Continuous Data Collection and Appendix B: HC&C System Operational Figures	Section 3.1 and Appendix B	9	c. WS-8-59 is located on the Siltronic GSA to the southeast of the HC&C system. In general fluctuating hydraulic gradients at this location are consistent with the HC&C system design objectives. Please revise the draft 2021 Annual Report to include a description and/or table of these wells and their role/limitations for assessing inward hydraulic gradients. Please also include notes on Appendix B figures with this same information.	Anchor QEA proposes to incorporate these changes in the 2022 HC&C Annual Report rather than revise the 2021 HC&C Annual Report.	DEQ accepts NW Natural's response.
5.	Continuous Data Collection and Appendix B: HC&C System Operational Figures	Section 3.1 and Appendix B	9	Monitoring Wells MW-21U (located in Segment 2; Appendix B, Figure 4.25) and MW-36U (located in Segment 1; Appendix B, Figure 4.49) illustrate weaker hydraulic control in the Upper Alluvium WBZ with 3-day average head differences with the river greater than -0.1 ft (transducer margin of error), which indicates a potential loss of hydraulic control. Please explain the significance of these observations relative to achievement of source control objectives, and identify corrective actions to ensure that 3-day average head differences at these wells remains demonstrably below the river elevations.	The two instances identified show rare occurrences where there is a temporary loss of reversal at a specific well but do not indicate a loss of capture. Near MW-21U, the Upper Alluvium WBZ is thin, and three extraction wells (PW-15U, PW-16U, and PW-8Ub) control Upper Alluvium WBZ groundwater but are limited by available drawdown. Near MW-36U, a new extraction well (PW-1Uc) has been installed to control groundwater in this area. The corrective action associated with MW-36U has already been addressed. There is no corrective action proposed for MW-21U.	DEQ accepts NW Natural's response.
6.	Vertical Hydraulic Gradients	Section 3.1.2	11	The second paragraph notes that upward vertical gradients are not maintained southeast of the PW-2 extraction wells. The contours of water elevation difference between the Upper and Lower Alluvium WBZs using Serfes 3-day rolling averages (Appendix B, Figure series 6.1 and 6.2) show occasional downward gradients that extend to the northwest of PW-2L. Refer to General Comment 2.	The occasional downward gradients extending north of PW-2L are very short-lived. As a priority, we are evaluating a change in the operation of the PW-2U and PW-2L extraction well pair to maintain upward vertical gradients more consistently without losing reversals from the river toward the upland. Also see our response to General Comment No. 2a.	DEQ accepts NW Natural's response.
7.	Vertical Hydraulic Gradients and Appendix E: Geologic Cross Sections	Section 3.1.2 and Appendix E	11	The review of benzene and naphthalene concentrations in the Upper and Lower Alluvium WBZs may serve as one line of evidence to support this report, but does not justify losing upward vertical gradients at the PW-2 extraction wells. DEQ notes that this evaluation does not consider that data in the Lower Alluvium WBZ are reported for wells where DNAPL was identified within the well screen interval, but that is not the case for samples collected from the Upper Alluvium WBZ wells.	Anchor QEA acknowledges that chemistry data is only one line of evidence. See previous responses for discussions regarding PW-2 extraction wells.	DEQ accepts NW Natural's response.

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8.	Groundwater Quality Monitoring; Appendix D3: Concentrations of Contaminants by WBZ; and Appendix D4: Concentrations of Contaminants for Individual Wells	Section 5 and Appendices D3 and D4	14	DEQ agrees that monitoring groundwater chemistry is not part of the source control RAOs, and groundwater quality data will not be used to assess whether the source control actions are successful at achieving RAOs. That said, DEQ requests that the data plots included in Appendices D3 and D4 include lines representing Portland Harbor ROD Table 17 CULs to use as a reference for visually assessing measured concentrations.	Anchor QEA proposes to implement these changes in the 2022 HC&C Annual Report.	DEQ accepts NW Natural's response.
9.	Figure 2-4: Annual and Cumulative Containment Mass Removed from the HC&C System	Figure 2.4	--	Review the plotted total benzene mass removed for all wells for 2021. There appears to be discrepancy between the value plotted on this figure and the information in Table 2-4.	Anchor QEA proposes to implement these changes in the 2022 HC&C Annual Report.	DEQ accepts NW Natural's response.
10.	Appendix B: HC&C Operational Figures	Appendix B	--	The plots in Appendix B show a sustained declining pumping performance at some Upper Alluvium WBZ wells, notably PW-3U and PW-11U. Pumping rates improved in PW-3U after maintenance in late October after a long period of declining pumping rates. Maintenance was performed on PW-11U in January 2021, but appears to have been ineffective at improving pumping rates. Please explain the criteria for well replacement and whether replacement of these two wells is anticipated.	PW-11U has already been replaced with the installation of PW-11Ub, which was brought online in early 2022. PW-3U performance has improved with well screen maintenance and is not slated for replacement. Well replacement criteria are evaluated on a case-by-case basis. The criteria include data evaluation for declining performance, maintenance efforts completed to date, additional maintenance that has been identified during inspections, and the likelihood of success of continued operation.	DEQ accepts NW Natural's response. While the 2021 HC&C System Annual Report includes a table summary of maintenance activities, DEQ requests that future reports more directly discuss declining pump performance and specific maintenance actions taken to address the declining performance.
11.	Appendix D4: Concentrations of Contaminants for Individual Wells	Appendix D4	--	DEQ requests that trendlines be removed from these figures. These figures are used to support the conclusion that concentrations of COCs in shoreline wells is generally stable. DEQ does not think the trendlines are necessary for supporting this statement.	Anchor QEA proposes to implement these changes in the 2022 HC&C Annual Report.	DEQ accepts NW Natural's response.

Notes:
2021 HC&C Annual Report: *2021 Hydraulic Control and Containment System Annual Report* 2022 HC&C Annual Report: *2022 Hydraulic Control and Containment System Annual Report* COP: City of Portland datum
DEQ: Oregon Department of Environmental
Quality gpm: gallons per minute
HC&C: hydraulic control and
containment WBZ: water-bearing zone