



Oregon

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Sent via electronic delivery

Mr. Robert J. Wyatt
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**Re: January through June 2019 DNAPL Monitoring Summary
NW Natural “Former Gasco Manufactured Gas Plant Operable Unit”
Portland, Oregon
ECSI No. 84**

Dear Bob.

The Oregon Department of Environmental Quality (DEQ) reviewed the “DNAPL Monitoring Semiannual Summary Report (January 1 through June 30, 2019)” dated September 30, 2019 (Jan-Jun2019 DNAPL Summary). The Jan-Jun2019 DNAPL Summary compiles and evaluates DNAPL accumulation and removal measurements at certain hydraulic control and containment (HC&C) system extraction wells, observation wells, and monitoring wells during the first half of 2019. Anchor QEA, LLC (Anchor) prepared the Jan-Jun2019 DNAPL Summary on behalf of NW Natural.

DEQ’s comments are provided below. DEQ requests that these comments be incorporated into the next DNAPL summary report due by March 31, 2020. Anchor and DEQ discussed many of the comments during a conference call on January 23, 2020.

General Comments

Influence of HC&C System Operations on DNAPL

The Jan-Jun2019 Summary Report indicates the HC&C system is hydraulically capturing and depleting DNAPL along the shoreline, and/or not mobilizing DNAPL towards the river. For example, the last paragraph of Section 1 states:

“DNAPL monitoring data collected since 2013 in accordance with the DEQ-approved DNAPL monitoring program presented in the *Revised Groundwater Source Control Construction Design Report* (Anchor QEA 2012) conclusively show that the HC&C system is effectively capturing and depleting DNAPL from the shoreline upland area and creating a reverse hydraulic gradient from the River toward the system. The HC&C system is not mobilizing DNAPL toward or into the River.”

DEQ does not approve the entire paragraph and/or similar content in the Jan-Jun2019 Summary Report. Similar content includes, but is not limited to the last sentence in the 1st bullet in Section 2.3; the last sentence of the 3rd paragraph in Section 2.3; the last paragraph of Section 2.3; and the 4th, 6th, and 7th sentences in Section 5.

DEQ directs NW Natural to exclude this content, or similar content, in future submittals beginning with the Jul-Dec2019 DNAPL summary report. This comment applies to previous versions of semi-annual DNAPL summary reports containing similar content.

DEQ considers these types of assertions to be limited by NW Natural's focus on DNAPL accumulation measurements in installations. The assertions do not consider or evaluate factors relevant to DNAPL accumulation, such as the locations and depths of extraction wells, observation wells, and monitoring wells relative each other or to DNAPL occurrence along the shoreline and in the uplands. DEQ also notes that few installations have been constructed to monitor DNAPL occurrence and movement associated with operating extraction wells. DEQ is aware of three DNAPL observation well/extraction well pairs in the Upper Alluvium WBZ (i.e., DW-6U and PW-6U; DW-11U and PW-11U; DW-14U and PW-14U), and one monitoring well/extraction well pair in the Lower Alluvium WBZ (MW-PW2L and PW-2L) constructed for this purpose.

DEQ's position regarding the HC&C system design objectives and DNAPL entry/removal have been communicated to NW Natural previously, most recently in our August 15, 2019 comments to the Draft Gasco OU Interim Feasibility Study¹. The 1st bullet under our comment to "Section 2.4.2, NW Natural Hydraulic Control and Containment System, p. 19" is cut-and-pasted below.

The Draft Interim FS states that, "A groundwater and DNAPL HC&C system is currently in operation to prevent discharge of upland groundwater from the Upper and Lower Alluvium water-bearing zones (WBZs) to the Willamette River." The description of the hydraulic control and containment (HC&C) system as a "groundwater and DNAPL HC&C system" is inaccurate as the design objective of the system is to hydraulically control and contain groundwater. The system is not designed to control dense non-aqueous phase liquid (DNAPL). DEQ directs NW Natural to replace the statement with: "A groundwater HC&C system is currently in operation to control and contain discharges of upland groundwater from the Upper and Lower Alluvium water-bearing zones (WBZs) to the Willamette River. Incidental to operating the system, DNAPL accumulation in, and removal from many extraction wells and monitoring wells does occur and is currently reported semi-annually (e.g., see Appendix D)."

Beginning with the Jul-Dec2019 DNAPL summary, DEQ requests that a redline strike-out (RLSO) version of the current DNAPL summary be provided for comparison to the previous version.

Anchor QEA, LLC, 2018, "Draft Interim Feasibility Study," November 18 (final content received January 11, 2019), a document prepared on behalf of NW Natural.

Plots of Accumulation (or Entry) and Removal

The Jan-Jun2019 DNAPL Summary includes a variety of figures that plot DNAPL accumulation and removal data with time. The relationships between, and rationale for the figures are not clear. DEQ has previously indicated that the different plots make the figures difficult to understand, interpret, compare, and/or check. DEQ requests that calculation spreadsheets with the formulas retained be provided to facilitate our review of the DNAPL summaries going forward.

The January 23rd conference call included discussions of DNAPL field measurements and use in calculating accumulation and removal volumes. DEQ understands that removal volumes are based on measuring changes in DNAPL levels within 55-gallon drums following the addition of DNAPL from a specific installation during a discrete removal event. Accumulation (or entry) volumes rely on measurements of DNAPL levels within the collection sumps of extraction wells, DNAPL observation wells, and monitoring wells made at specified frequencies. The consensus from the call is that DNAPL level measurements in installations are more reliable and comparable than measurements made in a drum, and the uncertainty in estimating volume in drums increases as removal volumes decrease.

Based on this information, DEQ requests that for individual installations NW Natural plot DNAPL accumulation data with time and show removal as individual discrete events. Our specific comments provide additional details.

DEQ acknowledges that at certain locations, evaluations of DNAPL utilize removal volume measurements to prepare figures and plots, including the following:

- Extraction well PW-2L where DNAPL accumulation is rapid and removal is nearly continuous;
- Extraction well PW-1-80 due to difficulties in measuring DNAPL levels in the installation;
- Monitoring wells MW-38U and MW-PW2L for time periods where only removal information is available; and
- Monitoring wells MW-6-32 and MW-13-30 that are piped together for the purpose of removing of DNAPL from the fill (i.e., the installations are not accessible for measuring DNAPL levels).

DEQ concurs with NW Natural's reasons for using removal information from these installations in lieu of accumulation data.

DEQ requests that the Jul-Dec2019 summary: 1) document the use of removal volume information at the installations identified above; and 2) provide the calculation spreadsheets that are the basis for the data shown in plots of accumulation and removal volumes and rates with time.

Specific Comments

Section 2.1, DNAPL Occurrence. The 2nd paragraph states that:

“In this report, ‘DNAPL zone’ indicates a stratigraphic interval in which DNAPL was visually identified during well installation, and the term ‘DNAPL’ refers only to potentially fluid or residual oil, as well as semisolid tar, and does not include solid tar.”

DEQ acknowledges that the definition of DNAPL is consistent with Comment #4 from our March 12, 2018 letter regarding the 2016 DNAPL Monitoring Report Revisions Package.² That said, DEQ’s August 15, 2019 comments to Section 4.2 of the Draft Gasco OU Interim FS further clarify the site-specific definition. For purposes of describing the nature and vertical distribution of MGP residuals, particularly DNAPL (or “oil”) in the alluvium, DEQ directed NW Natural to use the term “Weathered DNAPL” to indicate the occurrence of tar-like material observed in the alluvium. The terms “tar” and/or “semisolid tar” are restricted to the fill. This comment should be incorporated into DNAPL monitoring summary reports going forward. The Draft Gasco OU Interim FS provides additional information on the topic.

Section 2.1, DNAPL Occurrence. The 1st sentence in the 4th paragraph states that:

“DNAPL was observed during well drilling and installation activities in 54 of the 74 nearshore wells that are monitored, and measurable DNAPL has entered and accumulated in 19 of the 74 wells.”

The sentence could be misunderstood to mean that 54 of the 74 nearshore extraction wells, observation wells, and monitoring wells are constructed with the screens at depth intervals where DNAPL was observed during drilling.

For clarification, DNAPL was observed during drilling of 54 of the 74 shoreline borings. The 19 installations with DNAPL accumulation consist of: 1) 14-installations with screens that include depth intervals where DNAPL was observed during drilling; and 2) 5-installations where DNAPL was not observed within the screen interval during drilling, but post-construction entry did occur.

DEQ believes that revising Table 1 by replacing the column titled “DNAPL Visible During Well Installation?” with the “DNAPL in Well Screen Zone When Constructed” column from the 2016 DNAPL Summary Report³ reflects this information. DEQ requests that NW Natural incorporate the clarification and Table 1 revised as indicated, into future documents discussing DNAPL monitoring.

Section 2.2, DNAPL Entering Wells. Information and figures regarding DNAPL removal for “MW-6-32 and MW-13-30 Combined” is not included in the Jan-Jun2019 DNAPL Summary. DEQ requests that going forward DNAPL summary reports include this information consistent with previous submittals such as the Jan-Jun2018 DNAPL Summary Report⁴.

Table 1. DEQ’s comment to Section 2.1 applies here.

Table 2. There appear to be inconsistencies or discrepancies in measurements in the table. Examples include:

² Anchor QEA, LLC, 2018, “Gasco Site, Portland, Oregon: Dense Nonaqueous Phase Liquid Monitoring Summary Report - 2016 Revisions Package,” January 2, a document prepared for NW Natural.

³ Anchor QEA, LLC, 2017, “DNAPL Monitoring Summary Report – 2016,” April 7, a report prepared for NW Natural.

⁴ Anchor QEA, LLC, 2018, “DNAPL Monitoring Semi-Annual Summary Report (January 1 through June 30, 2018),” October 1, a report prepared on behalf of NW Natural.

- DNAPL Thickness (feet). The thickness inexplicably decreases at several locations, without any associated DNAPL removal between the measurements. An example is at DW-14U between 4/1/2018 and 4/8/2018 where the DNAPL decreased by over 1-foot.
- Volume of DNAPL in Well Sump (gallons). The well sump capacity is exceeded in installations, in particular extraction well PW-2L. For example, on 5/29/2019, a volume of 11.7-gallons of DNAPL was calculated to be present in the PW-2L sump. The capacity of the 5-foot long sump is 7.3-gallons.
- Cumulative volume of DNAPL removed (gallons). The volume shown for MW-26U on 3/18/2019 does not appear to be summed correctly.

DEQ requests that the table be reviewed and revised as appropriate. DEQ further requests that a note be added to the table indicating that the 1st entry in the "Cumulative Volume of DNAPL Removed (gallons)" column represents the total amount removed through the end of the previous reporting period.

DEQ concludes that the sump capacity exceedances at extraction PW-2L warrant increasing the DNAPL measurement and removal frequencies. DEQ requests that NW Natural develop an approach to maintain DNAPL levels below the top of the sump within 2-weeks of receiving this letter.

Table 3. DEQ requests that the table be revised to present information consistent with Table 4, including identifying extraction wells, and for each time period providing cumulative totals, totals for non-pumping and pumping wells, and percent of cumulative totals for non-pumping and pumping wells.

Tables 3 and 4. Consistent with DEQ’s comments provided on other submittals, including the Draft Gasco OU Interim FS DEQ directs NW Natural to revise the note for DNAPL to, “DNAPL: dense non-aqueous phase liquid or ‘oil.’”

Table 5. NW Natural’s proposal to modify the DNAPL monitoring frequency is presented in the table. DEQ approved the proposal by e-mail dated November 7, 2019.

Figure 1. DEQ requests that the WS-15-85/140 monitoring well cluster be shown as decommissioned. Monitoring well WS-23-112 is identified as an installation with DNAPL entry that is not in the DNAPL monitoring program. DEQ understands that a “trace” amount of DNAPL has been observed one time at this location (December 2014), and requests that NW Natural confirm this information and revise the figure accordingly.

Figure 2. The figure posts the average monthly DNAPL accumulation rates for the reporting period below the well name. DEQ requests that the legend identify installations where removal information is shown in lieu of accumulation data. DEQ requests that decommissioned installations be added to Figure 2 for completeness (e.g., WS-11-125/161, WS-14-125/161).

Figure 3b. DEQ requests that monitoring well WS-47-183 be added to the figure.

Figures 4a, 4b, and 4c. DEQ’s request for spreadsheets documenting the method(s) for calculating DNAPL entry rates (or the removal rates for MW-38U, MW-PW2L, PW-1-80, and

PW-2L) applies to these figures. DEQ further requests that the figures include notes that clarify use of DNAPL removal volumes for the MW-38U, MW-PW2L, PW-1-80, and PW-2L plots.

Figure 4c. The figure plots the pumping rate and monthly DNAPL removal rate at PW-2L with time. The figure shows that NW Natural increased the pumping rate at extraction well PW-2L in July 2017 with a corresponding increase in the rate of DNAPL removal. The pumping rate and DNAPL removal rate fluctuated over a wide-range between July 2017 and the summer of 2018. Since January 2019, the monthly DNAPL removal rate ranges between 45 and 55 gallons per month in response to pumping rates between 20 and 30 gpm.

The increase in the pumping rate at PW-2L post-dates the last TarGOST® monitoring event in June 2016. Based on this information, DEQ requests that NW Natural schedule a TarGOST® monitoring event at the previous monitoring locations, including within established monitoring areas. As indicated in DEQ's October 27, 2017 comments on the 2016 DNAPL Summary Report, additional TarGOST® borings should be advanced next to monitoring well MW-27U and DNAPL observation well PW-14U.

Figures 5a and 5b. DEQ's request for spreadsheets documenting the method(s) for calculating combined monthly DNAPL entry rates, and our comment regarding use of removal volumes, apply to these figures.

Figures 6a and 6b. DEQ requests that a figure showing the cumulative removal volume at PW-2L be added to the DNAPL summaries going forward. DEQ's request for spreadsheets documenting the method(s) for calculating cumulative removal volumes applies here.

Figures 7a and 7b. DEQ requests that a figure showing the monthly average removal volume for PW-2L be added to the DNAPL summaries going forward. DEQ's request for spreadsheets documenting the method(s) for calculating monthly average entry and removal volumes applies here.

Figures 8 and 9. DEQ requests that the figure show only material removal from oil-water separators as individual discrete events.

Appendix B Figures. DEQ requests that NW Natural discontinue plotting trends in the "Average DNAPL Removal Rate (gallons/month)," and that the figures show removal as individual discrete events.

Appendix C and Appendix D Figures. DEQ requests that NW Natural revise the figures to show the cumulative volumes of DNAPL entry in gallons with time (Appendix C), and monthly DNAPL accumulation in gallons with time (Appendix D). The figures in Appendix D should depict removal as individual discrete events. Future submittals should provide spreadsheets to document the steps for calculating DNAPL accumulation volumes for purposes of plotting.

Please contact me with any questions you have regarding this letter.

Sincerely,



Dana Bayuk
Project Manager
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