

Memorandum

April 30, 2020

To: Dana Bayuk, Oregon Department of Environmental Quality
From: John Renda, Anchor QEA, LLC
cc: Bob Wyatt, NW Natural; Patty Dost, Pearl Legal Group; Rob Ede, Hahn and Associates, Inc.;
Halah Voges, Mike Gefell, Ryan Barth, Anchor QEA, LLC
ECSI No. 84

Re: Revised Fill WBZ Trench Interim Measure Field Investigation Plan

This memorandum discusses the field investigation plan to collect data needed to support the design of a Fill Water-Bearing Zone (WBZ) trench in response to increased concentrations of benzene detected downgradient of the NW Natural Gasco Site Liquefied Natural Gas (LNG) Basin following the lining of the LNG Basin in 2018. The original plan was submitted to the Oregon Department of Environmental Quality (DEQ) on March 26, 2020. DEQ provided comments in an email dated April 16, 2020 (Bayuk 2020). This revised investigation plan addresses DEQ comments.

Background

Two construction projects were completed within the Former Gasco Manufactured Gas Plant Operable Unit in 2018. NW Natural implemented one project, and its former tenant Koppers, Inc., performed another. These improvements are summarized as follows:

- In July 2018, Koppers completed demolition and decommissioning of its lease area, which included changes to stormwater management.¹
- NW Natural made modifications to the LNG Basin, including installation of an impermeable liner in the basin to eliminate seepage of groundwater into the basin and to separate groundwater from stormwater. Prior to the improvement, commingled groundwater and stormwater were pumped from a single sump located at the southeastern edge of the basin. Water was last pumped out of the unlined LNG Basin in October 2018.

These improvements are described in detail in the *LNG Basin and Koppers Basin Groundwater Evaluation Baseline Data Report* (Baseline Data Report; Anchor QEA 2019a).

DEQ requested an assessment of the potential effects of these two projects on Fill WBZ groundwater hydrology and contaminant flux to the Willamette River. Anchor QEA, LLC, submitted a proposed

¹ Decommissioning activities impacting stormwater management included the removal of catch basins and piping so that stormwater can infiltrate through the ground surface into the Fill WBZ, rather than being directed to the Former Koppers Basin. Post-demolition, the only water that accumulates within the Former Koppers Basin is precipitation that falls directly into the basin and shallow Fill WBZ groundwater (during the wet season) that seeps into the basin from underlying fill soils.

groundwater monitoring program to DEQ on March 23, 2018, which included the installation of three monitoring wells (MW-47F, MW-48F, and MW-49F) downgradient of the LNG Basin and Former Koppers Basin, installation of pressure transducers in new and existing wells, and groundwater sampling and analysis (Anchor QEA 2018). DEQ conditionally approved the program in a May 2, 2018 email (Bayuk 2018), with the addition of several DEQ-requested modifications to the scope of work. The modifications included installing an additional monitoring well (MW-46F), adjusting some of the proposed monitoring well locations, installing transducers in additional wells, and installing a staff gage and piezometer in the Former Koppers Basin. The DEQ-requested changes were added to the monitoring program, which began in 2018.

The results of the baseline monitoring conducted in the second and third quarters of 2018 prior to the completion of the site improvements were reported in the Baseline Data Report (Anchor QEA 2019a). Results of monitoring conducted in the fourth quarter of 2018 (following site improvements) were provided to DEQ in February 2019 (Anchor QEA 2019b). The LNG Basin and Former Koppers Basin Groundwater Evaluation – First Quarter 2019, Second Quarter 2019, and Third Quarter 2019 memoranda were submitted to DEQ on June 28, 2019, October 31, 2019, and February 17, 2020 respectively (Anchor QEA 2019c, 2019d, 2020).

As discussed in the third quarter 2019 memorandum, benzene concentrations in some of the Fill WBZ monitoring wells directly downgradient of the LNG Basin and along the shoreline downgradient of the LNG Basin showed increases in benzene concentrations of one or two orders of magnitude within 1 year of when comingled water was last pumped out of the unlined LNG Basin. Anchor QEA recommended a Fill WBZ interim measure to offset changes in hydraulic conditions near the basin due to the improvement, which included the removal of the pump in the sump formerly located in the southeastern edge of the basin and cessation of associated pumping of water from the sump. NW Natural proposed to install a groundwater recovery trench in the general vicinity of wells MW-47F and MW-49F to capture contaminated Fill WBZ groundwater immediately downgradient of the LNG Basin and mitigate the change in hydraulic conditions caused by the improvements. Anchor QEA recommends a recovery trench because it is an optimal method for reducing benzene mass flux toward the shoreline wells.

Anchor QEA met with DEQ on February 19, 2020, to discuss the third quarter 2019 memorandum and the proposed Fill WBZ trench. A follow-up meeting was held with DEQ on March 5, 2020, to discuss the proposed trench alignment and length. Anchor QEA presented model simulation results, including estimated capture zones using particle tracking for a single Fill WBZ trench in the PacTerm Basin with lengths of 50 feet, 100 feet, and 150 feet. DEQ requested additional model runs to include a second Fill WBZ trench near MW-49F as well as evaluation of the amount of time it takes to reach steady-state capture zone. Another meeting was held with DEQ on March 11, 2020. Anchor QEA presented additional simulation results for two Fill WBZ trenches and evaluation of time to reach steady-state capture zone. DEQ requested changes to the model result presentations, which

Anchor QEA provided to DEQ on March 16, 2020. Anchor QEA and DEQ met again on March 19, 2020 to discuss the trench alignment, scope of pre-design data collection, and schedule. Anchor QEA is in discussions with DEQ evaluating a one-trench option and a two-trench option. Both options include a primary trench (Figure 1) located in the PacTerm Basin downgradient of the LNG Basin. Modeling shows that a 100- or 150-foot trench at this location should capture sufficient groundwater to replace the groundwater extraction previously maintained by the sump prior to lining of the LNG Basin and produce a capture zone that covers the entire footprint of the LNG Basin. The two-trench option includes an additional 50-foot or an alternate 30-foot trench segment (Figure 1) that DEQ requested be evaluated at the northern corner of the LNG Basin. The alternate 30-foot alignment was added to this revised investigation plan based on continued conversations with DEQ about alignment and adjustments to the angle of the trench to be more perpendicular to groundwater flow direction within the space available. This investigation plan includes data collection along a 150-foot alignment in the PacTerm Basin and the additional 50-foot and 30-foot alignments. Based on historical operations, subsurface obstructions may be encountered such as tank or building foundations or footings. If a drilling location needs to be moved more than 10 feet due to an obstruction, DEQ will be notified during drilling.

It is important to note that these proposed trench alignments are considered an interim measure, and the upland Feasibility Study (FS) will include final remedial measures for the Fill WBZ and be integrated with the U.S. Environmental Protection Agency's selected in-water remedy for the riverbank area. The interim trench measure near the basin is intended to mitigate any contaminant transport changes that may have resulted from the LNG Basin and Koppers area improvements while NW Natural and DEQ work to complete the FS and select a final remedy.

Data Collection Needs

Anchor QEA has developed the following scope of work to support the design of the two Fill WBZ trench alignment options. In general, the work described in this revised investigation plan will follow similar procedures described in Section 2.2 of the *Upland Feasibility Study Data Gaps Investigation Work Plan* (Anchor QEA 2016) with the following exceptions:

- A rotosonic drill rig will be used instead of a direct push drill rig.
- The core sampler will have a 4-inch inside diameter.
- The sample will be vibrated into a plastic sleeve rather than using a liner.
- The sample intervals will be consistent as described further in this section.

For the proposed 150-foot alignment, five equally spaced borings (TDB-1 through TDB-5) will be advanced, and for the proposed additional 50-foot alignment, three equally spaced borings (TDB-6 through TDB-8) will be advanced with an additional boring (TDB-9) along the alternate 30-foot alignment, for a total of nine borings. The approximate locations of these borings are shown in Figure 1. Soil borings will be advanced using a rotosonic drill rig through the Fill WBZ and then into

the silt layer at the base of the fill (upper silt unit). Each boring will be advanced until the base of the silt unit is reached to identify the thickness of the silt unit at each location. A continuous core sample will be collected at each location. Core samples will be examined to develop a lithologic boring log for each boring location. Sample color, structure, texture, mineral composition, moisture content, and percent recovery will be recorded in the field in general accordance with ASTM International (ASTM) method D2488. Samples will also be examined for evidence of possible contamination, including presence of nonaqueous phase liquid (NAPL), anthropogenic material, chemical odor, and staining. Observations will be noted on boring logs.

Standard penetrometer tests (SPTs) will be completed at each boring starting at the ground surface and at 5-foot intervals. Samples from the saturated zone will be collected from each boring for the following list of analyses:

- Grain size by ASTM method D422
- Specific gravity by ASTM method D854
- Moisture content by ASTM method D2216
- Dry density by ASTM method D2937

One sample representing the finest fill material and one sample from the silt layer at the base of the fill will be analyzed for grain size. One sample from each saturated 5-foot interval representing the coarsest fill material will be analyzed for grain size, specific gravity, moisture content, and dry density. Analysis for dry density requires an undisturbed sample, so this sample will be collected by inserting a liner into the split spoon sampler used to collect the SPTs in the saturated zone. Up to one sample from each borehole will be collected for Atterberg limit analysis by ASTM method D4318 to characterize the plasticity of the fine-grained layers, if encountered. Additional samples will be collected from the upper silt unit for vertical permeability testing following the American Petroleum Institute Recommended Practices for Core Analysis (API 1998). The vertical permeability samples will be collected by inserting a liner into the split spoon sampler used to collect the SPTs in the upper silt unit. The liner will be removed from the split spoon sampler, capped, marked with top and bottom, and stored and shipped upright. Up to five samples from the upper silt unit will be submitted for vertical permeability testing. The remaining samples will be placed in laboratory-supplied sample jars and submitted for laboratory analysis.

Boreholes will be decommissioned either with high solids bentonite grout or, if dense nonaqueous phase liquid (DNAPL) is observed in the borehole, an organoclay/bentonite slurry consisting of approximately nine parts sodium bentonite and one part organoclay by volume that will be placed by a tremie pipe.

Samples will be submitted to Core Laboratories for laboratory analysis under chain-of-custody procedures.

DEQ provided conditional approval of this investigation plan in an email dated April 16, 2020 (Bayuk 2020). This work is scheduled to start on May 4, 2020, and is expected to be completed in 2 to 3 days.

References

Anchor QEA, (Anchor QEA, LLC), 2016. *Upland Feasibility Study Data Gaps Investigation Work Plan*. NW Natural Gasco Site. Prepared for NW Natural. May 13, 2016.

Anchor QEA, 2018. Letter to: Dana Bayuk, Oregon Department of Environmental Quality. Regarding: Groundwater Monitoring Program to Assess Effects of Upcoming Activities at the NW Natural LNG Tank Basin and Koppers Facility. March 23, 2018.

Anchor QEA, 2019a. *LNG Basin and Koppers Basin Groundwater Evaluation Baseline Data Report*. NW Natural Gasco Site. Prepared for NW Natural. February 8, 2019.

Anchor QEA, 2019b. Regarding: LNG Basin and Koppers Basin Groundwater Evaluation Data Tables and Figures. Email to: Dana Bayuk, Oregon Department of Environmental Quality, from Jen Mott, Anchor QEA, LLC. February 28, 2019.

Anchor QEA, 2019c. Memorandum to: Dana Bayuk, Oregon Department of Environmental Quality. Regarding: LNG Basin and Former Koppers Basin Groundwater Evaluation – First Quarter 2019. June 28, 2019.

Anchor QEA, 2019d. Memorandum to: Dana Bayuk, Oregon Department of Environmental Quality. Regarding: LNG Basin and Former Koppers Basin Groundwater Evaluation – Second Quarter 2019. October 31, 2019.

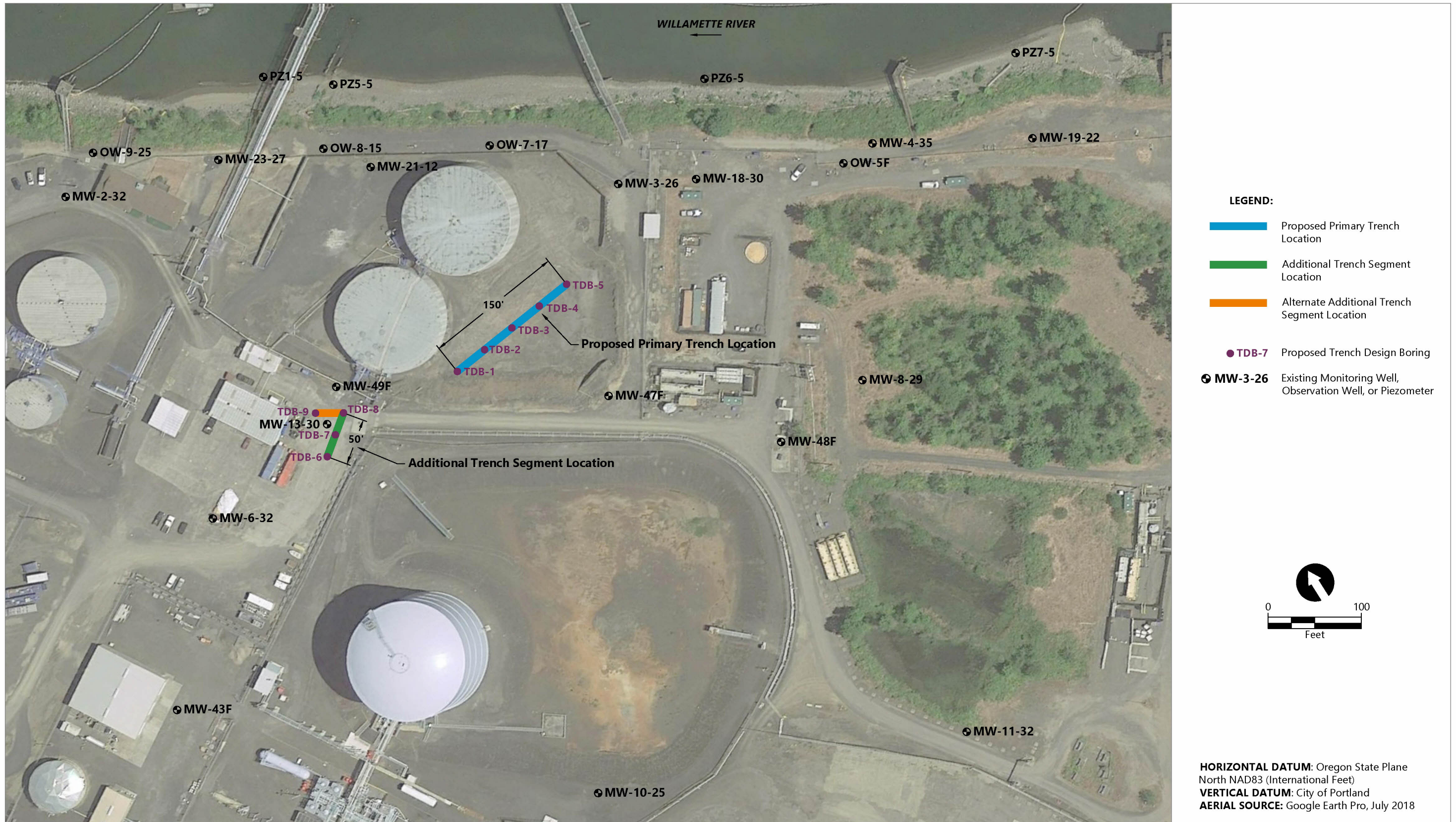
Anchor QEA, 2020. Memorandum to: Dana Bayuk, Oregon Department of Environmental Quality. Regarding: LNG Basin and Former Koppers Basin Groundwater Evaluation – Third Quarter 2019. February 17, 2020.

API (American Petroleum Institute), 1998. *Recommended Practices for Core Analysis*. Recommended Practice 40, Second Edition. February 1998.

Bayuk, D., 2018. Regarding: NW Natural, LNG Basin and Koppers Tank Farm Groundwater Monitoring. Email to: John Renda (Anchor QEA, LLC). May 2, 2018.

Bayuk, D., 2020. Regarding: NW Natural, DEQ Comments on Trench Investigation Plan. Email to: Halah Voges (Anchor QEA, LLC). April 16, 2020.

Figure



Publish Date: 2020/04/28 7:46 AM | User: hmerrick
 Filepath: K:\Projects\0029-NW Natural Gas Co\Gasco Site Remedy\LNG Basin Retrofit_Koppers GW Eval\0029-RP-003 (Prop Trench and Borings).dwg Figure 1



Figure 1
Proposed Trench Alignments and Boring Locations
 Revised Fill WBZ Trench Interim Measure Field Investigation Plan
 NW Natural Gasco Site