Oregon
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April 20, 2020 *Sent via electronic delivery*

Bob Wyatt
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Re: Liquified Natural Gas Tank Basin, Fill Water-Bearing Zone Removal Action
NW Natural "Gasco Site"
Portland, Oregon
ECSI# 84

Dear Bob:

This letter notifies NW Natural of the Oregon Department of Environmental Quality (DEQ) decision regarding implementation of the Liquified Natural Gas Tank Basin (LNG Basin) Fill Water-Bearing Zone (WBZ) Removal Action (LNG Basin Removal Action).

In the summer and fall of 2018, modifications to the LNG Basin by NW Natural and demolition of the Koppers facilities by Koppers resulted in changes to vicinity groundwater conditions in the Fill WBZ, including increasing contaminant flux towards the Willamette River. The primary purpose of this letter is to inform NW Natural that, as a result of the LNG Basin modifications and Koppers facility demolition, a removal action is warranted to control groundwater in the Fill WBZ downgradient of the LNG Basin and migration of manufactured gas plant (MGP) contamination towards the river.

The LNG Basin Removal Action will consist of the following elements constructed in the Fill WBZ:

- Groundwater interceptor trench system, built in segments located near the LNG Basin and between the basin and the river; and
- Network of groundwater installations (i.e., piezometers and monitoring wells) to monitor the performance and effectiveness of the interceptor trench system.

This letter provides background information on current and former Gasco Site operations; describes modifications to the LNG Basin and demolition of the Koppers facilities with an emphasis on hydrologic changes; summarizes the results of the ongoing groundwater evaluations NW Natural is conducting; and discusses DEQ's decision regarding the LNG Basin Removal Action, including the rationale and removal action objectives (RAOs).

Background

The property owned by NW Natural (i.e., the "Gasco Site") is currently being utilized by NW Natural for an LNG operation and Pacific Terminals (PacTerm) as a marine fuel storage and distribution terminal. Until the summer of 2018 Koppers operated a facility involved in coal tar

pitch and creosoting activities. The LNG Basin and the two PacTerm marine fuel storage tank basins (north basin and south basin) are containment basins for the NW Natural LNG tank and the PacTerm marine fuel storage tanks. The former Koppers operations utilized above-ground tanks remaining from the former Gasco manufactured gas plant (MGP).[1] The tanks were located in the former MGP tank farm basin (referred to as Koppers Basin in this letter). Koppers used the tanks for operational purposes and for storing mixtures of stormwater and shallow groundwater prior to discharge. The LNG Basin and Koppers Basin are located in the central and southwestern corner of the Gasco Site, respectively. The PacTerm Basins occupy upland areas nearer the river in the northeastern and east-central portions of the site.

Historically, seasonal accumulations of precipitation, stormwater, and/or groundwater required pumping by Koppers to dewater the Koppers Basin, and by NW Natural to control water levels in the LNG Basin. Koppers batch discharged water from the tanks in the Koppers Basin to Doane Creek between 1966 and 2007. Subsequently, discharges from the tanks in the Koppers Basin went to the City of Portland publicly-owned treatment works (POTW) under an industrial wastewater discharge permit until the summer of 2018.

The LNG Basin as originally constructed was unlined, with the bottom below the water table. Ponding of water in the basin occurred seasonally when groundwater levels in the Fill WBZ rose above the bottom of the basin. Precipitation commingled with groundwater seepage and contributed to the ponding. Prior to 2007, NW Natural pumped water out of the LNG basin and through carbon prior to discharge to the Willamette River under permit. Between 2007 and early 2014, subsequent to carbon treatment the water from the LNG Basin was discharged to the POTW under an industrial wastewater discharge permit. In September 2013, NW Natural began operating the on-site Alluvium WBZ hydraulic control and containment system (HC&C system), including the system's water treatment plant. The HC&C system prevents contaminant migration to the river via transport in the Upper Alluvium WBZ and Lower Alluvium WBZ. Beginning in early 2014, NW Natural meters water from the LNG Basin into the treatment plant for discharge to the Willamette River under the plant's NPDES permit (Permit No. 103061).

Pumping from the LNG Basin and the Koppers Basin occurred for years and influenced the configuration of the water table and direction of groundwater movement in the Fill WBZ. The basins represented established hydrologic features at the Gasco Site. The LNG Basin was the dominant on-site feature influencing shallow groundwater elevations, and groundwater in the vicinity of the basin exhibits some of the highest chemical concentrations in the Fill WBZ on the Gasco Site. Interpretations presented in site submittals regarding hydraulic gradients, groundwater flux, nature and extent of contamination, and contaminant transport in the Fill WBZ reflect the influence of the LNG Basin.

LNG Basin and Koppers Basin Modifications

In the summer of 2018, Koppers demolished their facilities and vacated the Gasco Site. During demolition Koppers disconnected stormwater pipes into, and dismantled tanks within the

[1] Between 1912 and 1956 Portland Gas and Coke Company, the predecessor to NW Natural; operated an MGP (the "Gasco Facility") on what is now the Gasco Site and the approximate northern half of the adjoining property currently owned by the Siltronic Corporation. The Gasco Site and northern Siltronic Site comprise the Former Gasco MGP Operable Unit (Gasco OU). NW Natural's remedial investigation and feasibility study of the Gasco OU is ongoing.

Koppers Basin. Koppers also removed paving and foundation pads and completed area-wide filling and regrading to promote infiltration of precipitation and stormwater. In June-July 2018, Koppers ceased basin dewatering and discharge to the POTW. Since the winter of 2018, standing water is present within most of the basin.

Seasonal ponding of water in the LNG Basin was an ongoing issue requiring pumping and treatment by NW Natural. During the winter of 2016 and 2017, high groundwater levels in the LNG Basin prompted NW Natural to initiate planning and design of a project to control ponding in the basin and maintain long-term compliance with National Fire Protection Association standards. In October 2018, NW Natural completed substantial modifications to the basin involving the installation of an impermeable liner system that hydraulically isolates the basin from the Fill WBZ. Currently, the only source of water into the basin is precipitation.

Fill WBZ Evaluations

Because the LNG Basin and Koppers Basin were long-term influences on groundwater flow and contaminant migration in the Fill WBZ, DEQ requested NW Natural to monitor changes to groundwater conditions following cessation of Koppers Basin pumping; and prior to, during, and following the LNG Basin lining project. NW Natural implemented a program to monitor groundwater elevations (and surface water in the Koppers Basin) and collect groundwater samples for analysis at monitoring wells in the vicinity of the basins. To support data collection, NW Natural installed a piezometer and surface water gaging station within, and an additional monitoring well adjacent to, the Koppers Basin. Three Fill WBZ monitoring wells were installed immediately downgradient of the LNG Basin. In addition, NW Natural placed pressure transducers in new and existing monitoring wells in the vicinity of the basins. Water levels were initially measured on a monthly basis from July 2018 through April 2019, then weekly from May 2019 to the present. Groundwater sampling in the vicinity of the LNG Basin and the Koppers Basin is being conducted quarterly. NW Natural is conducting this work consistent with DEQ-approved work plans.

The results of the groundwater monitoring work are provided in the following documents:

- "LNG Basin and Koppers Basin Groundwater Evaluation Baseline Data Report" dated February 8, 2019 and supplemented February 28, 2019 (covers the 2nd quarter through the 4th quarter 2018);
- "LNG Basin and Koppers Basin Groundwater Evaluation – First Quarter 2019," a technical memorandum dated June 28, 2019;
- "LNG Basin and Koppers Basin Groundwater Evaluation – Second Quarter 2019," a technical memorandum dated October 31, 2019
- "LNG Basin and Koppers Basin Groundwater Evaluation – Third Quarter 2019," a technical memorandum dated February 17, 2020 (Q3 2019 Memorandum).

Anchor QEA, LLC prepared all of the submittals listed above on behalf of NW Natural.

The groundwater monitoring data presented in the Q3 2019 Memorandum document that higher concentrations of groundwater contamination are migrating downgradient from the LNG Basin. Concentrations of many MGP constituents are increasing, notably benzene at monitoring well MW-49F, which is located approximately 50-feet from upper rim of the LNG Basin towards the river. Previously, the maximum benzene detection at this monitoring well was 1,770

micrograms per liter (ug/L) in December 2018. In June 2019, benzene concentrations increased at MW-49F to 79,300 ug/L. Resampling confirmed the increase in benzene concentrations, and from June 2019 through September 2019 the average concentration of benzene in three samples and two duplicates was approximately 70,500 ug/L.

The memorandum also indicates that the concentration of benzene is increasing in a group of monitoring wells near the shoreline, including MW-21-12 (increasing from 28.9 ug/L in September 2018 to 2,220 ug/L in September 2019), OW-7-17 (2.98 ug/L in September 2018 to 545 ug/L in September 2019), and OW-8-15 (0.2 ug/L in October 2016 to 3,170 in September 2019).

Groundwater data trends correlate to gradient changes in the Fill WBZ since cessation of pumping from the Koppers Basin and construction of LNG Basin liner system. The direction of the gradient in the Fill WBZ prior to basin changes was generally north-northeast, with water table contours converging at the LNG Basin during periods of seasonal high water levels and groundwater seepage into the basin. Subsequent to lining the basin, the Fill WBZ gradient has rotated approximately 15-degrees to the north and is now more north-directed. The monitoring wells exhibiting increasing concentrations of benzene (i.e., MW-49F, MW-21-12, OW-7-17, and OW-8-15) are located north and downgradient of the LNG Basin.

DEQ concludes from the Q3 2019 Memorandum that contaminated groundwater is migrating from under the LNG Basin north and downgradient towards the river, and that migration is ongoing and uncontrolled.

Fill WBZ Source Control Status

DEQ previously identified the Fill WBZ as a high priority contaminant transport pathway to the Willamette River warranting source control measures (SCM) implementation. NW Natural completed a SCM alternatives evaluation for the Fill WBZ in April 2015[2] (Fill WBZ SCMs Evaluation). The Fill WBZ SCMs Evaluation identifies trenches and horizontal wells as suitable source control technologies, and assesses six configurations of the technologies for controlling shallow groundwater migration along approximately 2,000-feet of riverbank adjoining the Willamette River. Given the scale of the project and the likelihood that construction of the in-water remedy would destroy an existing SCM constructed near the top of the riverbank, the Former Gasco MGP Operable Unit Feasibility Study (Gasco OU FS) incorporates the Fill WBZ SCMs Evaluation into uplands remedy planning to facilitate integration of the uplands and in-water remedy designs. Currently, the in-water remedy is in the pre-design stage, and the schedule for implementation has not been established.

LNG Basin Removal Action

Since submittal of the Q3 2019 Memorandum, NW Natural and DEQ have engaged in a series of planning meetings to identify a path forward for addressing the increase in Fill WBZ contaminant flux towards the river from the LNG Basin. NW Natural and DEQ considered two options for controlling groundwater migrating from under LNG Basin:

[2] Anchor QEA, LLC, 2015, "Fill WBZ Trench Design Evaluation Report – Gasco/Siltronic," April 8, a report prepared for NW Natural.

- Early implementation of a portion of the Fill WBZ remedy along the top of the bank; and
- A groundwater removal action located near the LNG Basin.

Based on the discussions and with DEQ's concurrence, NW Natural is focusing removal action evaluations on an approach that places trenches near and downgradient of the LNG Basin (i.e., separate from, and upgradient of the top-of-bank) for the following reasons:

- Integrating the uplands and in-water final remedies along the shared boundary of the Gasco OU and Gasco SMA (i.e., the top of the riverbank) remains a priority for project planning;
- An SCM located along the top of the riverbank could result in contaminant concentrations at the river increasing to levels similar to the LNG Basin vicinity; and
- Time for design and construction of a removal action is reduced as some permits (e.g., City of Portland Greenway review) are not required and there are fewer facility interferences near the LNG Basin.

Given the data in the Q3 2019 Memorandum, DEQ concludes the RAOs for the LNG Basin Removal Action should prevent or minimize:

- Future releases of MGP contamination in the Fill WBZ by intercepting and controlling groundwater migrating from under the LNG Basin; and
- Mobilization and migration of existing groundwater contamination in the Fill WBZ in the vicinity of the LNG Basin to the river.

The RAOs recognize that groundwater contamination in the Fill WBZ is migrating downgradient of the LNG Basin, and that prior to construction of the interceptor trench system there will be a period of time during which groundwater concentrations at the shoreline may continue to increase.

DEQ reviewed the removal action evaluations in the context of the RAOs. The removal action evaluations include using the site groundwater model to simulate trenches near the LNG Basin under two conceptual layouts: 1) a single trench ranging in length between 50 to 150-feet located in the bottom of the southern of the two PacTerm Basins; and 2) a trench in the southern PacTerm Basin in combination with a second separate trench segment located near the PacTerm maintenance shop/warehouse (i.e., across an access road and just west of the trench in the southern PacTerm Basin).

Based on the simulations, DEQ is selecting a removal action that consists of the following elements:

- Two trenches that functionally operate as a single trench (i.e., have overlapping zones of hydraulic influence), aligned approximately perpendicular to the shallow groundwater gradient, including: 1) a trench between 100 and 150-feet long within the bottom of the southern PacTerm Basin; and 2) a second trench of a to-be-determined length located between the PacTerm maintenance shop/warehouse and the southern PacTerm Basin; and
- A network of groundwater installations (i.e., piezometers and monitoring wells) to monitor the performance and effectiveness of the interceptor trench system.

DEQ considers all of the elements outlined above to be necessary to address current contaminant conditions associated with changes to on-site basin features. Implementation of the removal

action is an uplands priority to reduce to the extent practicable, the time that MGP contamination in the Fill WBZ is migrating from under the LNG Basin towards the river.

NW Natural's evaluation of the length and alignment of each trench is ongoing. Although, the specifics of the interceptor trench design remain to be finalized, DEQ understands that NW Natural is planning to key trenches into the upper silt unit underlying the Fill WBZ; and route groundwater pumped out of the trenches to the existing on-site water treatment plant for treatment.

NW Natural submitted the Trench Investigation Plan[3] on March 26, 2020 for a pre-design investigation of Fill WBZ materials representative of both trenches. The investigation will determine the thickness of the fill and provide samples for engineering testing and for estimating hydraulic properties. DEQ conditionally approved the plan on April 16, 2020 subject to NW Natural revising and resubmitting the document consistent with our comments. The revised plan is due to DEQ on or before April 30, 2020.

DEQ requests that NW Natural prepare a preliminary schedule for the LNG Basin Removal Action by May 5th that includes the pre-design investigation and the removal action design, implementation, and system startup and testing activities, to facilitate communications going forward.

Please contact me with questions regarding this letter.

Sincerely,

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Cc: ECSI No. 84 File

[3] Anchor QEA, LLC, 2020, "Fill WBZ Trench Interim Measure Field Investigation Plan," March 26, a technical memorandum prepared for NW Natural.