Transmittal

August 31, 2021

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		Project no.	11218519
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1		Well Installation Work Plan	1

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Well Installation Work Plan

Shell Harbor Island Terminal
255, 1835, 1711 13th Avenue Southwest
Seattle, Washington 95822

PlaNet Site ID MIGUS357032
PlaNet Project ID 86013
Consent Decree No 99-2-07176-OSEA

August 31, 2021

→ **The Power of Commitment**

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Sam Nevosh

Jacquelyn L. England, LG

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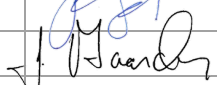
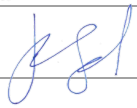
S3			Jeff Gaarder				
S4					Sam Nevosh		8/31/2021
S4					Jacquelyn England		8/31/2021
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1. Well Installation Work Plan

GHD is submitting this *Well Installation Work Plan* for the Shell Harbor Island Terminal as referenced above (Figure 1) on behalf of Equilon Enterprises dba Shell Oil Products US (Shell). Following the October 1, 2020 release of 580 gallons of gasoline, GHD oversaw a portion of the cleanup at the Shell Harbor Fuel Terminal. This included remedial soil excavation at the north and south ends of the Pump House where a total of 136.05 tons of impacted soil and 9,190 gallons of fuel and water were hauled offsite. The limits of the excavation are shown on Figure 2. GHD concluded that it was unknown whether the release had impacted the groundwater and recommended further investigation.

To assess the groundwater quality and determine groundwater flow direction and hydraulic gradient in the vicinity of the Pump House area, GHD proposes the installation of four monitoring wells. Site background information, a summary of previous environmental assessment and remediation work, and GHD's proposed scope of work are presented below.

2. Site Background

The following sections provide a description of the site, previous environmental work, and a summary of the environmental setting at the site.

2.1 Site Description

The Shell Harbor Island Terminal is a petroleum distribution facility located on Harbor Island, which is approximately one mile southwest of downtown Seattle at the mouth of the Duwamish River (Figure 1). The site is comprised of three parcels located at 2555 13th Avenue Southwest, 1835 13th Avenue Southwest, and 1711 13th Avenue Southwest. These parcels are designated as the Main Tank Farm, North Tank Farm, and Shoreline Manifold Area, respectively (Figure 3).

This is a Model Toxics Control Act (MTCA) site and compliance monitoring activities are performed under *Consent Decree No. 99 2-07 176 SEA* with the Washington State Department of Ecology (Ecology, 1998). Three groundwater monitoring and cleanup areas are associated with the three parcels. Groundwater monitoring and cleanup area TX-03A Area, shown on Figure 3, encompasses the North Tank Farm and the northern portion of the Main Tank Farm. The SH-04 Area overlaps the southeastern portion of the Main Tank Farm. The boundaries for the Shoreline Manifold Area parcel and groundwater monitoring and cleanup area are identical.

2.2 Site Geology and Hydrogeology

Soil underlying the site consists of emplaced grade and dredge fill overlying native estuarine deposits (EMCON and LCI, 1999). The uppermost grade fill unit consists of coarse-grained fill varying in thickness from less than 1 foot to approximately 2 feet thick. The dredge fill unit was created when estuarine deposits near the site were dredged and used as fill. The contact between the dredge fill and native estuarine units is not well defined due to similar properties of the two units. The dredge fill appears to vary from approximately 8 to 20 feet in thickness at the site. It consists of fine- to medium-grained sand with some gravel. Native estuarine deposit underlies the dredge fill at depths of

approximately 8 to 20 feet below grade. These deposits are composed of primarily fine- to medium-grained sand with thin silt interbeds.

Groundwater occurs as a thin lens of fresh water overlying brackish water at depth. The groundwater table occurs within the dredge fill 4 to 8 feet below ground surface (ft bgs). Groundwater within the dredge fill unit occurs under unconfined conditions. The North Tank Farm and Main Tank Farm areas generally are unaffected by tides, whereas the Shoreline Manifold Area groundwater quality and elevations are affected by tides.

The native estuarine deposits are fully saturated, and groundwater within this unit is unconfined. Groundwater quality and groundwater elevations within this unit can be influenced by surrounding surface water bodies and associated tidal fluctuations. This shallow groundwater flows in a radial fashion to the north and to the south from a potentiometric high located within the Main Tank Farm area.

2.3 Previous Environmental Work

Cleanup actions were performed in compliance with the Consent Decree, which provides Site-specific cleanup levels for total petroleum hydrocarbons (TPH), lead, and arsenic in soils, and for TPH, select metals, benzene, toluene, ethylbenzene, and total xylenes (BTEX), and carcinogenic polycyclic aromatic hydrocarbons (cPAHs) in groundwater. The Site-specific cleanup levels applicable to this report are summarized in Table 1. The Site-specific soil cleanup levels are included in the summary of cleanup actions discussed below.

The primary cleanup action at the Site included excavation of near-surface lead- and arsenic-impacted soil in areas throughout the Main Tank Farm which was conducted from December 2003 through February 2004. Lead- and arsenic-impacted surface soils with concentrations above the soil cleanup levels of 1,000 milligrams per kilogram (mg/kg) and 32 mg/kg, respectively, were removed. In addition, a small area of lead-impacted soil near the oil-water separator (OWS) in the Main Tank Fam was excavated in October 2001; however, some lead-impacted soils were left in place due to structural constraints. A 3-inch cap was placed over the lead-impacted subsurface soil in the area around the OWS.

Between November 2001 and October 2009, TPH-impacted surface and subsurface hotspots with concentrations greater than 10,000 mg/kg, the shoreline soil cleanup level, were removed from the Shoreline Manifold Area. Additional impacted soils with TPH concentrations greater than 20,000 mg/kg, the inland soil cleanup level, were removed near a former underground storage tank (UST) in October 2001, and in the Main Tank Farm in February 2004 and 2007.

A free product and vapor extraction system was installed in the Shoreline Manifold Area in 1996. The vapor extraction system operated until August 2005 when it was shut down because the hydrocarbon recovery through vapor extraction had declined. Passive free product recovery occurred in the Shoreline Manifold Area at monitoring well MW-211 through 2010 and in monitoring wells MW-210 and MW-212 through 2011. Vacuum purging was conducted on a quarterly basis in monitoring wells MW-210 and MW-212 in 2012.

On September 10, 2013, less than three barrels of diesel product were released in the Shoreline Manifold Area during an "in-line" inspection of the dock lines. Approximately 2.4 barrels of free-standing product were recovered immediately by vacuum truck and the use of sorbent pads. Additionally, approximately 8 to 10 cubic yards of soil were removed. Confirmation soil samples collected from the excavated area were below the shoreline soil cleanup level of 10,000 mg/kg. Field observations indicated that surface water and the stormwater system were not impacted by the release (URS, 2014). Pooled diesel product was observed surrounding monitoring well MW-212 following the release. The product was removed using a vacuum truck and subsequent monitoring did not detect product. At the request of Ecology, sorbent socks were installed in monitoring wells MW-209, MW-210, and MW-212 in January 2014. In addition, monitoring wells MW-208, MW-210, MW-211, and MW-212 are monitored monthly for product.

In September 2016, RECON Environmental, Inc. (RECON) excavated and disposed of approximately 5.28 tons of visibly stained soils at the former Lubes Facility, located near the southwest corner of the Main Tank Farm and directly west of the Pump House. Confirmation soil samples were collected and the open piping at two small petroleum impacted areas were capped. The TPH concentrations in the confirmation soil samples were less than the inland soil cleanup level of 20,000 mg/kg (Ecology, 1998; RECON, 2017). Upon receipt of these results, AECOM authorized RECON to backfill the excavations.

In November 2016, construction of the bio-sparging system commenced within the TX-03A Area (Figure 2). The City of Seattle (the City) halted the completion of the system in December 2016 due to a delay in the issuance of the Utility Major Permit and the Annual Permit. Prior to the work halt, AECOM oversaw the installation of the 37 bio-sparging wells in the City Parking Lot and Main Tank Farm, and the installation of the system piping within the Main Tank Farm. System construction was completed in May 2017 and the system was started on May 25, 2017. The bio-sparging system construction details were documented in a Bio-Sparging Completion Technical Memorandum, submitted in the first quarter of 2018. The bio-sparging system was shut down in December 2019 to evaluate for rebound and has remained off.

Between March and September of 2018, AECOM completed rehabilitation of the 24-inch mainline of the City's stormwater system located directly north of the Seattle Terminal's Main Tank Farm, per the terms of a Voluntary Compliance Agreement (VCA) between Shell and the City dated April 2016. Per the VCA, annual dry weather stormwater system sampling events are required for a period of 3 years. Sampling events were conducted in January and August of 2019 and in August 2020. A third event will be completed during the dry season of 2021.

On October 1, 2020 a gasoline release occurred from a failed pump inside the Pump House during tanker truck fueling operations. The Pump House is located south of the Main Tank Farm. Areas affected by the release included the Pump House interior, Manifold Pit East, and limited areas outside the Pump House on the ground surface at its northern and southern entryways. Following initial recovery of the release, additional excavation was completed as described in the March 11, 2021 *Interim Action Report* (GHD, 2021).

3. Proposed Scope of Work

Due to the gasoline release in October 2020, GHD proposes to install four monitoring wells (MW-113 through MW-116), to define the extent of the contaminant plume. The proposed location for monitoring wells MW-113 through MW-116 are presented on Figure 3.

3.1 Site Health and Safety Plan

GHD will prepare a site safety plan to inform site workers of known hazards and to provide health and safety guidance. The plan will remain on Site at all times during field activities and will be reviewed and signed by all site workers and visitors on a daily basis.

3.2 Underground Utility Location and Clearance

Prior to field Activities, GHD will notify the Washington State One Call Utility Notification Service of planned drilling activities a minimum of 48 hours prior to field work. Additionally, GHD will subcontract a private utility locator to identify subsurface obstacles prior to initiating drilling activities. Due to the high concentration of utilities in the Pump House area, the well locations may need to be adjusted, and the top 5 to 10 feet will be cleared by air-knife to ensure

any underground utilities or obstructions that may not have been identified through the pre-field utility clearance procedures are avoided.

3.3 Borehole Drilling

Four soil borings for installation of groundwater monitoring wells (MW-113 through MW-116) will be advanced to a total depth of approximately 15 ft bgs. The borings will be advanced using an 8-inch diameter hollow-stem auger to the maximum explored depth. Actual boring depths will be determined in the field. All wells will need to be installed using a track-mounted limit access rig.

3.3.1 Soil Sampling

Soil samples will be collected at least every five feet to characterize the subsurface sediments and for possible chemical analysis. Additional soil samples may be collected near the water table and at lithologic changes. Samples will be collected using lined split-barrel or equivalent samplers driven into undisturbed sediments at the bottom of the borehole. Each sample will be screened with a photoionization detector (PID) and logged using ASTM standard D2488 to describe lithology. Samples exhibiting elevated PID readings or physical signs of residual hydrocarbon impact will be submitted for laboratory analysis. Soil samples submitted for laboratory analyses will be capped with Teflon™, labeled, entered onto a chain-of-custody form, packed on ice, and sent to a State of Washington certified analytical laboratory for analysis.

3.3.2 Monitoring Well Construction

After advancing the hollow-stem auger to the total depth, each monitoring well will be constructed using 2-inch diameter, flush-threaded schedule 40 PVC well casing. The wells will be screened using 0.010-inch machined slot, and #2/12 Monterey Sand will be emplaced within the annular space between the boring and the well screen from the total depth to approximately ½-foot above the well screen. A one-foot-thick hydrated bentonite seal will separate the sand from the overlying sanitary surface seal composed of Portland cement. The sanitary seal will extend to approximately 1 ft bgs. The monitoring wells will be secured either within a locking steel stove pipe set in concrete and extending approximately 3 feet above the ground surface, or inside a traffic-rated vault finished flush with the ground surface and set in concrete. GHD anticipates completing the wells to a total depth of 15 ft bgs with a screen from approximately 5 to 15 ft bgs; however, actual depth and screen interval will be determined in the field.

3.3.3 Monitoring Well Development

At least 72 hours following monitoring well construction, the well will be developed using a combination of groundwater surging and extraction to dislodge fine sediments from the sand pack and remove the sediments from the well. Surging and extraction will continue until at least ten well-casing volumes of groundwater are extracted and the sediment volume in the groundwater is negligible.

3.3.4 Surveying

After installation, the monitoring well will be surveyed by a Washington state licensed surveyor.

3.3.5 Groundwater Sampling

Following installation, development, and surveying, the wells will be added to the routine sampling schedule at the Site following existing sampling protocols. We anticipate quarterly sampling of the new wells for a minimum of four quarters and then will recommend an appropriate sampling schedule for future events.

3.3.6 Laboratory Analyses

Soil and groundwater samples will be submitted to the laboratory for analyses of:

- TPHg = Gasoline range organics per Method Northwest Total Petroleum Hydrocarbon Identification (NWTPH) Gx
- TPHd = Diesel range organics per Method NWTPH Dx
- TPHo = Oil range organics per Method NWTPH Dx
- BTEX = benzene, toluene, ethylbenzene and xylenes per EPA Method 8260B

All samples will be analyzed on a standard turnaround time.

3.4 Soil and Water Disposal

Soil cuttings or rinse water generated during well installation activities will be temporarily stored onsite in 55-gallon drums. The drums will be profiled for waste characterization and transported to an approved facility for disposal.

4. Schedule and Reporting

Following written approval of this work plan by Ecology, GHD will begin coordinating the well installation work. Upon completion of site assessment activities, GHD will prepare and submit a report summarizing site assessment activities to Ecology within 60 days of completing all field work.

5. References

Ecology, 1998. *Equilon Seattle Terminal MTCA Consent Decree*. October 2.

Ecology, 1998. *Cleanup Action Plan, Equilon Seattle Sales Terminal, Harbor Island Site, Seattle, Washington*. September 28.

EMCON and LCI, 1999. *Compliance Monitoring Plan, Equilon Seattle Sales Terminal, Seattle, Washington*. Submitted to the Washington State Department of Ecology. February 24 (revised).

RECON, 2017. *Remedial Action Letter Report – Former Lubes Facility Decommissioning, Shell Harbor Island Terminal, Seattle, Washington, Consent Decree 99-2-07176-OSEA*. June 19.

URS, 2014. *Annual Compliance Monitoring Report 2014, Shell Harbor Island Terminal, Seattle, Washington*. April.

GHD, 2021. *Interim Action Report, Shell Harbor Island Terminal, Seattle, Washington*. March 11.

Table

Table 1
Site-Specific Cleanup Levels
Shell Harbor Island Terminal
Seattle, Washington

Surface Soil (0 - 6 inches)

Constituent	Cleanup Level[a,b] (mg/kg)
Arsenic	32.6
Lead	1,000

Subsurface Soil - Property Boundaries and Shorelines

Constituent	Cleanup Level[a] (mg/kg)
Total TPH	10,000

Subsurface Soil - Inland Areas

Constituent	Cleanup Level[a] (mg/kg)
Total TPH	20,000

Groundwater

Constituent	Cleanup Level[a] (mg/L)
Arsenic	0.036[c]
Benzene	0.071
Benzo(a)anthracene	0.000031
Benzo(a)pyrene	0.000031
Benzo(b)fluoranthene	0.000031
Benzo(k)fluoranthene	0.000031
Chrysene	0.000031
Dibenzo(a,h)anthracene	0.000031
Ethylbenzene	29.0
Indeno(1 ,2,3-cd)pyrene	0.000031
Lead	0.0058
TPH-G	1.0
TPH-D	10
TPH-O	10
Toluene	200.0

Notes:

[a] Cleanup levels per the Consent Decree (Ecology, 1998), except where noted.

[b] Cleanup level based on Environmental Protection Agency (EPA) Record of Decision (ROD), 1994, Soil and Groundwater for Harbor Island

[c] Cleanup level based on ambient water quality criteria (chronic criteria for the protection of aquatic organisms) per WAC 173-201A-040.

mg/kg = milligrams per kilogram
mg/L = milligrams per liter

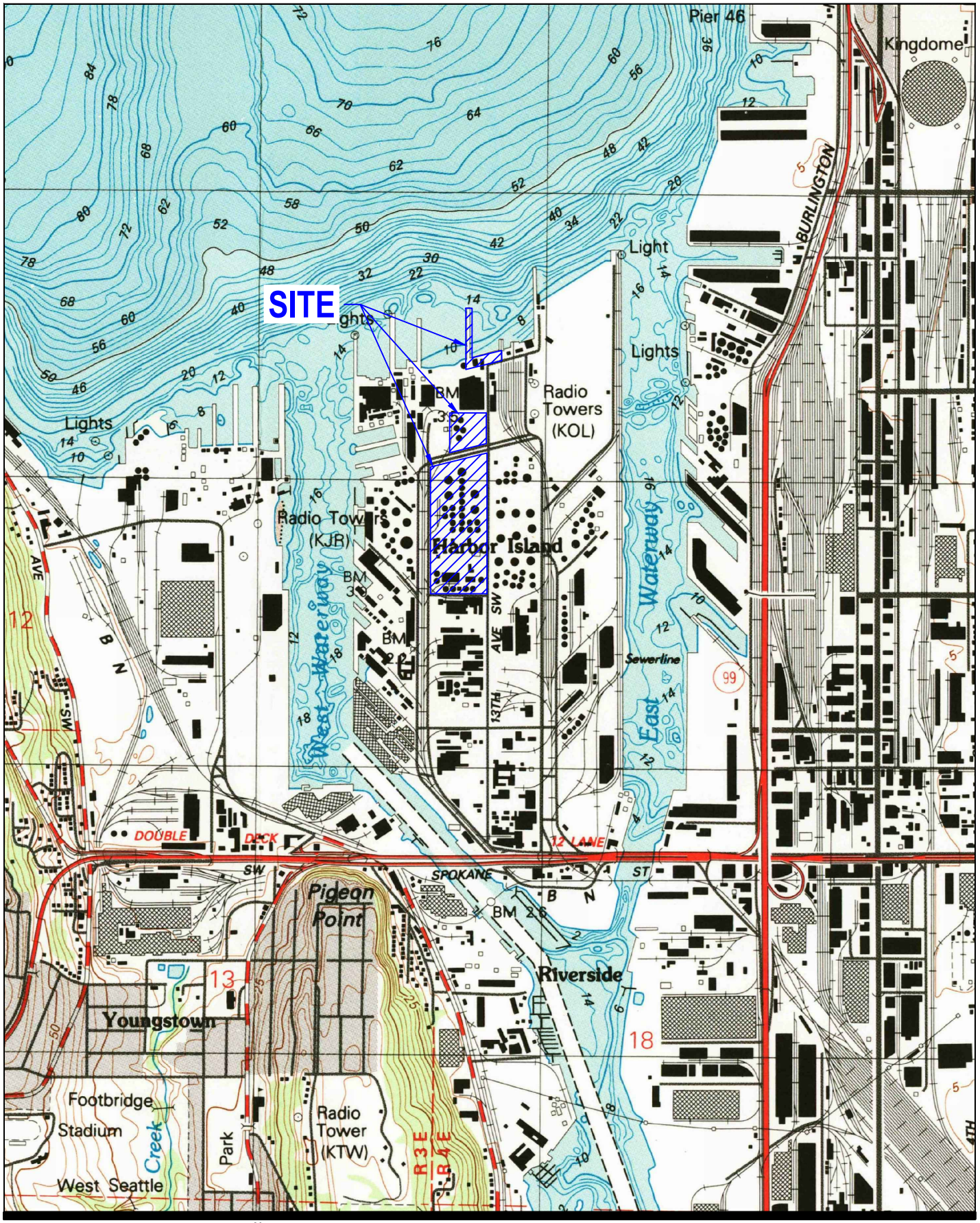
TPH = total petroleum hydrocarbons

TPH-D = total petroleum hydrocarbons as diesel

TPH-G = total petroleum hydrocarbons as gasoline

TPH-O = total petroleum hydrocarbons as oil

Figures



SHELL DISTRIBUTION TERMINAL
2555 13th AVENUE SW
SEATTLE, WASHINGTON

Project No. **11218519**
Date **August 2021**

SITE LOCATION MAP

FIGURE 1

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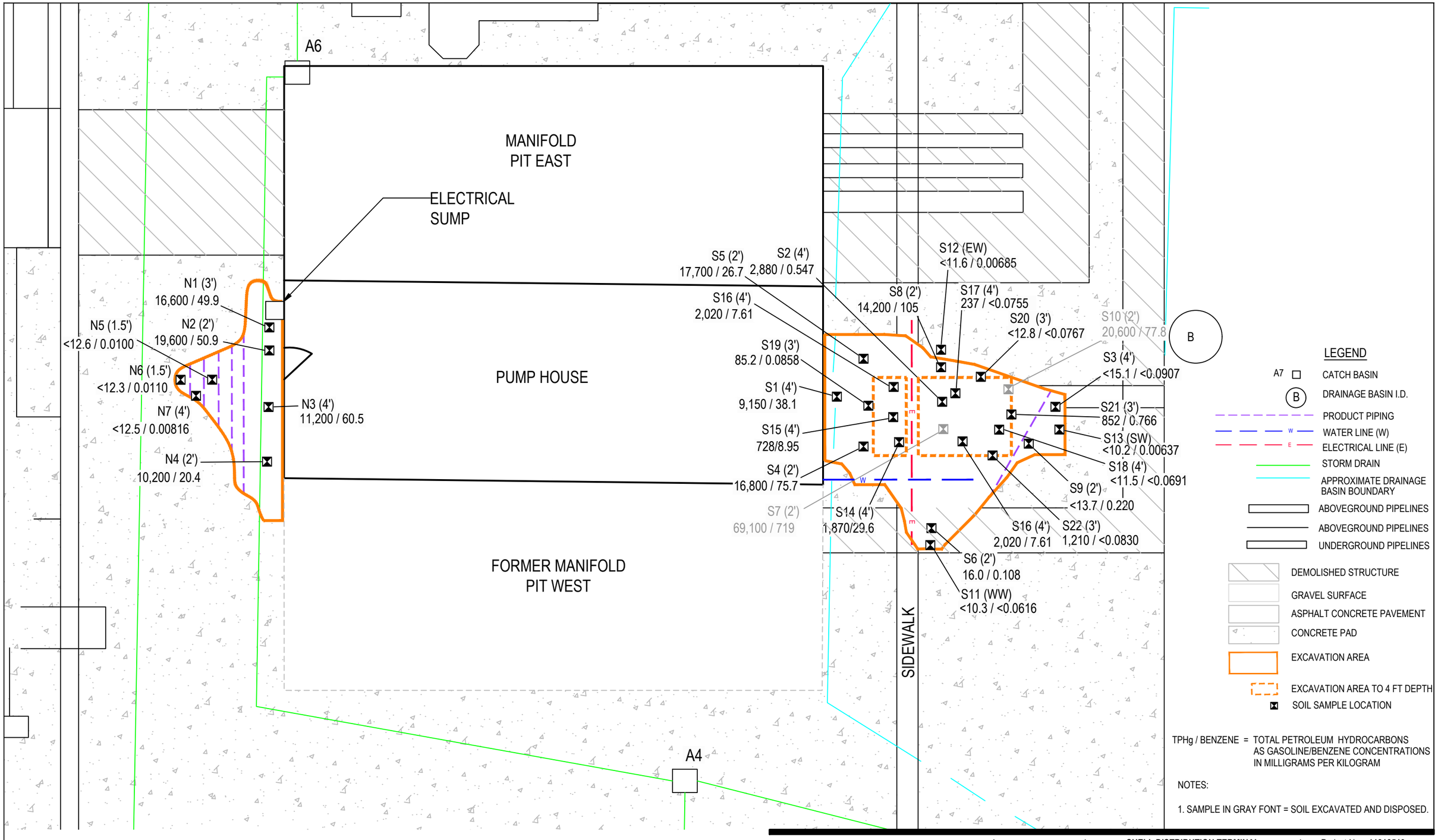

LEGEND

- A7 CATCH BASIN
- (B) DRAINAGE BASIN I.D.
- PRODUCT PIPING
- WATER LINE (W)
- ELECTRICAL LINE (E)
- STORM DRAIN
- APPROXIMATE DRAINAGE BASIN BOUNDARY
- ABOVEGROUND PIPELINES
- ABOVEGROUND PIPELINES
- UNDERGROUND PIPELINES
- DEMOLISHED STRUCTURE
- GRAVEL SURFACE
- ASPHALT CONCRETE PAVEMENT
- CONCRETE PAD
- EXCAVATION AREA
- EXCAVATION AREA TO 4 FT DEPTH
- SOIL SAMPLE LOCATION

TPHg / BENZENE = TOTAL PETROLEUM HYDROCARBONS AS GASOLINE/BENZENE CONCENTRATIONS IN MILLIGRAMS PER KILOGRAM

NOTES:

1. SAMPLE IN GRAY FONT = SOIL EXCAVATED AND DISPOSED.

SHELL DISTRIBUTION TERMINAL
2555 13th AVENUE SW
SEATTLE, WASHINGTON

Project No. **11218519**
Date **August 2021**

SOIL CHEMICAL CONCENTRATION MAP

FIGURE 2

Filename: N:\US\Santa Rosa\Projects\561\11218519\Digital_Design\ACAD 2020\Figures\RPT001\11218519-GHD-0000-RPT-EN-0102_SO-001.DWG
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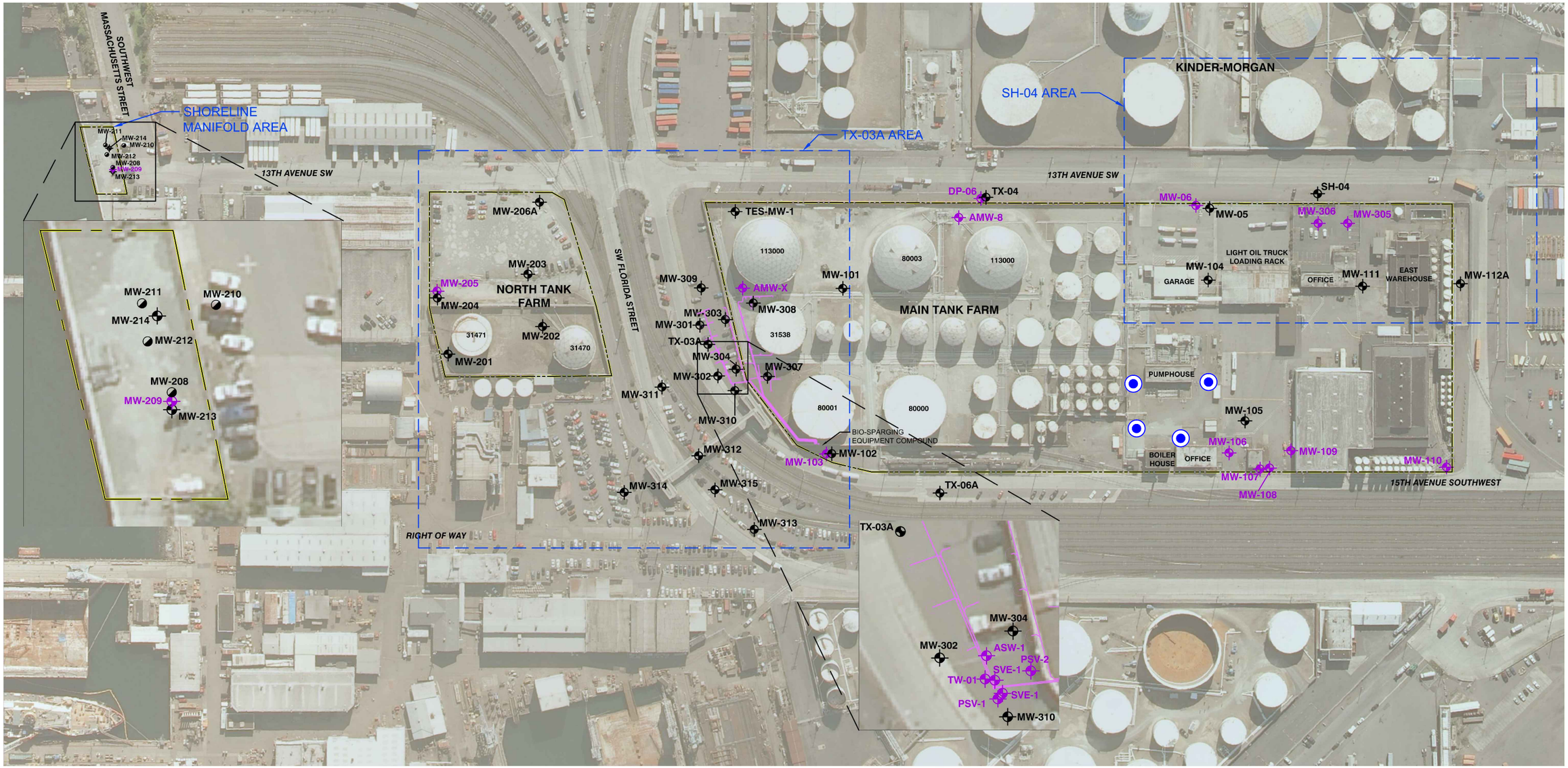
Data Source: PES Environmental, Inc. Main Terminal Drainage Map 6/19.



Map Features

- MW-212 — Monitoring Well Location (Included in Current Groundwater Monitoring Program)
- MW-210 — Product Recovery / Monitoring Well Location
- MW-103 — Additional Well Location (Not Included in Current Groundwater Monitoring Program)
- Shell Property Line
- Bio-Sparging Well Location
- Bio-Sparging Line (System start on May 25, 2017)
- Proposed Monitoring Well Location

0 100 200 ft

N

GHD

SHELL DISTRIBUTION TERMINAL
2555 13th AVENUE SW
SEATTLE, WASHINGTON

PROPOSED WELL LOCATIONS

Project No. **11218519**
Date **August 2021**

FIGURE 3

Filename: N:\US\Santa Rosa\Projects\561\11218519\Digital_Design\ACAD 2020\Figures\RPT001\11218519-GHD-0000-RPT-EN-0103_SO-001.DWG
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