MOTT MACDONALD

AECOM

2023 Annual Compliance Monitoring Report Terminal 91 Tank Farm Affected Area

January 2024

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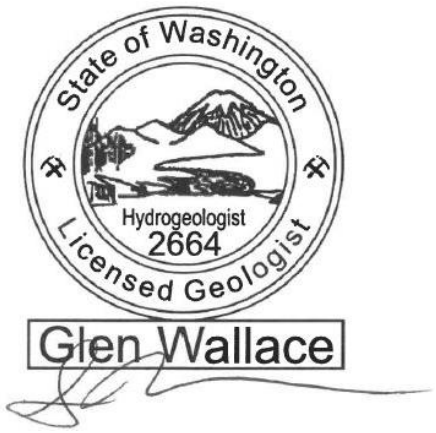

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1 Summary

1.1 Introduction and Purpose

Mott MacDonald (formerly Pacific Groundwater Group [PGG]) and AECOM Technical Services, Inc. (AECOM) has prepared this *2023 Annual Compliance Monitoring Report* to document the groundwater compliance monitoring at the Terminal 91 (T-91) Tank Farm Affected Area (TFAA) (Figure 1). The TFAA is situated within the Port's T-91 Facility in Seattle, Washington (Figure 1).

This report has been prepared pursuant to Agreed Order No. DE-8938 (AO) between the Port of Seattle (Port) and Washington Department of Ecology (Ecology) and in accordance with the Model Toxics Control Act (MTCA) under Chapter 70.105D of the Revised Code of Washington (RCW) and Chapter 173-340 of the Washington Administrative Code (WAC).

The work summarized in this annual report was conducted from November 2022 through August 2023 in accordance with the *Compliance Monitoring Plan* (CMP) and Ecology-approved revisions (PES Environmental, Inc. (PES 2013b; PGG 2019)). The scope of work for monitoring activities documented in this report is described in the following documents:

- CMP, Terminal 91 Tank Farm Cleanup, Port of Seattle, Seattle, Washington. (PES et al. 2013b), and
- *Operations and Maintenance Plan* (OMP), Terminal 91 Tank Farm Cleanup, Port of Seattle, Seattle, Washington. (PES et al. 2013c).

Compliance monitoring currently includes groundwater monitoring and a water level snapshot annually in August, and quarterly light non-aqueous phase liquid (LNAPL) gauging. PES conducted groundwater monitoring at the TFAA through the construction phase and the first year of performance monitoring ending in August 2016. PGG continued the monitoring program beginning in November 2016. PGG was acquired by Mott MacDonald in 2021. Mott MacDonald was subcontracted to AECOM in March 2023. The CMP requirements for the annual report include:

- An overview of the current cleanup status identifying significant results and trends (Sections 1.2, 2.2, and 4.0);
- Water level contour map using data from shallow groundwater monitoring wells sampled during the 2023 event (Section 3.2; Figure 1);
- Tabulated current and historical monitoring and water table elevation data (Figures 2 and 3, Tables 1 through 4); and
- A narrative discussion of data validation and a description of all data qualified or rejected (Section 4.4).

1.2 Key Results

Key results from November 2022 - August 2023 compliance monitoring include:

- Groundwater flow directions are consistent with previous flow directions, suggesting a relatively stable groundwater flow setting along previously identified flow pathways.
- Indicator Hazardous Substance (IHS) concentrations at Conditional Point of Compliance (CPOC) wells remain below cleanup levels.
- Groundwater concentrations at non-CPOC wells are generally consistent with previous concentrations and some values exceed applicable cleanup levels.

2 Project Background

2.1 Background Information

Section 2 summarizes the general site history, subsurface conditions, and cleanup actions conducted between 2005 and 2014. The *Construction Completion Report* and its references provide additional detail on the background and history of the TFAA (PES 2017).

2.1.1 Property Description and History

T-91 is located at 2001 West Garfield Street, Seattle, Washington and includes approximately 216 acres (Figure 1). The TFAA occupies approximately 17 acres in the central portion of T-91. The TFAA includes the Tank Farm Lease Parcel (TFLP) identified as “Tank Farm” within the TFAA as shown on Figure 1. The TFLP is a contiguous parcel approximately four acres in size located immediately north of the Magnolia Bridge. The TFAA is flat and paved or covered with buildings.

The TFLP is located at the north end of the TFAA. The environmental history of the TFLP includes the bulk petroleum tank farm present from the 1920s through 2005, and the dangerous waste treatment and storage operations conducted from 1980 through 1995. The aboveground portion of the tank farm, including the tanks, containment walls, and other aboveground piping and equipment, was demolished and removed in 2005 as part of an interim remedial action (Roth Consulting 2005). The final cleanup was performed in 2013-2015 and is described further in the construction completion report (PES 2017).

2.1.2 Subsurface Conditions

The geology, hydrogeology, and nature and extent of contamination are informed by investigations conducted at T-91 since 1988. The results of these investigations are detailed in the *Remedial Investigation Summary Report* (Roth Consulting 2007) and *Final Cleanup Action Plan* (Ecology 2010). The geology and hydrostratigraphy of the site are briefly summarized below.

2.1.3 Geology

Four lithologic units have been identified beneath the TFLP and adjacent areas. These four units in order of increasing depth include:

- The Shallow Sand Unit consists of fill material placed over shallow marine and tidal marsh deposits of Smith Cove during the early 1900s. It consists primarily of moderately to poorly sorted, fine- to medium-grained unconsolidated sand with laminations of silty sand and gravel lenses occurring locally. The Shallow Sand Unit extends vertically from just below the paved ground surface to between 15 and 20 feet below ground surface (ft bgs).
- The Silty Sand Unit consists of gray or olive, moderately sorted, fine- to medium-grained silty sand with traces of coarse sand, shell debris, and wood debris. This unit is interpreted to be native marsh, intertidal, and shallow marine sediments that formed the pre-fill surface in the Smith Cove Waterway and the adjacent tidelands. Beneath the TFLP and adjacent upland areas, the Silty Sand Unit generally occurs at depths of 15 to 20 ft bgs and varies from 20 ft thick beneath the BNSF rail yard east of the TFLP to 5 ft thick or less in the southwest corner of the TFLP. A gravel layer was found within the Silty Sand Unit in some locations that consists of moderately to poorly sorted, silty sandy gravel.

- The Deep Sand Unit directly underlies the Silty Sand Unit and consists primarily of poorly to moderately sorted, medium- to coarse-grained sand and gravelly sand, with only isolated occurrences of silt. However, beneath the northern portion of the TFLP, the Deep Sand Unit is composed of only 6 to 8 ft of sand, gravelly sand, and sandy gravel with the remaining deeper portions of the unit characterized by interbedded silty sand and sand. The depth to the top of the Deep Sand Unit varies from approximately 25 ft bgs at the center of the TFLP to as much as 45 ft beneath the north end of Pier 90.
- The Silty Clayey Sand Unit underlies the Deep Sand Unit and consists of soft to stiff fine-grained sediments, primarily silty clay and clayey silt, with lesser amounts of silt and silty clayey sand. The top of the Silty Clayey Sand Unit is shallowest beneath the eastern portion of the TFLP, where it occurs as shallow as 42 ft bgs.

2.1.4 Hydrostratigraphy

Shallow Aquifer. The Shallow Aquifer is generally present in the Shallow Sand Unit and is separated from the Deep Confined Aquifer by the Silty Sand Unit that acts as an upper confining unit. Well water level data collected during routine monitoring show that the dominant unconfined groundwater flow direction is generally towards the south beneath the TFLP, TFAA, and piers, with flow locally to the southwest beneath Area of Concern (AOC) 11, located in the western portion of the TFAA. Water levels in the monitoring wells typically range between 3 and 10 ft bgs and generally correspond to seasonal variations in precipitation rates with the highest water levels observed during the wet season. The typical horizontal gradient beneath the TFLP is approximately 0.001 feet per foot (ft/ft).

Downward vertical gradients between the Shallow Aquifer and Deep Confined Aquifer are noted throughout the TFAA. Vertical gradients typically range from approximately 0.018 to 0.040 ft/ft, with vertical gradients decreasing to the south. Despite the presence of downward vertical gradients, significant downward movement of Shallow Aquifer groundwater under most of the TFAA is considered unlikely due to the low measured vertical permeability in the upper confining unit (Silty Sand Unit).

Tidal influence on Shallow Aquifer groundwater levels under the piers (reflected in higher tidal efficiency and lower time lag) is generally highest near the southern ends of the piers, decreasing progressively inland towards the bulkheads, that run east to west parallel to the shoreline. Tidal efficiencies are notably higher on Pier 91 than Pier 90 and in areas without bulkheads or significant silt locally within the Shallow Aquifer. Little tidal influence is evident in Shallow Aquifer wells at the south end of the TFLP.

Deep Confined Aquifer. The deep confined aquifer is present in the Deep Sand Unit. The tidally-averaged groundwater flow direction in the Deep Confined Aquifer beneath and shoreward (i.e., south) of the TFLP is toward the south. As in the Shallow Aquifer, water levels in the Deep Confined Aquifer respond to seasonal variations in precipitation rates with the highest water levels observed during the wet season. The typical horizontal gradient of the Deep Confined Aquifer is relatively constant at approximately 0.003 ft/ft beneath the TFAA.

Tidal influence on Deep Aquifer groundwater levels under the piers is similar to the Shallow Aquifer, with a higher influence near the southern ends of the piers. Time lags are generally shorter in the Deep Aquifer under the piers than in the Shallow Aquifer. Tidal influence is evident in Deep Aquifer wells in most of the TFLP; the shortest time lags are along the southern boundary of the TFLP, and the longest time lags are in the north.

2.2 Cleanup Action Summary

The TFAA cleanup actions between 2005 and 2014 consisted of the cleanup action for the TFLP and the cleanup actions addressing secondary source areas, other potential future exposures, and the start of compliance monitoring (PES 2017).

2.2.1 Cleanup Action for the Tank Farm Lease Parcel

The primary objectives for the TFLP cleanup action are to prevent migration of light non aqueous phase liquid (LNAPL) from the TFLP source area and to prevent future surface product seeps from occurring (PES 2013). Specific actions include:

- Removing existing above-ground structures and asphalt paving; removing the remaining subsurface utilities, structures, and tank bases that appear to be the source of the historic surface seeps; and removing highly contaminated soil encountered during the tank base removal process;
- Constructing a subsurface cutoff wall around the perimeter of the former tank farm;
- Installing an enhanced passive LNAPL recovery system; and
- Backfilling and grading the area, constructing a new asphalt cover over the area, and constructing new stormwater drainage improvements.

2.2.2 Actions for Secondary Source Areas and Potential Future Exposures

Actions taken to address secondary source areas and potential future exposures include:

- Institutional controls, such as health and safety requirements for site workers and addressing potential exposures when future land use changes are made, including a restrictive environmental covenant filed in 2017;
- Excavating LNAPL source areas at Solid Waste Management Unit (SWMU) 30;
- Cleaning and decommissioning underground fuel pipelines remaining in the TFAA; and
- Implementing a monitored natural attenuation (MNA) groundwater sampling program to confirm that natural attenuation processes continue to degrade chemicals in groundwater (see Section 2.2.3).

3 Compliance Groundwater Monitoring Activities

This section describes compliance monitoring from November 2022 through August 2023 including four LNAPL gauging events and one groundwater monitoring event. The results are described in Section 4.0. Field data forms are included in Appendix A.

The compliance monitoring program is designed to assess how the cleanup action is affecting groundwater quality and to evaluate if cleanup levels continue to be achieved at the CPOC wells. The CPOC wells are located at the downgradient end of three groundwater flow paths, the Pier 90, Pier 91, and AOC 11 flow paths. Figure 1 shows well locations. Shallow aquifer CPOC wells include:

- CP-GP08 is located at the downgradient end of the Pier 90 flow path
- CP-GP09R and CP-GP10 are located at the downgradient end of the Pier 91 flow path
- CP-GP14 is the CPOC for the AOC 11 flow path

Deep aquifer CPOC wells include:

- PNO-MW-06B is located on the Pier 91 flow path
- CP-GP01B is located on the Pier 90 flow path

The groundwater compliance monitoring program follows the schedule specified in the CMP. Consistent with the CMP, groundwater sampling shifted to a semi-annual schedule in 2018, and an annual schedule in 2019, with quarterly LNAPL gauging (PGG 2019; Ecology 2019). The monitoring well network and analyte list was updated for the current monitoring period based on the recommendations in the *2020 Annual Monitoring Report* and as approved by Ecology (PGG 2020, Ecology 2021).

3.1 LNAPL Monitoring

Mott MacDonald personnel collected LNAPL measurements at the east and west end of three LNAPL recovery trenches and at three monitoring wells (CP-107, CP-110, and PNO-MW104) on November 9, 2022; February 27, 2023; and May 1, 2023. Mott MacDonald and AECOM personnel jointly collected LNAPL measurements at the above locations on August 11, 2023 (Figures 1 and 3, Table 1). The presence of LNAPL and the depth to water were measured from the surveyed top of casing (TOC) to the nearest 0.01 foot using an electronic oil-water interface probe. LNAPL recovery was not performed during this annual monitoring period due to LNAPL thicknesses at or less than 0.25 feet, as specified in the CMP and OMP (PES et al. 2013b, c). LNAPL thickness ranged from sheen or less than measurable (< 0.01 ft) to 0.25 feet.

3.2 Groundwater Level Monitoring

Mott MacDonald and AECOM personnel jointly conducted compliance groundwater level monitoring in 45 of 46 active CMP monitoring wells[1] on August 9, 2023 (Table 2a, Figure 1). Water level elevations from 2016 to 2023 are summarized in Table 2b.

[1] The monument lid bolts at CP-GP03B were seized and the well could not be opened.

3.2.1 Groundwater Monitoring Well Redevelopment

No wells required redevelopment during this annual reporting period.

3.3 Groundwater Sampling and Analysis

CMP groundwater sampling was conducted on August 9 and 11, 2023 (Table 3). Groundwater quality was monitored during purging for field parameters such as temperature, pH, specific conductance, visual turbidity, dissolved oxygen (DO), and oxidation-reduction potential (ORP) at each well sampled.

The groundwater samples were collected using low-flow sampling methods. A peristaltic pump and dedicated tubing were used for purging and sample collection. Groundwater was purged until field parameters stabilized prior to sample collection. Samples were collected directly into laboratory-provided containers. Sample containers were stored in coolers with ice and chain of custody was maintained through delivery to the analytical laboratory.

During this annual sampling event, sample splits were sent to two Ecology- accredited laboratories: OnSite Environmental Inc. (OnSite) and Friedman & Bruya, Inc. (Friedman & Bruya).

- Samples were submitted to Friedman & Bruya located in Seattle, Washington for analysis on August 11, 2023. Samples were analyzed for the full analytes list including gasoline-range, diesel-range, and oil-range hydrocarbons using Northwest Total Petroleum Hydrocarbons-Gasoline (NWTPH-Gx), and Northwest Total Petroleum Hydrocarbons-Diesel extended (NWTPH-Dx). NWTPH-Dx analysis was conducted with silica gel cleanup, consistent with the CMP.
- In addition, sample splits were collected for NWTPH-Dx and submitted to OnSite located in Redmond, Washington for analysis on August 11, 2023. Samples were analyzed for NWTPH-Dx with silica gel cleanup, consistent with the CMP.

Appendix B includes a comparison of data from the two laboratories.

4 Compliance Monitoring Results

This section describes the results of the annual compliance groundwater monitoring event and four quarterly LNAPL gauging events.

4.1 LNAPL Measurements

Table 1a summarizes LNAPL measurements. As thicknesses were not greater than 0.25 feet, LNAPL recovery was not performed, consistent with the CMP and OMP (PES et al. 2013b, c). LNAPL was not measured in trench 2E during the first quarter and trench 3W during the third quarter LNAPL gauging event due to a broken latch and to a seized vault latch, respectively. The vault latch in trench 2E was repaired in second quarter and repair at 3W is pending. The LNAPL field data forms are included in Appendix A.

Key LNAPL observations include during this monitoring period:

- LNAPL was intermittently detected in trench monitoring points with thicknesses from 0 to 0.10 ft.
- LNAPL was consistently detected in monitoring well PNO-MW104 with thicknesses from 0.17 to 0.25 ft.
- Monitoring well CP-107 had 0 to 0.01 ft of measurable.

LNAPL thickness appears to have a seasonal variation in observed thickness related to rising and falling water levels. LNAPL thickness measurements are typically the greatest in summer-fall events when water levels are the lowest (Figure 3). This is consistent with the expected LNAPL behavior in unconfined aquifers (Newell 1995).

4.2 Groundwater Elevations and Flow Direction

Compliance groundwater level monitoring was conducted on August 9, 2023, in all available and active CMP monitoring wells; UT-MW39-3 was previously decommissioned and CP-GP03BR had a damaged bolt that could not be opened. The damaged bolt at CP-GP03BR will be extracted and replaced during the upcoming site visits. Field water level forms are included in Appendix A.

Depth to water measurements are summarized in Table 2a. This table also includes the calculated groundwater elevations, referenced to mean low-low water (MLLW) vertical datum. The top of casing elevations in Table 2a include updated survey values from supplemental survey measurements in 2015 and 2016 at selected wells.

Shallow aquifer groundwater elevations were used to generate groundwater contours and evaluate the shallow aquifer flow direction during August 2023 (Figure 1). The shallow aquifer flow direction is to the south and is consistent with previous groundwater flow directions. No adjustments to the CMP are necessary due to changes in flow direction.

4.3 Groundwater Quality Monitoring

4.3.1 Field Parameters

The groundwater quality was monitored for temperature, pH, specific conductance, visual turbidity, DO, and ORP. The August 2023 groundwater results are presented in Table 3.

4.3.2 Petroleum Hydrocarbons

The analytical results for total petroleum hydrocarbons are summarized in Table 3. Data trends for petroleum hydrocarbons are shown in Figures 2a through 2c.

In August 2023, groundwater concentrations were below cleanup levels at all CPOC wells for gasoline-, diesel-, and oil-range hydrocarbons. The CPOC wells include shallow aquifer wells CP-GP08, CP-GP09R, CP-GP10, and CP-GP14 and deep aquifer wells PNO-MW06B and CP-GP01B.

Key CPOC results included:

- No sampled wells had exceedances for gasoline-, diesel-, and oil-range hydrocarbons during the monitoring period.
- All analytical results were non-detect, except at CPOC well PNO-MW06B, where gasoline (140 micrograms per liter (ug/L)) and diesel (0.15 milligrams per liter (mg/L)) were detected below their respective cleanup levels (800 ug/L and 0.5 mg/L).

Total petroleum hydrocarbons results exceeded cleanup levels at two non-CPOC wells in the former tank farm affected area. These results were generally consistent with expected site conditions. Exceedances included:

- One well, CP-106A, exceeded cleanup level for gasoline range organics.
- One well, PNO-MW103, exceeded cleanup level for diesel range organics, which is consistent with prior monitoring results.

The well locations are shown in Figure 1. The data generally indicate continued compliance with site cleanup objectives. Gasoline concentrations were generally consistent with previous monitoring events with compliance at all CPOC wells.

4.3.3 Data Trends

Figures 2a through 2c show data trends for gasoline-, diesel-, and oil-range hydrocarbons for site CPOC wells and wells generally north and south of the Magnolia Bridge. Table 4 provides a summary of the data from 2016 to 2023. Data trends show generally low concentrations or lack of detections at CPOC wells. None of the plotted trends showed an increasing trend in detected concentrations[2], though the data from some wells are noisy enough that the beginning of a trend may be hard to detect.

The data trends do not indicate action or changes to the CMP based on the current results.

4.4 Data Validation and Management

Samples were submitted to both Friedman & Bruya and OnSite for the August 2023 event as a quality assurance check to support transition to Friedman & Bruya for future sample analyses. Appendix B is a comparison of results from the two laboratories. The comparison supports using Friedman & Bruya moving forward. Data validation for the Friedman & Bruya data is discussed below; data from OnSite is not used beyond the data comparison in Appendix B.

Data were reviewed using Stage 2 data validation consistent with EPA Contract Laboratory Program National Functional Guidelines for Organic and Inorganic Data Review (U.S. EPA 2016a, b). Data completeness, holding times, laboratory instrument calibrations, surrogate recoveries, matrix spike and matrix spike duplicates, laboratory control samples, quantitation

[2] Z-flagged NWTPH-D and NWTPH-O results from 2021 were analyzed without silica gel cleanup and are biased high and not considered for evaluation of trend. The CMP specifies silica gel cleanup for NWTPH-Dx analyses.

limits, method blanks, field QC samples, and trip blanks were reviewed. No additional data qualifiers were added to data presented in this report and in the data package for Port database use. Data quality assurance review key points include:

- NWTPH-Dx analysis was conducted with silica gel cleanup during the sample extraction and preparation phase. Silica gel cleanup is specified in the CMP[3].
- Samples were analyzed within applicable holding times.
- Laboratory instrument calibrations, surrogate recoveries, matrix spike and matrix spike duplicates, and laboratory control samples were within the applicable quality assurance ranges.
- The relative percent differences for the field duplicates were within the recommended criteria of 20%.
- Laboratory control samples were within acceptable ranges.

The reviewed data are considered generally acceptable for the intended use.

[3] See footnote 2.

5 Compliance Monitoring Plan Deviations

There were few deviations from the CMP in the November 2022 - August 2023 monitoring year. Water levels were not measured at well CP-GP03BR due to a seized monument lid, and LNAPL thickness was intermittently not measured at Trenches 2E and 3W due to a seized latch. The vault latch in trench 2E was repaired in second quarter, and repair at well CP-GP03BR and trench 3W is pending.

There were no other deviations from the CMP during the monitoring period.

6 References

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Ecology, 2021. Letter from Tom Mackie, Department of Ecology Re: Approval (with comments) of Annual Compliance Monitoring Report (November 2019 through August 2020) Terminal 91 Tank Farm Affected Area Seattle, Washington. January 8.

Table 1a. November 2022 to August 2023 LNAPL Monitoring Summary

Port of Seattle Terminal 91

Well or Riser	Date	Easting	Northing	Top of Casing	LNAPL Top	LNAPL Bottom	LNAPL Thickness	*Groundwater Elevation (feet)
CP-107	11/9/2022	1258549.03	235217.38	17.70	6.03	6.03	0.00	11.67
CP-107	2/27/2023	1258549.03	235217.38	17.70	5.12	5.13	0.01	12.58
CP-107	5/1/2023	1258549.03	235217.38	17.70	5.37	5.37	0.00	12.33
CP-107	8/11/2023	1258549.03	235217.38	17.70	6.34	6.34	0.00	11.36
CP-110	11/9/2022	1258545.20	235064.79	17.46	6.73	6.74	0.01	10.73
CP-110	2/27/2023	1258545.20	235064.79	17.46	6.67	6.68	0.01	10.79
CP-110	5/1/2023	1258545.20	235064.79	17.46	6.29	6.30	0.01	11.17
CP-110	8/11/2023	1258545.20	235064.79	17.46	7.08	7.08	0.00	10.38
PNO-MW104	11/9/2022	1258507.67	234985.46	17.70	6.95	7.12	0.17	10.72
PNO-MW104	2/27/2023	1258507.67	234985.46	17.70	6.45	6.63	0.18	11.21
PNO-MW104	5/1/2023	1258507.67	234985.46	17.70	6.64	6.83	0.19	11.02
PNO-MW104	8/11/2023	1258507.67	234985.46	17.70	7.27	7.52	0.25	10.38
Trench 2E	11/9/2022	1258689.24	235172.27	21.43	9.97	9.97	0.00	11.46
Trench 2E	2/27/2023	1258689.24	235172.27	21.43	NM	NM	NM	NM
Trench 2E	5/1/2023	1258689.24	235172.27	21.43	9.90	9.91	0.01	11.53
Trench 2E	8/11/2023	1258689.24	235172.27	21.43	10.72	10.72	0.00	10.71
Trench 2W	11/9/2022	1258614.92	235174.81	18.37	7.90	7.90	0.00	10.47
Trench 2W	2/27/2023	1258614.92	235174.81	18.37	6.61	6.62	0.01	11.76
Trench 2W	5/1/2023	1258614.92	235174.81	18.37	6.82	6.82	0.00	11.55
Trench 2W	8/11/2023	1258614.92	235174.81	18.37	7.67	7.67	0.00	10.70
Trench 3E	11/9/2022	1258683.13	235311.86	19.29	8.82	8.85	0.03	10.46
Trench 3E	2/27/2023	1258683.13	235311.86	19.29	7.49	7.50	0.01	11.80
Trench 3E	5/1/2023	1258683.13	235311.86	19.29	7.71	7.71	0.00	11.58
Trench 3E	8/11/2023	1258683.13	235311.86	19.29	8.55	8.60	0.05	10.73
Trench 3W	11/9/2022	1258607.59	235312.57	18.10	5.64	5.65	0.01	12.46
Trench 3W	2/27/2023	1258607.59	235312.57	18.10	6.29	6.30	0.01	11.81
Trench 3W	5/1/2023	1258607.59	235312.57	18.10	6.50	6.51	0.01	11.60
Trench 3W	8/11/2023	1258607.59	235312.57	18.10	NM	NM	NM	NM
Trench 5E	11/9/2022	1258571.45	235310.84	16.51	5.20	5.22	0.02	11.31
Trench 5E	2/27/2023	1258571.45	235310.84	16.51	4.14	4.16	0.02	12.37
Trench 5E	5/1/2023	1258571.45	235310.84	16.51	4.38	4.39	0.01	12.13
Trench 5E	8/11/2023	1258571.45	235310.84	16.51	5.48	5.48	0.00	11.03
Trench 5W	11/9/2022	1258516.23	235312.10	16.56	5.18	5.19	0.01	11.38
Trench 5W	2/27/2023	1258516.23	235312.10	16.56	4.13	4.16	0.03	12.42
Trench 5W	5/1/2023	1258516.23	235312.10	16.56	4.36	4.43	0.07	12.19
Trench 5W	8/11/2023	1258516.23	235312.10	16.56	5.48	5.58	0.10	11.06

Notes:

NMT: no measurable thickness.

LNAPL top and bottom measured as distance below top of riser pipe.

LNAPL thickness was measured twice in the field; reported values are the final measurement.

NM: not measured.

Table 1b. LNAPL Thickness Summary 2015-2023

Port of Seattle Terminal 91

Date	CP-107	CP-110	PNO-MW104	Trench 2E	Trench 2W	Trench 3E	Trench 3W	Trench 5E	Trench 5W
8/6/2015	0.00	0.00	0.23	0.00	0.00	0.00	0.03	0.00	0.07
9/15/2015	0.01	0.01	0.18	0.02	0.00	0.04	0.05	0.00	0.19
10/14/2015	0.00	0.00	0.21	0.04	0.17	0.07	0.07	0.01	0.11
11/12/2015	0.00	0.00	0.19	0.10	0.19	0.06	0.06	0.00	**0.70**
11/16/2015	0.00	0.00	0.15	0.03	0.02	0.04	0.02	NA	0.03
2/8/2016	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.02
5/2/2016	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.09
8/15/2016	0.00	0.00	0.20	0.05	0.06	0.04	0.02	0.03	0.10
11/14/2016	0.00	0.00	0.04	0.01	0.01	0.01	0.02	0.02	0.04
2/13/2017	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.18
5/10/2017	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.06
8/15/2017	NA	NA	NA	0.07	0.00	0.00	0.00	0.06	0.11
11/30/2017	0.00	0.00	0.11	0.04	0.07	0.12	0.05	0.08	0.06
2/15/2018	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.07
5/9/2018	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.06
8/15/2018	0.00	0.00	0.13	0.01	0.00	0.00	0.01	0.03	0.02
11/25/2018	0.00	0.00	0.06	0.02	0.03	0.03	0.04	0.02	0.03
2/21/2019	0.00	0.00	0.11	0.00	0.01	0.01	0.01	0.00	0.02
5/30/2019	0.00	0.00	0.08	0.00	NA	0.01	0.00	0.00	0.04
8/22/2019	0.09	0.00	0.19	0.00	0.00	0.02	0.02	0.00	0.01
11/19/2019	0.00	0.00	0.10	0.01	0.02	0.05	0.05	0.02	0.02
2/26/2020	0.00	0.00	0.08	0.00	0.00	0.01	0.00	0.00	0.03
5/27/2020	NA	NA	NA	NA	0.00	0.00	0.00	0.00	0.03
8/7/2020	0.02	0.01	0.11	0.01	0.00	0.04	0.02	0.01	0.03
11/18/2020	0.00	0.00	0.11	0.00	0.02	0.02	0.05	0.00	0.02
2/9/2021	0.00	0.01	0.13	0.00	0.00	0.00	0.01	0.00	0.01
5/27/2021	0.00	0.01	0.14	0.00	0.01	0.01	0.00	0.00	0.06
8/26/2021	0.01	0.00	0.24	0.00	0.01	0.01	0.02	0.00	0.00
11/17/2021	0.00	0.00	0.16	0.00	0.02	0.04	0.05	0.01	0.04
2/25/2022	0.00	0.01	0.11	0.00	0.00	NA	0.01	0.01	0.02
5/10/2022	0.00	0.01	0.13	0.01	0.01	NA	0.01	0.02	0.06
8/25/2022	0.00	0.00	0.09	0.00	0.00	NA	0.00	0.00	0.00
11/9/2022	0.00	0.01	0.17	0.00	0.00	0.03	0.01	0.02	0.01
2/27/2023	0.01	0.01	0.18	NA	0.01	0.01	0.01	0.02	0.03
5/1/2023	0.00	0.01	0.19	0.01	0.00	0.00	0.01	0.01	0.07
8/11/2023	0.00	0.00	0.25	0.00	0.00	0.05	NA	0.00	0.10

Notes:

All measurements in feet.

Bold indicates thickness greater than the recovery threshold (0.25 feet).

NA - well not accessible at time of gauging event

AECOM MOTT MACDONALD

Table 2a. 2023 Water Level Snapshot

Port of Seattle Terminal 91

Location	Aquifer	Northing	Easting	Top of Casing Elevation (ft)	Depth to Water (ft.)	Groundwater Elevation (ft)
B1-93	Shallow	235056.488	1259053.02	17.24	24.38*	--*
CP-103A	Shallow	234972.532	1258577.49	17.21	6.71	10.50
CP-104A	Shallow	235419.92	1258578.53	17.49	5.75	11.74
CP-104B	Deep	235426.99	1258578.29	17.39	5.90	11.49
CP-106A	Shallow	235301.93	1258919.04	18.11	6.57	11.54
CP-106B	Deep	235311.62	1258908.04	18.06	6.98	11.08
CP-107	Shallow	235217.377	1258549.03	17.70	6.34	11.36
CP-108A	Shallow	234962.68	1258931.98	17.19	6.61	10.58
CP-108B	Deep	234962.46	1258927.28	17.22	9.68	7.54
CP-110	Shallow	235064.79	1258545.2	17.46	7.08	10.38
CP-111	Shallow	234994.011	1258361.25	17.74	7.30	10.44
CP-112	Shallow	235347.293	1258424.51	17.40	5.86	11.54
CP-113	Shallow	235538.49	1258574.6	17.36	5.73	11.63
CP-114	Shallow	235478.726	1258827.05	17.17	6.27	10.90
CP-115A	Shallow	235411.433	1258723.96	17.74	6.05	11.69
CP-115B	Deep	235417.48	1258737.17	17.87	6.38	11.49
CP-121	Shallow	235478.449	1258668.95	17.91	6.01	11.90
CP-122B	Deep	235241.133	1258967.84	17.07	5.91	11.16
CP-203B	Deep	234972.13	1258599.96	17.56	8.33	9.23
CP-205A	Shallow	235677.44	1258726.8	17.69	5.95	11.74
CP-205B	Deep	235682.021	1258725.15	17.72	5.98	11.74
CP-GP01A	Shallow	234783.171	1259137.77	17.79	8.41	9.38
CP-GP01B	Deep	234780.155	1259127.74	17.58	10.93	6.65
CP-GP02	Shallow	234870.331	1259056.83	17.52	7.65	9.87
CP-GP03AR	Shallow	234510.996	1258309.84	18.00	9.12	8.88
CP-GP03BR	Deep	234481.72	1258309.70	17.91	NA	NA
CP-GP04R	Shallow	234734.039	1258317.31	18.14	8.54	9.60
CP-GP05	Shallow	234925.882	1258075.23	17.75	8.12	9.63
CP-GP06	Shallow	234926.509	1257941.21	17.85	7.89	9.96
CP-GP07R	Shallow	234873.769	1258267.68	18.07	8.15	9.92
CP-GP08	Shallow	234457.14	1259008.14	17.27	8.32	8.95
CP-GP09R	Shallow	234287.947	1258417.29	17.67	9.00	8.67
CP-GP10	Shallow	234293.606	1258302.87	17.68	9.52	8.16
CP-GP11	Shallow	235153.122	1258319.95	16.98	6.33	10.65
CP-GP12	Shallow	235283.731	1258226.95	17.31	6.70	10.61
CP-GP13	Shallow	235085.865	1258020.07	16.45	6.88	9.57
CP-GP14	Shallow	234927.563	1257862.3	17.60	7.96	9.64
CP-PR-13	Shallow	235133.41	1258256.72	17.34	6.85	10.49
CP-W210	Shallow	234966.79	1258734.14	17.40	7.41	9.99
PNO-MW02	Shallow	234813.143	1258463.27	17.87	8.42	9.45
PNO-MW06A	Shallow	234773.718	1258421.89	18.21	8.68	9.53
PNO-MW06B	Deep	234764.073	1258421.79	18.17	10.02	8.15
PNO-MW101	Shallow	234996.104	1258273.01	17.72	8.45	9.27
PNO-MW103	Shallow	234472.89	1258453.46	17.53	8.89	8.64
PNO-MW104	Shallow	234985.46	1258507.67	17.70	7.52	10.18
UT-MW39-1	Shallow	235313.48	1258481.61	16.89	5.33	11.56

Notes:

NA - well not accessible at time of snap shot.

* Depth to water was incorrectly entered in the field. The value is an outlier and not representative.

Water level gauging performed on August 9, 2023.

Table 2b. 2016-2023 Water Level Elevations

Port of Seattle Terminal 91

Date	B1-93	CP-103A	CP-104A	CP-104B	CP-106A	CP-106B	CP-107	CP-108A	CP-108B	CP-110	CP-111	CP-112	CP-113	CP-114	CP-115A	CP-115B
11/14/2016	11.85	11.71	13.80	12.77	13.16	12.52	12.85	11.97	11.03	11.63	11.12	12.68	13.55	13.09	13.70	12.91
2/13/2017	--	12.18	14.34	13.35	13.60	13.31	13.36	12.52	9.94	12.09	11.36	13.12	14.41	13.72	14.54	14.68
5/9/2017	12.05	11.73	13.70	12.97	12.91	12.88	13.13	11.97	7.29	11.69	10.96	12.83	13.71	13.01	13.82	12.85
8/15/2017	10.49	10.58	11.97	11.67	11.38	11.38	11.55	10.70	8.93	10.52	10.35	11.67	11.87	11.15	11.91	11.62
11/30/2017	11.60	11.56	13.34	12.54	12.82	12.47	12.61	11.72	10.82	11.49	11.34	12.54	13.30	12.69	13.42	12.72
5/9/2018	11.34	11.16	12.99	12.34	12.36	12.27	12.31	11.38	8.97	11.12	10.64	12.38	12.97	12.51	13.08	11.69
11/25/2018	10.37	10.58	11.80	11.45	11.63	11.16	11.45	10.74	9.27	10.50	10.60	11.58	11.69	11.02	11.24	11.90
5/29/2019	--	10.70	12.20	11.78	11.60	11.58	11.72	10.89	8.27	10.63	10.50	--	--	11.39	12.17	11.78
5/27/2020	10.67	10.85	12.46	11.91	11.79	11.55	11.93	10.94	7.70	10.78	10.49	12.00	12.38	11.69	12.48	11.95
8/26/2021	--	10.36	11.65	11.33	11.14	10.93	11.29	10.40	7.53	10.28	10.32	11.44	11.55	10.82	11.62	11.31
8/25/2022	10.53	10.57	11.96	11.59	11.35	11.36	11.58	10.69	6.62	10.50	10.43	11.70	11.90	11.17	11.92	11.54
8/9/2023	--*	10.50	11.74	11.49	11.54	11.08	11.36	10.58	7.54	10.38	10.44	11.54	11.63	10.90	11.69	11.49

Date	CP-121	CP-122B	CP-203B	CP-205A	CP-205B	CP-GP01A	CP-GP01B	CP-GP02	CP-GP03AR	CP-GP03BR	CP-GP04R	CP-GP05	CP-GP06	CP-GP07R	CP-GP08	CP-GP09R
11/14/2016	13.90	12.44	10.48	13.79	13.30	10.65	10.18	11.16	10.33	7.33	10.37	11.35	10.71	10.60	9.98	9.86
2/13/2017	14.76	13.10	10.82	14.75	14.53	10.82	9.68	11.56	10.22	9.47	10.59	10.87	10.93	10.79	10.34	9.74
5/9/2017	14.03	12.84	9.62	13.95	13.84	10.00	6.41	10.98	8.75	3.57	9.80	9.73	10.10	10.32	9.66	8.31
8/15/2017	12.14	11.28	9.29	11.99	11.87	9.72	8.65	9.93	9.42	7.86	9.70	9.95	10.03	9.97	8.72	8.98
11/30/2017	13.67	12.23	10.54	13.57	13.47	10.48	10.28	10.81	10.12	12.97	10.43	10.64	10.87	10.36	9.90	9.32
5/9/2018	13.28	12.18	9.65	13.17	12.79	9.80	8.43	10.47	8.99	8.37	9.70	9.61	9.92	10.10	9.20	8.54
11/25/2018	11.98	10.92	9.60	11.81	11.58	10.03	--	9.99	9.89	8.69	10.06	10.31	10.33	10.14	9.02	9.52
5/29/2019	12.40	11.39	9.05	12.25	12.03	9.31	6.98	10.05	8.63	6.50	9.51	9.50	9.65	9.94	8.90	8.27
5/27/2020	12.70	--	8.98	12.57	12.17	9.63	7.54	10.14	9.03	4.27	9.63	9.62	9.83	9.98	9.08	8.72
8/26/2021	11.84	10.82	9.33	11.65	11.44	9.17	6.80	9.72	8.72	--	9.42	9.46	9.76	9.88	8.78	8.77
8/25/2022	12.16	11.22	9.34	11.99	11.72	9.34	5.97	9.95	8.65	--	9.49	9.55	9.75	9.87	8.85	8.35
8/9/2023	11.90	11.16	9.23	11.74	11.74	9.38	6.65	9.87	8.88	--	9.60	9.63	9.96	9.92	8.95	8.67

Date	CP-GP10	CP-GP11	CP-GP12	CP-GP13	CP-GP14	CP-PR-13	CP-W210	PNO-MW02	PNO-MW06A	PNO-MW06B	PNO-MW101	PNO-MW103	PNO-MW104	UT-MW39-1
11/14/2016	9.75	11.41	11.47	10.19	10.91	11.07	11.36	10.54	10.40	8.79	11.07	9.76	11.50	12.69
2/13/2017	9.45	11.56	11.54	7.44	10.67	11.25	13.71	10.63	10.73	9.94	11.11	9.84	11.80	13.16
5/9/2017	--	11.23	11.23	9.86	9.75	10.93	11.27	10.03	9.89	6.39	10.67	8.49	13.50	12.90
8/15/2017	8.68	10.60	10.52	9.55	9.88	10.43	10.11	9.47	9.59	8.33	10.18	8.90	10.40	11.65
11/30/2017	8.98	11.32	11.52	10.20	10.60	11.29	11.04	10.31	10.41	11.79	10.95	9.51	11.30	12.48
5/9/2018	8.04	10.92	10.90	9.56	9.61	9.64	10.66	9.67	9.73	9.03	10.40	8.64	10.89	12.36
11/25/2018	9.16	10.67	10.61	9.69	10.28	10.55	10.11	9.69	9.89	9.28	10.32	9.34	10.51	10.52
5/29/2019	7.72	10.68	10.67	9.38	9.41	10.48	10.24	9.54	9.53	7.93	10.22	8.46	10.54	11.83
5/27/2020	8.29	10.73	11.91	9.44	9.70	10.55	10.34	9.61	9.64	6.28	10.25	8.74	10.60	12.01
8/26/2021	8.22	9.56	10.40	9.45	9.56	10.37	9.89	9.45	9.42	7.56	10.04	8.77	10.29	11.40
8/25/2022	7.78	10.55	10.61	9.55	9.40	10.49	10.15	9.33	9.33	6.08	10.12	8.39	10.43	11.69
8/9/2023	8.16	10.65	10.61	9.57	9.64	10.49	9.99	9.45	9.53	8.15	9.27	8.64	10.18	11.56

Notes:

* Depth to water was incorrectly entered in the field. The value is an outlier and not representative.

All water level elevations in feet referenced to mean low-low water vertical datum (MLLW).

Table 3. August 2023 Groundwater Results

Port of Seattle Terminal 91

Constituent	Units	Cleanup Level	CP-103A	CP-104A	CP-106A	CP-108A	CP-203B	CP-GP01B	CP-GP02	CP-GP08	CP-GP09R	CP-GP10	CP-GP11	CP-GP14	PNO-MW02	PNO-MW06A	PNO-MW06B	PNO-MW103
								CPOC		*CPOC*	*CPOC*	*CPOC*		*CPOC*			*CPOC*	
Field Parameters																		
Temperature	deg C	--	15.79	18.46	20.90	17.92	14.29	15.69	17.92	16.87	17.06	16.94	20.05	14.01	18.98	18.64	15.70	20.03
Specific Conductance	umhos/cm	--	494	948	1369	840	578	5792	1958	750	12260	37200	5958	16310	1121	3905	2534	1286
pH	pH	--	7.24	7.14	6.85	7.17	7.42	8.54	6.77	7.17	7.01	7.37	7.35	7.09	6.64	6.88	7.28	6.71
Oxidation-Reduction Potential	mV	--	-127.9	-123.7	-105.0	-123.1	-64.5	-167.6	-105.7	-11.6	56.9	98.5	-253.0	-123.7	-91.2	-106.8	-120.1	-123.0
Oxygen, Dissolved	mg/L	--	0.60	2.22	2.43	2.23	0.93	0.59	2.92	0.70	1.30	7.07	0.71	3.19	1.15	2.80	0.86	4.80
Total Petroleum Hydrocarbons																		
NWTPH-Gasoline	ug/L	800	380	450	**940**	450	300	100U	360	100U	100U	100U	130	100U	100U	100U	140	410
NWTPH-Diesel *	mg/L	0.5	0.31	0.34	0.45	0.34	0.21	0.05U	0.22	0.05U	0.05U	0.05U	0.05U	0.05U	0.055U	0.14	0.15	**0.68**
NWTPH-Oil *	mg/L	0.5	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U

Notes:

* NWTPH-Diesel and NWTPH-Oil analyses were conducted with silica gel cleanup.

Groundwater Cleanup Levels from PES 2009.

Bold, gray shaded cells indicate exceedance of cleanup level

deg C: degrees Celcius

umhos/cm: micromhos per centimeter, equivalient to microsiemens per centimeter (uS/cm)

pH: logarithmic units, -log[H^+]

mV: millivolts

ug/L: micrograms per liter

mg/L: milligrams per liter

U: Constituent not detected at reporting limit shown; values are gray

CPOC flag in header indicates that the well is a conditional point of compliance well

NWTPH: Northwest Total Petroleum Hydrocarbon analysis, with distillate range indicated (diesel-, gasoline-, and oil-range)

Groundwater samples were collected on August 9 and 11, 2023.

Table 4. Data Summary

Port of Seattle Terminal 91

			CPOC Wells																					
Constituent	**Units**	**Event Date**	**CP-GP08**	**CP-GP01B**	**CP-GP09R**	**CP-GP10**	**CP-GP14**	**PNO-MW06B**	**CP-103A**	**CP-104A**	**CP-106A**	**CP-108A**	**CP-108B**	**CP-114**	**CP-203B**	**CP-205B**	**CP-GP01A**	**CP-GP02**	**CP-GP03AR**	**CP-GP05**	**CP-GP11**	**PNO-MW02**	**PNO-MW06A**	**PNO-MW101**	**PNO-MW103**
Field Parameters																									
Oxidation-Reduction Potential	mV	11/14/2016	-170.5	-180.9	84.3	161.8	-8.8	-133.2	-122.7	-154.9	-98.3	-51.1	-290.0	-60.9	70.5	-247.2	-197.0	16.6	-68.3	-95.2	-230.0	-93.2	-113.6	-94.4	-84.2
Oxidation-Reduction Potential	mV	2/13/2017	14.4	-68.2	-15.9	-28.0	-12.3	-212.2	-22.6	-82.9	-6.7	-185.1	-278.0	-6.9	42.4	-107.8	-27.4	-11.3	-146.9	21.0	-40.7	18.6	-7.6	-127.2	-89.3
Oxidation-Reduction Potential	mV	5/10/2017	186.4	-186.4	-148.3	-166.8	183.9	-198.0	-160.8	-205.0	108.2	54.8	-243.0	-196.0	-186.4	-245.8	-187.4	-181.3	-205.8	-202.0	-178.6	7.6	-192.0	-158.5	-186.8
Oxidation-Reduction Potential	mV	8/15/2017	-155.6	Error	--	115.4	11.2	181.2	-157.3	-199.1	-223.2	-205.1	-299.4	--	-182.6	-328.9	-162.5	-232.9	-297.3	-230.5	141.1	228.9	225.8	635.1J	-46.5
Oxidation-Reduction Potential	mV	11/30/2017	-124.7	67.0	-97.0	-16.4	-30.4	-143.4	-66.7	-191.5	26.9	75.2	-253.7	-94.4J	-121.9	-216.3	37.9	-94.1	-180.0	-104.1	-188.6	-101.8	-129.3	-102.6	-123.7
Oxidation-Reduction Potential	mV	5/16/2018	40.9	112.9	71.8	78.1	-14.1	-247.7	-163.3	-22.5	-59.1	-24.5	-241.1	-50.9	--	-157.9	-1.9	2.9	-304.2	-89.8	-296.2	-142.8	-52.1	-66.7	-40.5
Oxidation-Reduction Potential	mV	11/25/2018	-53.7	23.8	-11.5	--	-219.8	-179.1	18.6	-5.5	-9.9	-25.2	-167.6	-149.7	26.2	-324.7	-40.0	-25.0	-323.3	-263.8	-306.9	-42.6	-114.5	-252.4	-253.3
Oxidation-Reduction Potential	mV	5/29/2019	-102.0	-89.8	220.4	-37.6	-40.2	-190.4	-100.1	-138.7	-119.2	-178.3	-297.7	-147.1	-109.8	-247.6	-129.4	-126.0	-110.3	-93.8	-237.4	-78.2	-80.4	-117.8	-44.5
Oxidation-Reduction Potential	mV	5/27/2020	41.1	-92.8	212.1	247.0	-37.1	-146.2	-57.4	26.8	-92.7	-219.6	-337.4	342.0	-43.7	-290.1	41.4	28.5	-306.0	-239.2	-303.3	76.3	-103.3	-208.0	-95.7
Oxidation-Reduction Potential	mV	8/25/2021	-87.9	-244.5	21.8	44.6	-65.8	-100.9	-117.5	-124.9	-98.1	-244.7	--	--	-100.7	--	--	-142.3	--	--	-281.3	-61.5	-181.2	--	-94.4
Oxidation-Reduction Potential	mV	8/25/2022	-16.7	-172.4	92.9	79.4	-76.2	-240.3	-127.5	-108.0	-96.9	-114.3	--	--	-108.3	--	--	-99.2	--	--	-228.8	-75.1	-114.6	--	-142.5
Oxidation-Reduction Potential	mV	8/9/2023	-11.6	-167.6	56.9	98.5	-123.7	-120.1	-127.9	-123.7	-105.0	-123.1	--	--	-64.5	--	--	-105.7	--	--	-253.0	-91.2	-106.8	--	-123.0
Oxygen, Dissolved	mg/L	11/14/2016	1.56	0.37	0.97	5.01	5.36	0.08	0.13	1.23	0.18	0.11	0.32	1.59	2.80	0.14	0.38	0.53	0.41	1.51	0.34	0.33	0.08	0.33	0.58
Oxygen, Dissolved	mg/L	2/13/2017	2.54	0.51	1.66	7.27	4.57	0.01U	0.13	0.27	0.70	0.99	0.38	1.39	0.14	0.32	0.87	1.64	0.28	0.66	0.08	0.15	0.08	0.09	0.04
Oxygen, Dissolved	mg/L	5/10/2017	1.93	0.31	0.86	8.81	0.88	0.04	1.69	1.20	0.17	0.26	0.07	1.21	1.60	0.68	0.89	0.88	0.56	0.87	1.62	5.76	0.45	0.80	0.80
Oxygen, Dissolved	mg/L	8/15/2017	0.44	1.84	--	3.86	0.50	0.12	0.25	0.28	0.38	0.23	0.18		0.25	0.17	1.65	0.18	0.17	0.22	0.12	0.11	0.20	0.19	0.16
Oxygen, Dissolved	mg/L	11/30/2017	2.48	3.42	0.68	4.12	2.54	0.75	0.19	0.22	1.00	0.23	0.08	1.24	0.58	0.17J	0.48	0.37	0.32	0.93	0.61	0.63	0.39	0.64	0.68
Oxygen, Dissolved	mg/L	5/16/2018	1.22	0.16	2.07	7.97	4.40	1.27	0.12	0.29	0.14	0.40	0.28	0.99		0.19	0.17	0.30	1.04	2.54	0.54	1.10	0.82	2.66	0.67
Oxygen, Dissolved	mg/L	11/25/2018	0.30	2.69	0.23	--	0.22	0.63	0.23	0.18	0.28	0.79	0.56	0.40	0.28	1.12	0.38	0.32	0.27	0.23	0.80	0.25	0.31	1.77	0.41
Oxygen, Dissolved	mg/L	5/29/2019	0.24	0.70	0.68	7.46J	0.33	0.40	0.23	0.23	0.21	0.19	0.12	0.33	0.22	0.16	0.21	0.32	0.12	0.61	0.35	0.54	0.24	0.79	0.18
Oxygen, Dissolved	mg/L	5/27/2020	0.10	0.50	0.87	6.33	0.81	0.31	0.10	0.20	0.18	0.60	0.10	0.60	0.20	0.50	0.30	0.10	0.20	0.54	0.83	0.27	0.29	0.91	2.48
Oxygen, Dissolved	mg/L	8/25/2021	0.39	0.41	0.99	5.59	1.95	1.17	0.49	0.40	0.59	0.27	--	--	0.31	--	--	0.33	--	--	2.64	0.50	2.19	--	0.58
Oxygen, Dissolved	mg/L	8/25/2022	0.31	0.14	0.61	5.66	0.56	0.27	0.25	0.18	0.32	0.14	--	--	0.21	--	--	0.39	--	--	0.16	0.48	0.40	--	0.33
Oxygen, Dissolved	mg/L	8/9/2023	0.70	0.59	1.30	7.07	3.19	0.86	0.60	2.22	2.43	2.23	--	--	0.93	--	--	2.92	--	--	0.71	1.15	2.80	--	4.80
pH, Field	pH	11/14/2016	7.17	6.67	7.29	7.28	6.84	7.30	7.17	7.05	6.94	6.94	7.92	7.38	6.71	8.01	7.21	6.59	7.49	6.94	7.39	6.79	6.71	7.53	7.12
pH, Field	pH	2/13/2017	6.99	8.41	7.33	7.55	6.76	7.12	6.98	7.27	7.02	7.21	7.89	7.41	7.23	7.86	7.17	6.88	7.32	6.77	7.77	6.65	6.88	7.17	6.56
pH, Field	pH	5/10/2017	6.83	8.05	7.39	7.81	7.19	7.34	7.35	7.51	7.14	7.40	8.01	7.77	7.39	8.27	6.94	6.66	7.65	7.42	7.48	6.68	6.91	7.40	6.62
pH, Field	pH	8/15/2017	7.06	8.27	--	7.19	9.75	6.88	7.09	7.13	6.82	6.99	7.79		7.11	7.69	6.98	6.81	7.44	7.13	6.73	6.2J	6.94	5.01J	6.75
pH, Field	pH	11/30/2017	7.03	6.18	6.91	7.19	6.76	6.93	7.14	7.27	6.78	6.85	8.04	7.38	7.61	7.76	7.01	6.90	7.23	6.89	6.98	6.39	6.43	7.34	6.63
pH, Field	pH	5/16/2018	7.08	5.86	7.16	7.41	7.20	7.29	7.11	6.85	6.95	6.88	8.07	7.41		7.72	7.13	6.74	7.62	7.10	7.42	6.60	6.73	7.41	6.72
pH, Field	pH	11/25/2018	7.13	7.63	6.98	--	6.89	7.30	8.11	6.82	8.16	6.52	7.81	7.52	8.06	7.79	8.51	8.37	7.36	7.03	7.02	6.70	6.54	7.49	6.82
pH, Field	pH	5/29/2019	7.07	6.25	5.82	7.13	6.80	5.77	7.09	7.11	6.89	6.82	7.76	7.58	7.19	7.88	7.07	6.73	5.88	7.02	6.96	6.53	4.69	7.22	6.34
pH, Field	pH	5/27/2020	7.16	8.43	7.24	7.59	7.22	7.09	7.18	7.29	6.74	7.37	7.77	7.57	7.40	8.21	7.09	6.85	7.55	7.27	7.31	6.49	6.73	7.51	6.69
pH, Field	pH	8/25/2021	7.12	8.32	6.98	7.36	7.21	7.33	7.13	7.21	6.83	7.23	--	--	7.32	--	--	6.80	--	--	7.34	6.73	6.93	--	6.79
pH, Field	pH	8/25/2022	6.75	8.08	6.74	7.43	7.25	7.51	7.36	7.12	6.68	6.83	--	--	6.91	--	--	6.44	--	--	7.25	6.50	6.99	--	6.89
pH, Field	pH	8/9/2023	7.17	8.54	7.01	7.37	7.09	7.28	7.24	7.14	6.85	7.17	--	--	7.42	--	--	6.77	--	--	7.35	6.64	6.88	--	6.71
Specific Conductance, Field	umhos/cm	11/14/2016	582.0	105.5	15849	3001	8800	1510	454.0	550.0	740.0	640.0	4382	460.0	194.0	2640	593.0	1158	25021	18155	3743	838.0	1940	3722	2092
Specific Conductance, Field	umhos/cm	2/13/2017	864.0	4730	18600	22190	595.0	1418	321.0	349.0	564.0	435.0	4171	437.0	395.0	2855	900.0	1286	38810	1782	1305	557.0	623.0	3282	1259
Specific Conductance, Field	umhos/cm	5/10/2017	731.0	3.39	7560	138200	4470	2140	384.7	388.0	617.3	416.9	5229	359.8	527.5	2504	1358	920.0	2.56	1757	1926	13.84	835.0	2009	1409
Specific Conductance, Field	umhos/cm	8/15/2017	802.0	4401		25560	404	1881	465.0	441.0	745.0	504.0	5563		586.0	2943	1771	998.0	35010	22700	4301	1334	1667	1595	1357
Specific Conductance, Field	umhos/cm	11/30/2017	721.0	25	19.08	335600	8.54	1813	419.0	409.0	594.0	673.0	3904	410.0	589.0	2865	1507	1150	383700	286000	9.06	905.0	2190	3260	1658
Specific Conductance, Field	umhos/cm	5/16/2018	831.0	47	15750	18.3	2445	2062	444.0	423.0	670.0	398.0	2906	378.0	--	2162	1131	1107	31150	23.62	3953	1171	1224	2624	1561
Specific Conductance, Field	umhos/cm	11/25/2018	946.0	55	18.17	--	1800	1279	495.0	530.0	818.0	726.0	2965	476.0	567.0	3353	1709	1194	34.28	3254	12630	1435	4216	3285	1591
Specific Conductance, Field	umhos/cm	5/29/2019	710.0	71.5	7483	24125	5104	1759	486.0	510.0	720.0	368.1	5742	359.2	512.0	2537	1242	1043	28990	17144	4067	1141	1113	3839	1347
Specific Conductance, Field	umhos/cm	5/27/2020	868.0	4809	7550	20570	1967	2675	473.8	494.4	735.0	379.8	6011	453.5	553.5	2865	1520	1244	33300	18650	3816	1012	1556	3711	1571
Specific Conductance, Field	umhos/cm	8/25/2021	831.0	6334	10.32	15.86	46.37	35.85	498.0	498.0	860.0	523.0	--	--	574.0	--	--	1105	--	--	5515	1369	2852	--	1521
Specific Conductance, Field	umhos/cm	8/25/2022	751.0	4649	8750	18110	2318	3626	460.0	456.0	635.0	410.0	--	--	487.0	--	--	1065	--	--	4336	945.0	1371	--	1368
Specific Conductance, Field	umhos/cm	8/9/2023	750.0	5792	12260	37200	16310	2534	494.0	948.0	1369.0	840.0	--	--	578.0	--	--	1958	--	--	5958	1121	3905	--	1286
Temperature	deg C	11/14/2016	16.20	15.90	17.80	16.10	14.70	15.10	14.90	16.30	18.40	15.10	15.20	15.20	14.70	15.00	18.30	16.40	16.80	13.90	17.00	17.20	17.40	17.30	17.70
Temperature	deg C	2/13/2017	11.96	15.10	11.79	9.50	11.47	14.01	11.45	11.10	12.55	9.32	14.00	10.49	13.26	13.36	1340.00	11.82	10.75	10.31	12.68	11.50	11.53	12.79	12.94
Temperature	deg C	5/10/2017	12.80	14.56	13.05	11.34	11.77	14.44	12.80	13.00	14.00	11.60	14.40	12.70	14.20	14.20	13.94	12.75	11.11	11.05	13.92	13.84	13.88	13.35	13.13
Temperature	deg C	8/15/2017	17.12	16.25	--	17.67	17.76	15.39	15.74	18.44	20.76	17.87	15.65	--	15.01	16.09	18.99	18.56	17.20	15.52	19.73	18.89	18.90	17.42	18.41
Temperature	deg C	11/30/2017	15.20	15.66	15.34	13.78	12.63	13.33	13.52	15.50	15.99	14.09	14.40	13.89	12.67	14.99	16.96	13.89	14.84	11.42	13.70	14.53	14.65	14.83	15.26
Temperature	deg C	5/16/2018	15.74	15.56	14.08	13.05	12.46	15.35	13.70	13.37	15.89	12.94	14.93	14.64	--	14.08	15.64	13.99	12.52	11.37	14.52	14.99	14.60	13.38	14.49
Temperature	deg C	11/25/2018	13.50	14.60	15.81	--	12.46	13.69	12.20	14.66	15.98	13.19	12.93	13.32	12.21	12.95	15.57	13.96	14.62	12.39	14.52	16.02	15.38	14.77	15.64
Temperature	deg C	5/29/2019	13.80	15.60	15.10	12.90	12.80	14.70	13.80	14.10	15.90	14.00	14.70	14.40	14.10	15.10	16.20	14.40	12.70	11.90	15.30	15.00	14.80	13.80	15.30
Temperature	deg C	5/27/2020	14.50	16.20	15.90	13.80	13.60	15.00	14.30	14.50	16.60	14.00	15.10	14.60	14.70	15.20	15.70	15.10	13.20	12.60	16.20	15.60	15.80	15.10	16.10
Temperature	deg C	8/25/2021	17.40	16.11	18.53	18.24	15.57	15.46	16.30	18.89	21.46	18.14	--	--	14.63	--	--	17.79	--	--	19.43	19.33	19.71	--	20.55
Temperature	deg C	8/25/2022	17.10	16.60	19.16	19.26	15.15	16.58	17.46	18.90	21.30	18.20	--	--	15.00	--	--	17.40	--	--	20.10	19.72	20.95	--	20.72
Temperature	deg C	8/9/2023	16.87	15.69	17.06	16.94	14.01	15.70	15.79	18.46	20.90	17.92	--	--	14.29	--	--	17.92	--	--	20.05	18.98	18.64	--	20.03

Table 4. Data Summary

Port of Seattle Terminal 91

			CPOC Wells																					
Constituent	**Units**	**Event Date**	**CP-GP08**	**CP-GP01B**	**CP-GP09R**	**CP-GP10**	**CP-GP14**	**PNO-MW06B**	**CP-103A**	**CP-104A**	**CP-106A**	**CP-108A**	**CP-108B**	**CP-114**	**CP-203B**	**CP-205B**	**CP-GP01A**	**CP-GP02**	**CP-GP03AR**	**CP-GP05**	**CP-GP11**	**PNO-MW02**	**PNO-MW06A**	**PNO-MW101**	**PNO-MW103**
Petroleum Compounds																									
NWTPH-D-SG	mg/L	11/9/2015	0.05U	0.526	0.074	0.05U	0.113	2.98	1.9	0.63	2.83	6.98	1.12	0.05U	2.35	0.05U	0.05U	6.75	0.152	0.1	0.05U	4.92	5.62	0.185	5.01
NWTPH-D-SG	mg/L	2/8/2016	0.05U	1.04	0.05U	0.05U	0.05U	2.26	3.08	0.555	1.84	6.54	0.606	0.05U	1.68	0.05U	0.182	3.24	0.434	0.05U	0.05U	0.892	1.82	0.05U	5.1
NWTPH-D-SG	mg/L	5/3/2016	0.05U	0.448	0.05U	0.05U	0.05U	1.98	0.999	0.806	6.96	5.33	0.405	0.05U	1.52	0.05U	0.109	0.05U	0.05U	0.05U	0.05U	0.271	0.997	0.078	6.08
NWTPH-D-No Silica Gel	mg/L	8/10/2015	0.05U	0.641Z	0.05U	0.05U	0.05U	0.05U	2.14Z	0.408Z	4.62Z	0.05U	0.27Z	0.05U	1.45Z	0.05U	0.05U	3.88Z	0.05U	0.05U	0.05U	3.42Z	3.73Z	0.05U	11.2Z
NWTPH-D-SG	mg/L	8/15/2016	0.05U	0.414	0.157	0.05U	0.05U	2.12	1.83	0.404	2.37	3.96	0.166	0.05U	1.94	0.05U	0.05U	7.72	0.137	0.091	0.05U	3.78	3.74	0.05U	1.5
NWTPH-D-No Silica Gel	mg/L	11/14/2016	0.26U	0.26U	0.26U	0.25U	0.26U	2.8Z	2.2Z	0.56Z	0.78Z	6.2Z	--	0.26U	0.25U	0.26U	0.26U	0.55Z	0.65Z	0.26U	0.25U	3.6Z	9.5Z	0.26U	5.5Z
NWTPH-D-SG	mg/L	2/13/2017	0.26UX	0.26UX	0.26UX	0.26UX	0.26UX	0.26UX	0.58X	0.38X	0.7X	0.26X	0.26U	0.26UX	0.26UX	0.31UX	0.26UX	0.26UX	0.25UX	0.26UX	0.26UX	0.26UX	0.26UX	0.26UX	0.6X
NWTPH-D-SG	mg/L	5/10/2017	0.26UX	0.26UX	0.25UX	0.26UX	0.26UX	0.26UX	0.53X	0.41X	0.66X	0.42X	0.26UX	0.26UX	0.26UX	0.26UX	0.26UX	0.26UX	0.25UX	0.26UX	0.26UX	0.26UX	0.26UX	0.25UX	0.73X
NWTPH-D-SG	mg/L	8/15/2017	0.26UX1	0.25UX1	0.26UX1	0.25UX1	0.26UX1	0.25UX1	0.64X1	0.52X1	0.83X1	0.53X1	0.27UX1	0.25UX1	0.36X1	0.26UX1	0.26UX1	0.48X1	0.46X1	0.25UX1	0.26UX1	0.45X1	0.26UX1	0.26UX1	0.73X1
NWTPH-D-SG	mg/L	11/30/2017	0.26UX1	0.26UX1	0.25UX1	0.25UX1	0.25UX1	0.26UX1	0.47X1,J	0.39X1,M	0.65X1,M	0.47X1	0.26UX1	0.26UX1	0.26X1,M	0.26UX1	0.26UX1	0.63X1,M	0.25UX1	0.25UX1	0.25UX1	0.26UX1	0.35X1	0.26UX1	0.98X1
NWTPH-D-SG	mg/L	5/16/2018	0.26UX1	0.26UX1	0.26UX1	0.25UX1	0.25UX1	0.26UX1	0.76X1,M	0.64X1,M	0.79X1,M	0.4X1,M	0.31UX1	0.26UX1	0.3X1,M	0.3UX1	0.25UX1	0.26UX1	0.25UX1	0.26UX1	0.26UX1	0.26UX1	0.62X1	0.26UX1	0.9X1,M
NWTPH-D-SG	mg/L	11/15/2018	0.25UX1	0.26UX1	0.25UX1	--	0.26UX1	0.25UX1	0.68X1	0.43X1	0.67X1	0.33X1	0.26UX1	0.25UX1	0.37X1	0.26UX1	0.26UX1	0.43X1	0.25UX1	0.25UX1	0.26UX1	0.47X1	0.41X1	0.25UX1	0.72X1
NWTPH-D-SG	mg/L	5/29/2019	0.25UX1	0.25UX1	0.26UX1	0.25UX1	0.25UX1	0.25UX1	0.69X1	0.63X1	0.67X1,M	0.32X1	0.26UX1	0.25UX1	0.44X1	0.25UX1	0.25UX1	0.4X1	0.25UX1	0.25UX1	0.25UX1	0.35X1,M	0.5X1,M	0.25UX1	0.89X1
NWTPH-D-SG	mg/L	5/27/2020	0.21UX1	0.21UX1	0.2UX1	0.2UX1	0.21UX1	0.24X1	0.78X1	0.5X1	0.86X1	0.59X1	0.22UX1	0.21UX1	0.3X1	0.22UX1	0.2UX1	0.97X1	0.2UX1	0.2UX1	0.2UX1	0.4X1	0.34X1	0.2UX1	0.86X1
NWTPH-D-No Silica Gel	mg/L	8/25/2021	0.48Z	1.5Z	0.45Z	0.2U	0.2U	2.6Z	1.5Z	1.0Z	4.0Z	2.7Z	--	--	1.4Z	--	--	6.2Z	--	--	0.22Z	3.7Z	4.5Z	--	6.2Z
NWTPH-D-SG	mg/L	8/25/2022	0.15UX1	0.15UX1	0.15UX1	0.15UX1	0.15UX1	0.22X1	0.54X1	0.57X1	0.6X1	0.72X1	--	--	0.36X1	--	--	0.34X1	--	--	0.15UX1	0.24X1	0.62X1	--	0.88X1
NWTPH-D-SG	mg/L	8/9/2023	0.05U	0.05U	0.05U	0.05U	0.05U	0.15	0.31	0.34	0.45	0.34	--	--	0.21	--	--	0.22	--	--	0.05U	0.055U	0.14	--	0.68
NWTPH-G	ug/L	8/10/2015	50U	50U	50U	50U	50U	50U	235	554	703	336	50U	50U	171	50U	50U	248	50U	50U	255	50U	50U	84.1	50U
NWTPH-G	ug/L	11/9/2015	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	51.8	50U
NWTPH-G	ug/L	2/8/2016	50U	50U	50U	50U	50U	50U	334	50U	50U	79.2	50U	616	290	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U
NWTPH-G	ug/L	5/3/2016	50U	50U	50U	50U	50U	164	290	712	1730	543	50U	50U	296	50U	50U	50U	50U	50U	1440	50U	50U	58.7	50U
NWTPH-G	ug/L	8/15/2016	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	93.4	50U	50U	50U	50U	50U	50U	148	50U
NWTPH-G	ug/L	11/14/2016	100U	100U	100U	100U	100U	400U	380	300	400U	400U	--	100U	100U	400U	100U	400U	400U	100U	400U	160	400U	100U	400U
NWTPH-G	ug/L	2/13/2017	100U	100U	100U	100U	100U	200	430	390	860	270	100U	100U	320	100U	100U	100U	100U	100U	230	100U	100U	100U	450
NWTPH-G	ug/L	5/10/2017	100U	100U	100U	100U	100U	130	500U	470O	1200O	500U	100U	100U	500U	100U	100U	140	100U	100U	360	100U	100U	100U	400U
NWTPH-G	ug/L	8/15/2017	100U	100U	100U	100U	100U	500U	100U	500U	1200O	500U	100U	100U	500U	100U	100U	500U	100U	100U	500U	500U	100U	100U	500U
NWTPH-G	ug/L	11/30/2017	100U	100U	100U	100U	100U	380O	540O	450O	990O	490O	400U	100U	380O	400U	100U	690O	100U	100U	350	380O	100UX	100U	600O
NWTPH-G	ug/L	5/16/2018	100U	100U	100U	400U	100U	230	630	370	1100	430	400U	100U	380	400U	100U	250	400U	100U	730	150	220	100U	710
NWTPH-G	ug/L	11/15/2018	100U	100U	100U	--	400U	400U	100U	100U	100U	100U	100U	100U	100U	400U	100U	100U	400U	400U	400U	400U	400U	400U	400U
NWTPH-G	ug/L	5/29/2019	100U	100U	100U	100U	100U	170O	500U	500U	790O	500U	500U	100U	500U	500U	100U	500U	100U	100U	330	250O	160O	100U	500U
NWTPH-G	ug/L	5/27/2020	100U	100U	100U	100U	100U	200O	520O	400O	900O	480O	100U	100U	370O	100U	100U	440O	100U	100U	280	190O	160O	100U	640O
NWTPH-G	ug/L	8/25/2021	100U	100U	100U	100U	100U	400U	400U	400U	510O	400U	--	--	400U	--	--	400U	--	--	400U	400U	100U	--	400U
NWTPH-G	ug/L	8/25/2022	100U	100U	100U	100U	100U	170	560	540	950	540	--	--	430	--	--	360	--	--	230	100U	140	--	660
NWTPH-G	ug/L	8/9/2023	100U	100	100U	100U	100U	140	380	450	940	450	--	--	300	--	--	360	--	--	130	100U	100U	--	410
NWTPH-LO-No Silica Gel	mg/L	8/10/2015	0.13Z	0.65Z	0.858Z	0.1U	0.1U	0.659Z	0.1U	0.1U	6.29Z	0.1U	0.1U	0.1U	0.1U	0.1U	0.151Z	5.58Z	0.57Z	0.1U	0.1U	2.44Z	2.17Z	0.196Z	0.1U
NWTPH-LO	mg/L	11/9/2015	0.1U	0.253	0.1U	0.1U	0.1U	0.1U	0.1U	0.76	3.83	0.1U	0.1U	0.1U	0.1U	0.1U	0.104	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U
NWTPH-LO	mg/L	2/8/2016	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.16	2.28	0.104U	0.1U	0.146	0.1U	0.114	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U
NWTPH-LO	mg/L	5/3/2016	0.1U	0.446	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	6.3	0.1U	0.524	0.338	0.103U	0.1U	0.1U	4.21	0.331	0.1U	0.1U	1.72	2.32	0.1U	0.1U
NWTPH-LO	mg/L	8/15/2016	0.1U	0.707	0.314	0.1U	0.1U	0.1U	0.1U	0.24	4.04	0.1U	0.593	0.118	0.1U	0.1U	0.15	0.1U	0.19	0.1U	0.1U	0.1U	0.1U	0.144	1.47
NWTPH-LO-No Silica Gel	mg/L	11/14/2016	0.41U	0.41U	0.41U	0.41U	0.41U	0.93Z	0.52Z	0.46Z	2.3Z	2.8Z	--	0.45Z	0.41U	0.42U	0.41U	2.9Z	0.5Z	0.41U	0.4U	1.5Z	1.9Z	0.41U	1.3Z
NWTPH-LO	mg/L	2/13/2017	0.41UX	0.42UX	0.41UX	0.41UX	0.41UX	0.41UX	0.41UX	0.41UX	0.41UX	0.41UX	0.4U	0.41UX	0.41UX	0.49UX	0.41UX	0.41UX	0.4UX	0.41UX	0.41UX	0.41UX	0.42UX	0.41UX	0.41UX
NWTPH-LO	mg/L	5/10/2017	0.42UX	0.41UX	0.41UX	0.41UX	0.41UX	0.41UX	0.41UX	0.41UX	0.41UX	0.41UX	0.42UX	0.41UX	0.41UX	0.42UX	0.41UX	0.41UX	0.4UX	0.41UX	0.41UX	0.41UX	0.41UX	0.41UX	0.41UX
NWTPH-LO	mg/L	8/15/2017	0.41UX1	0.41UX1	0.41UX1	0.4UX1	0.41UX1	0.41UX1	0.41UX1	0.41UX1	0.41UX1	0.41UX1	0.42UX1	0.41UX1	0.41UX1	0.42UX1	0.41UX1	0.41UX1	0.41UX1	0.4UX1	0.41UX1	0.41UX1	0.41UX1	0.41UX1	0.41UX1
NWTPH-LO	mg/L	11/30/2017	0.41UX1	0.41UX1	0.4UX1	0.4UX1	0.41UX1	0.41UX1	0.41UX1	0.41UX1	0.41UX1	0.41UX1	0.41UX1	0.41UX1	0.41UX1	0.42UX1	0.41UX1	0.41UX1	0.4UX1	0.4UX1	0.41UX1	0.41UX1	Error	0.41UX1	0.47X1,N
NWTPH-LO	mg/L	5/16/2018	0.41UX1	0.41UX1	0.41UX1	0.4UX1	0.41UX1	0.41UX1	0.41UX1	0.41UX1	0.41UX1	0.41UX1	0.49UX1	0.41UX1	0.41UX1	0.49UX1	0.41UX1	0.41UX1	0.4UX1	0.41UX1	0.41UX1	0.41UX1	0.41UX1	0.41UX1	0.41UX1
NWTPH-LO	mg/L	11/15/2018	0.4UX1	0.41UX1	0.4UX1	--	0.41UX1	0.4UX1	0.41UX1	0.41UX1	0.41UX1	0.41UX1	0.41UX1	0.4UX1	0.41UX1	0.41UX1	0.41UX1	0.41UX1	0.4UX1	0.4UX1	0.41UX1	0.41UX1	0.41UX1	0.4UX1	0.4UX1
NWTPH-LO	mg/L	5/29/2019	0.41UX1	0.41UX1	0.41UX1	0.4UX1	0.41UX1	0.41UX1	0.41UX1	0.41UX1	0.41UX1	0.41UX1	0.41UX1	0.41UX1	0.4UX1	0.41UX1	0.41UX1	0.41UX1	0.4UX1	0.4UX1	0.4UX1	0.4UX1	0.41UX1	0.41UX1	0.41UX1
NWTPH-LO	mg/L	5/27/2020	0.21UX1	0.21UX1	0.2UX1	0.2UX1	0.21UX1	0.2UX1	0.21UX1	0.21UX1	0.2UX1	0.21UX1	0.22UX1	0.21UX1	0.21UX1	0.22UX1	0.2UX1	0.21UX1	0.2UX1	0.2UX1	0.2UX1	0.2UX1	0.2UX1	0.2UX1	0.2UX1
NWTPH-LO-No Silica Gel	mg/L	8/25/2021	0.66Z	1.1Z	0.48NZ	0.35Z	0.26Z	1.3NZ	0.43NZ	0.43Z	2.3NZ	1.8NZ	--	--	0.55NZ	--	--	3.1NZ	--	--	0.27Z	1.1NZ	2.3NZ	--	1.7NZ
NWTPH-LO	mg/L	8/25/2022	0.2UX1	0.2UX1	0.2UX1	0.2UX1	0.2UX1	0.2UX1	0.2UX1	0.2UX1	0.2UX1	0.2UX1	--	--	0.2UX1	--	--	0.2UX1	--	--	0.2UX1	0.2UX1	0.27X1,N1	--	0.2UX1
NWTPH-LO	mg/L	8/9/2023	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	--	--	0.25U	--	--	0.25U	--	--	0.25U	0.25U	0.25U	--	0.25U

Notes:

mg/L: milligrams per liter

ug/L: micrograms per liter

deg C: degrees Celcius

umhos/cm: micromhos per centimeter, equivalient to microsiemens per centimeter (uS/cm)

pH: logarithmic units, -log[H^+]

mV: millivolts

NWTPH: Northwest Total Petroleum Hydrocarbon analysis, with distillate range indicated (diesel-, gasoline-, and oil-range)

SG: Analysis performed using silica gel.

U: non-detect at reporting limit shown.

J: Estimated value, result may be between reporting and method detection limits.

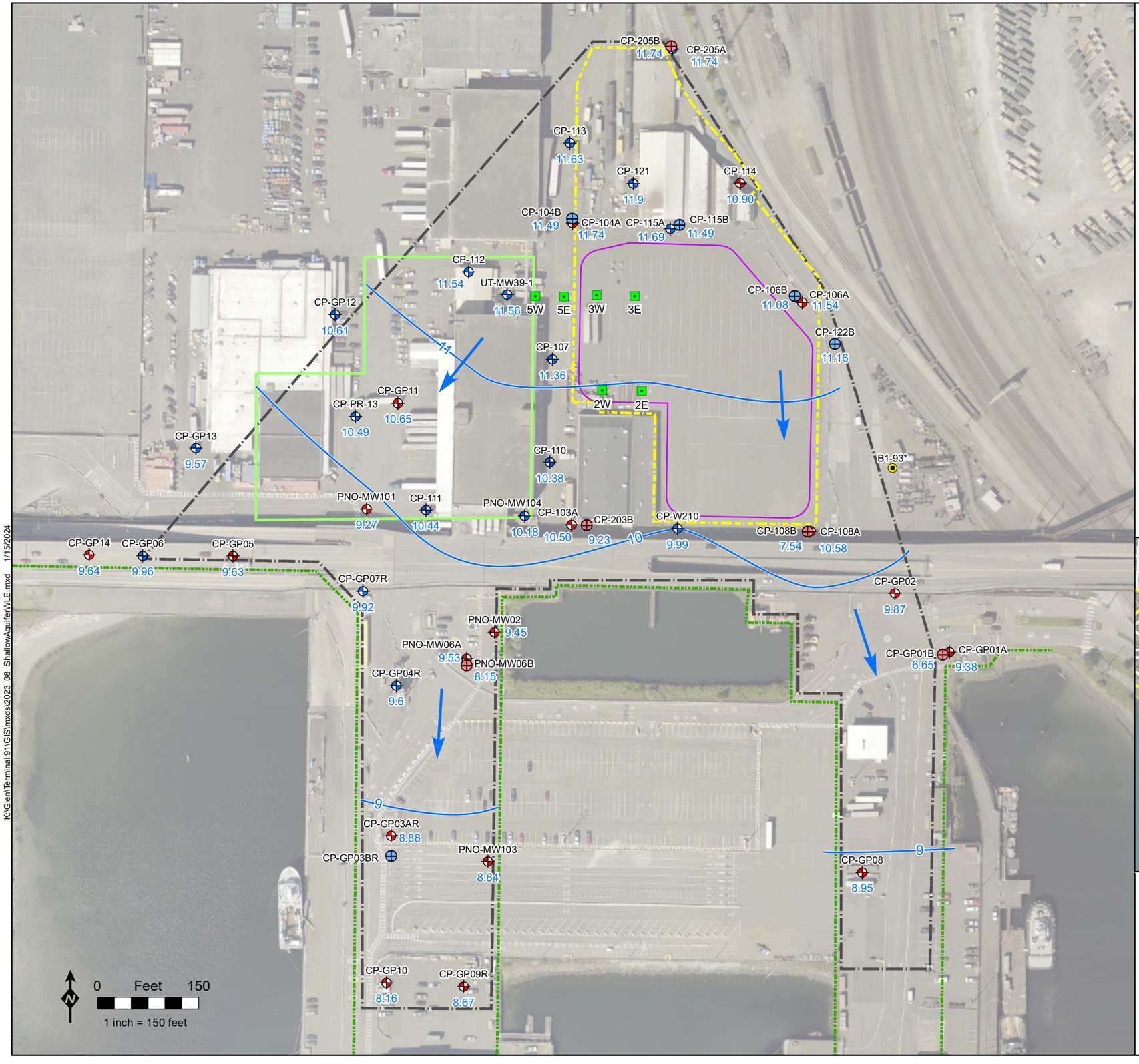
O: Hydrocarbons indicative of heavier fuels are present in the sample and are impacting the gasoline result.

CPOC: Conditional Point of Compliance

Z: sample did not include silical gel preparation and the detected result is biased high relative to the CMP-defined analytical method.

X1: Sample extract treated with a sulfuric acid/silica gel cleanup procedure.

N1: Hydrocarbons in diesel range are impacting lube oil range results.



K:\Glen\Terminal 91\GIS\mxds\2023_08_ShallowAquiferWLE.mxd 1/15/2024

- Shallow Aquifer Groundwater Elevation Contours
- Shallow Aquifer Flow Directions

Monitoring Well Network

- Shallow Aquifer Well
- Shallow Groundwater Sampling Well
- Deep Aquifer Well
- Deep Groundwater Sampling Well
- Piezometer
- LNAPL Trench Riser Pipe

- Bulkhead
- Tank Farm
- Tank Farm Affected Area (TFAA) Boundary
- Bentonite Cutoff Wall
- AOC 11 (Old Tank Farm)

Notes:
All deep wells and shallow well CP-114 were not used for contouring.
* Depth to water was incorrectly entered in the field at B1-93.
The value is an outlier and not representative.

Figure 1
Shallow Aquifer Potentiometric Surface Map
August 2023

Port of Seattle Terminal 91

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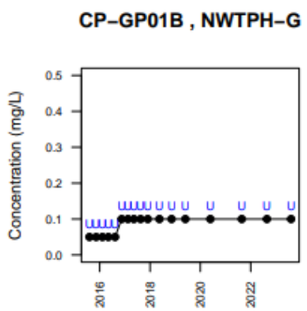
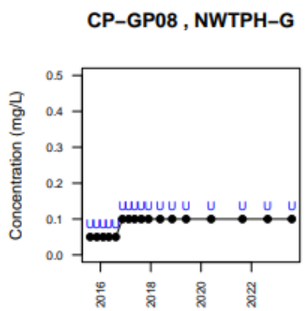
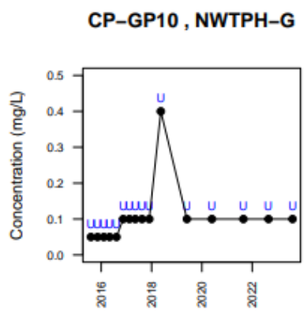
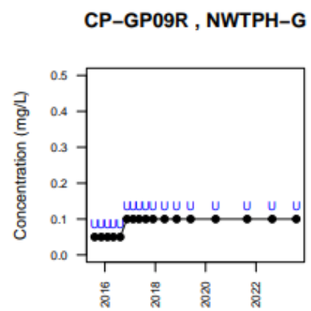
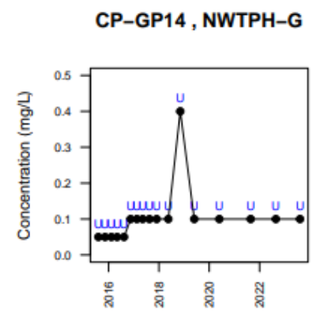
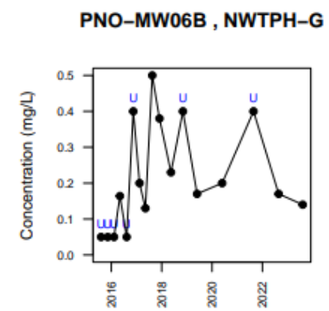


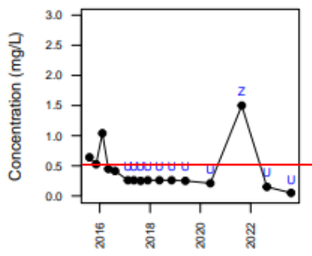


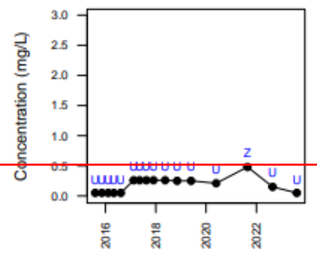


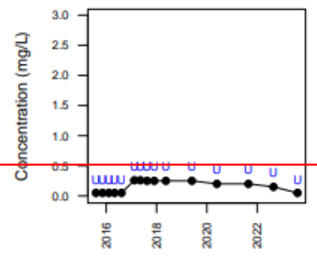


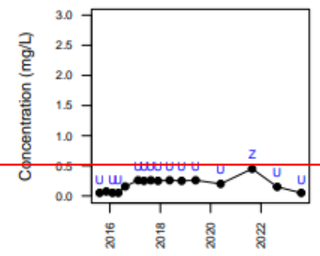


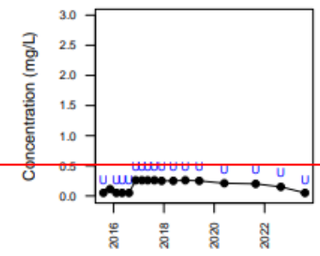


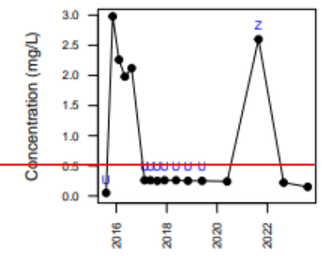


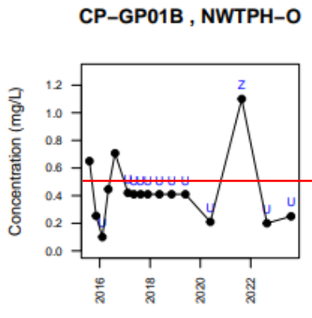


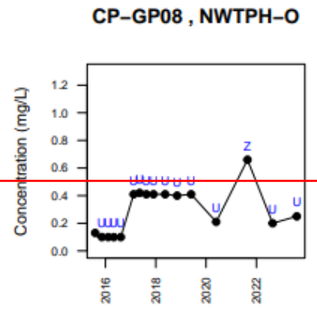


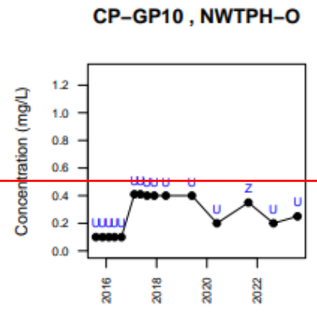


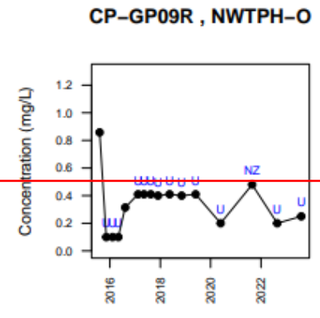


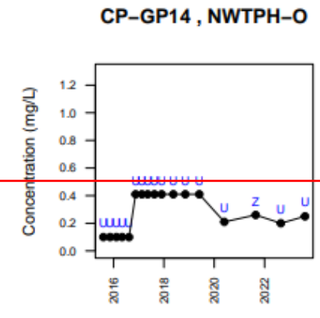


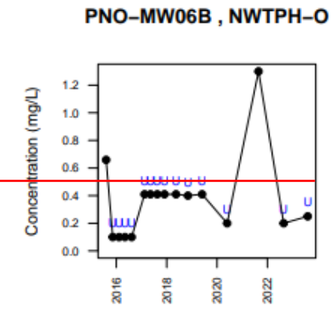








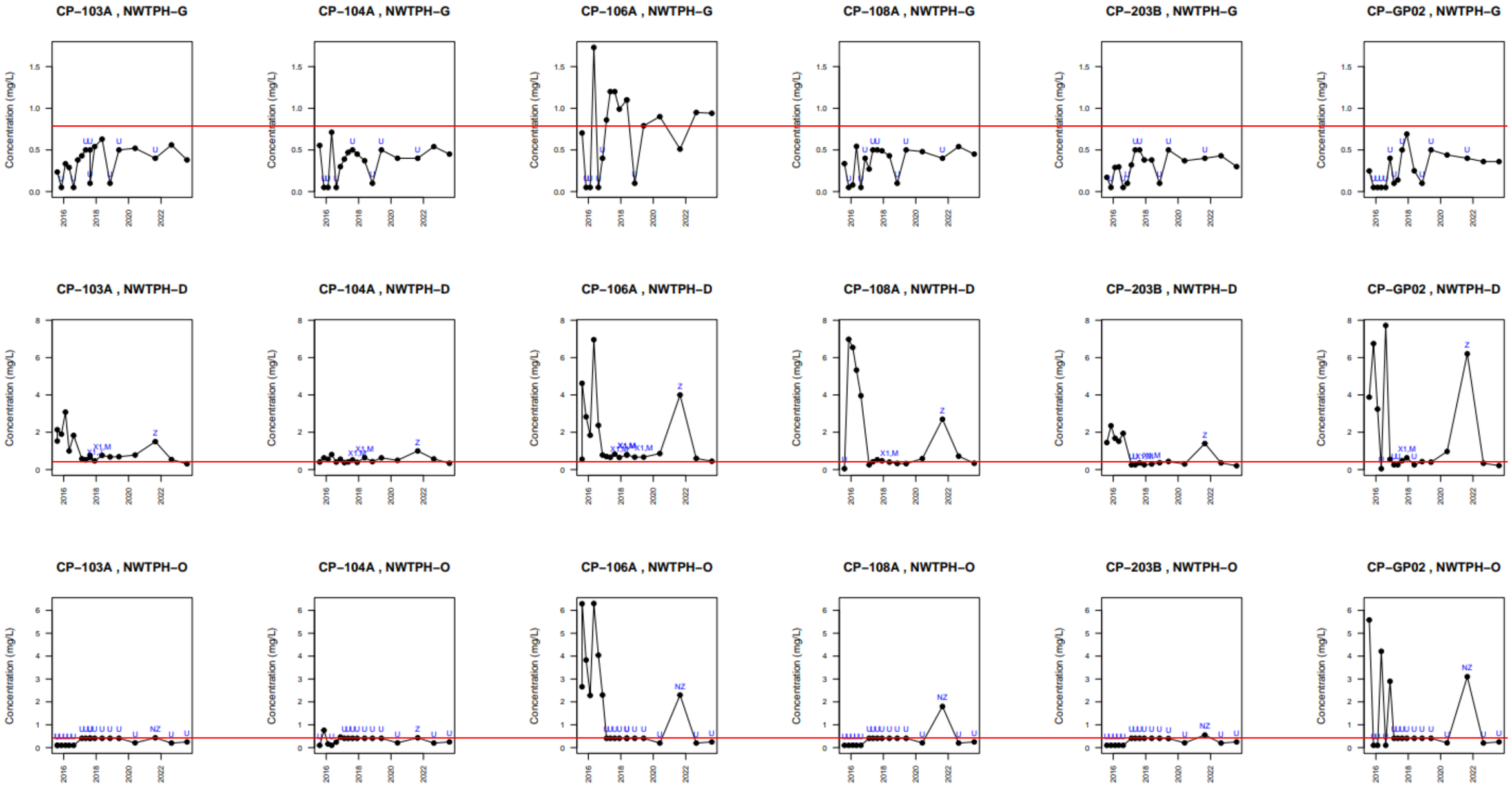




See Table 3 for data qualifiers shown in blue text.
Red lines are the cleanup levels for TPH-G (0.8 mg/L) and TPH-D/O (0.5 mg/L); line not shown where cleanup levels are off-scale.
All Z-flagged data are biased high and should not be compared to cleanup levels.

Figure 2a. CPOC Well Time Series TPH Plots
Terminal 91

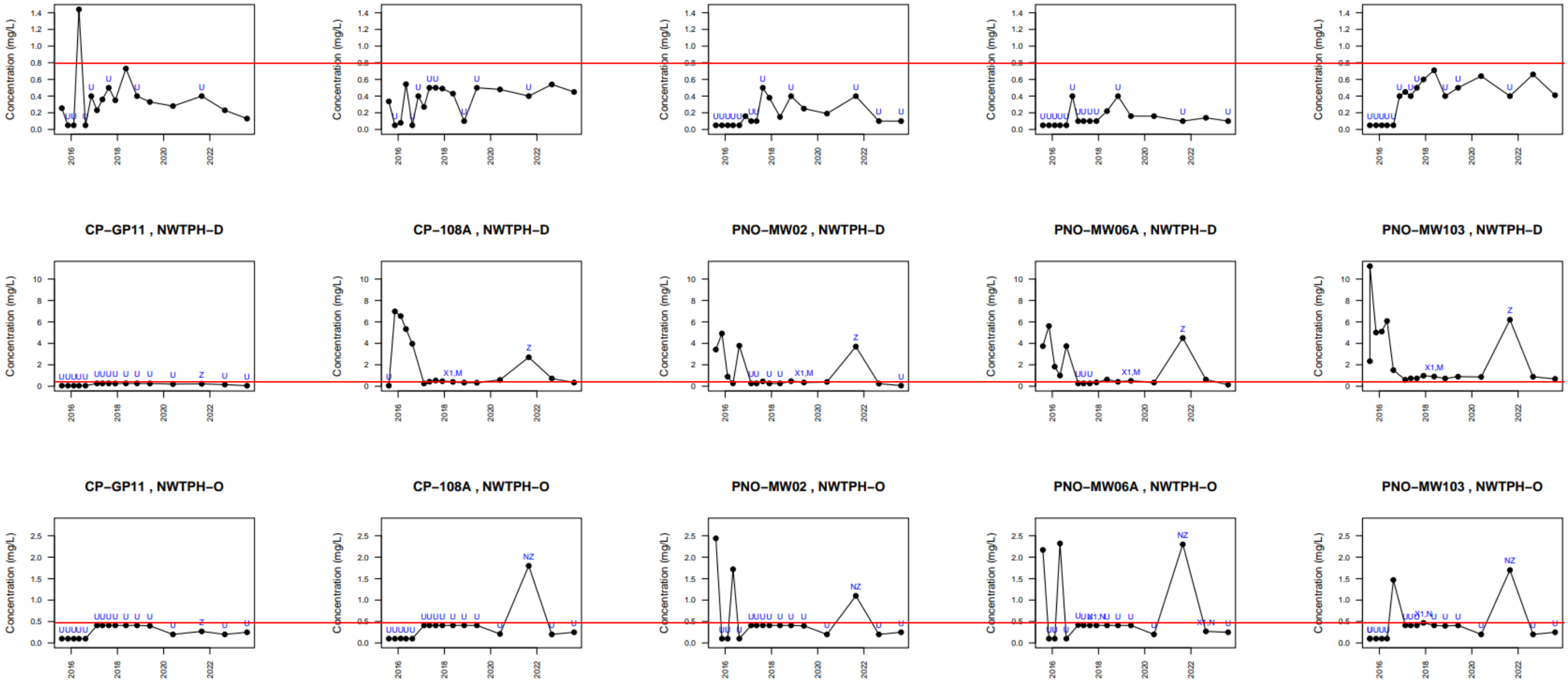
AECOM MOTT MACDONALD



See Table 3 for data qualifiers shown in blue text.
Red lines are the cleanup levels for TPH-G (0.8 mg/L) and TPH-D/O (0.5 mg/L); line not shown where cleanup levels are off-scale.
All Z-flagged data are biased high and should not be compared to cleanup levels.

Figure 2b. Northern Well Time Series TPH Plots
Terminal 91

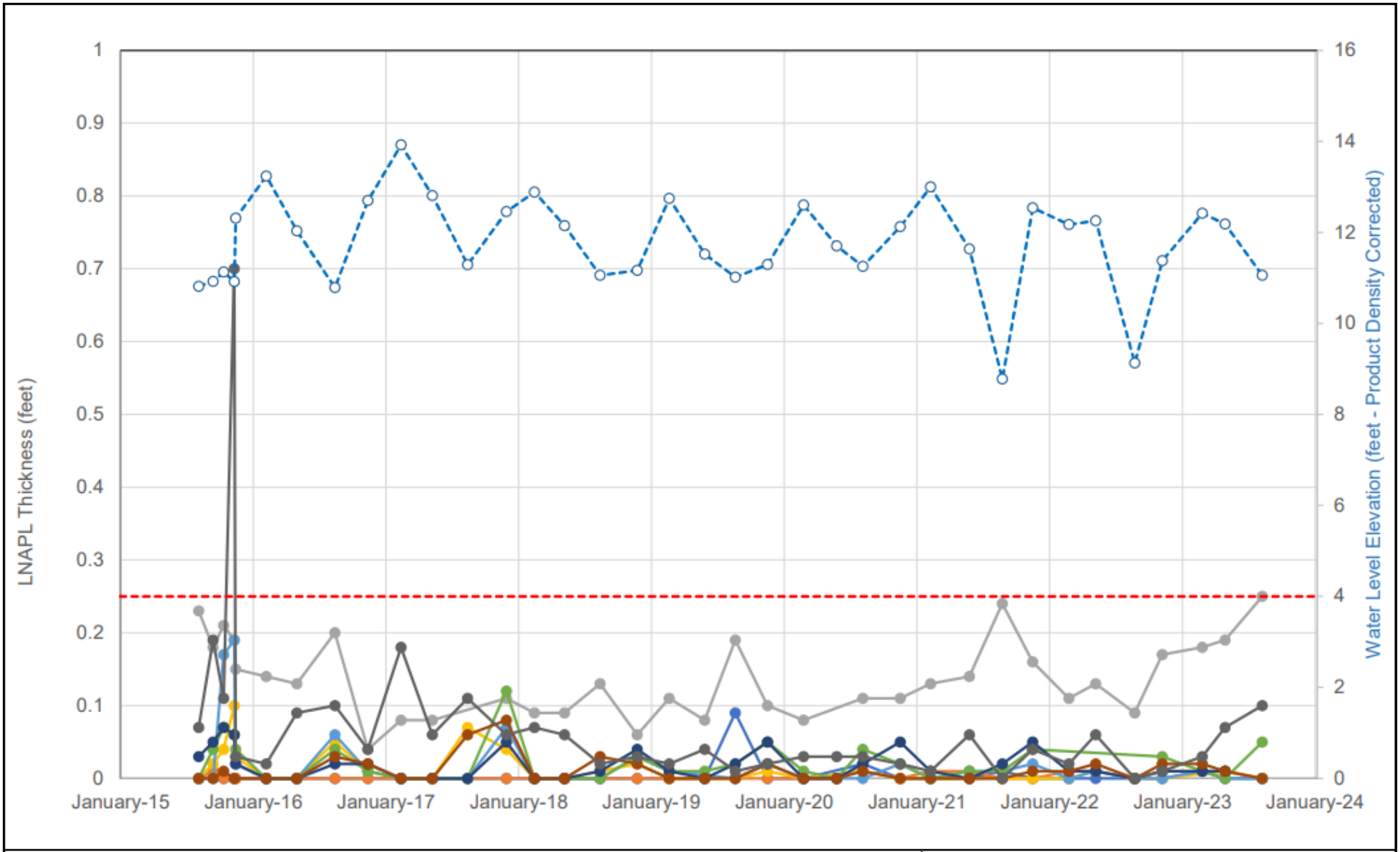
AECOM MOTT MACDONALD



See Table 3 for data qualifiers shown in blue text.
Red lines are the cleanup levels for TPH-G (0.8 mg/L) and TPH-D/O (0.5 mg/L); line not shown where cleanup levels are off-scale.
All Z-flagged data are biased high and should not be compared to cleanup levels.

Figure 2c. Southern Well Time Series TPH Plots
Terminal 91

AECOM MOTT MACDONALD



The water level hydrograph for location Trench 5W is plotted to show seasonal high and low water levels relative to LNAPL thickness variations as discussed in text. LNAPL thickness is typically greatest during seasonal low water levels. Trench 5W water elevations are corrected for LNAPL presence assuming product density of 0.8 grams per milliliter.

Figure 3
LNAPL Thickness Trends

Terminal 91

AECOM MOTT MACDONALD

A. Field Forms (Electronic Only)

GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: CP-103A

Sampling Event: T-91

Sample #:

Project Number: JG1601
Project Name: Terminal 91 (T91)
Project Address: 2001 W Garfield St.
Client Name: Port of Seattle
Laboratory: OnSite Environmental, Redmond, WA
Chain-of-Custody (yes/no):
Shipment Method:

Date: 8/11/23
Location: T-91
Sampled By: EE
Purged By: EE
Date Sent to Lab:
Field CC Sample Number:
Sample Split:

Depth to Water (feet): 6.72 ~~8.28~~
Depth of Well (feet): 15

Purge Volume Measurement Method:
Purge Date/Time: 8/11/23 1010

Reference Point: top of casing, N side if no notch
Sampling Equipment: Peristaltic Pump

Purging Equipment: Peristaltic Pump
Water Level Probe Used:

Casing Volume Constants (CVC): 2-inch = **0.16** gpf ; 4-inch = **0.656** gpf ; 6-inch = **1.47** gpf PV=($\pi r^2 h$) (7.48 gal/ft³)

Purge Volume = ft of water 8.28 x CVC 0.16 x Casing Volumes 1 = 1.25 (1.23) gallons x3 = 4 (3.97)

TIME (2400 hr)	CUMULATIVE VOLUME (gal)	pH (units)	EC ~~(umhos/cm 25 c)~~ mS/cm	Temp. (C)	Diss O_2 (mg/L)	ORP (mV)	TURBIDITY (visual)
1011	6.97 0	7.43	0.905	16.10	1.81	-155.8	600 ml/min
1014	6.91 0.5	7.27	0.591	15.85	1.06	-147.1	↓
1018	6.99 1	7.24	0.512	15.80	0.82	-142.6	↓
1022	6.95 1.5	7.24	0.500	15.92	0.72	-134.6	500 ml/min
1025	6.99 2	7.24	0.497	15.81	0.67	-133.8	↓
1029	7.00 2.5	7.24	0.495	15.80	0.63	-130.7	600 ml/min
1033	6.99 3	7.24	0.494	15.79	0.60	-127.9	↓
	~~3.5~~ 4						

Well Integrity: 1035

Bottle Inventory (check applicable rows) Day/Time Sampled:

Quantity:	Container:	Preservatives:	Filtered (type):	Remarks:
All Wells				
2	500 mL AG	HCl		NWTPH-Dx
3	40mL VOA	HCl		NWTPH-G
MS/MSD Samples				
3	40mL VOA	HCl		NWTPH-G

Maritime Operations: (206) 787-3751 Call if wells are covered. Kelli Goodwin is our main point of contact at Ops.

Signature:

Page 1 of 1

PgG

GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: CP-104A

Sampling Event: August 2023

Sample #:

Project Number: JG1601	Date: 8/11/2023
Project Name: Terminal 91 (T91)	Location: tank farm
Project Address: 2001 W Garfield St.	Sampled By: AP
Client Name: Port of Seattle	Purged By: AP
Laboratory: OnSite Environmental, Redmond, WA + FedB	Date Sent to Lab:
Chain-of-Custody (**yes**/no):	Field CC Sample Number:
Shipment Method:	Sample Split:

Depth to Water (feet): 5.78	Purge Volume Measurement Method:
Depth of Well (feet): 15.00	Purge Date/Time: 8/11/2023 1031
Reference Point: top of casing, N side if no notch	Purging Equipment: Peristaltic Pump
Sampling Equipment: Peristaltic Pump	Water Level Probe Used:

Casing Volume Constants (CVC): 2-inch = **0.16** gpf ; 4-inch = **0.656** gpf ; 6-inch = **1.47** gpf PV=($\pi r^2 h$) (7.48 gal/ft³)

Purge Volume = ft of water 9.22 x CVC 0.16 x Casing Volumes 1 = 1.48 gallons (3 = 4.43)

Q (mL/min)	TIME (2400 hr)	CUMULATIVE VOLUME (gal)	pH (units)	EC (umhos/cm 25 c)	Temp. (C)	Diss O_2 (mg/L)	ORP (mV)	TURBIDITY (visual)	DTW (ft)
375	1037	0.5	6.98	1077	18.28	3.42	-98.5	gray + bacteria	5.80
375	1043	1	7.06	995	18.54	2.66	-108.8	black flecks	5.80
400	1048	1.5	7.10	971	18.54	2.41	-114.3		5.80
425	1053	2	7.12	957	18.53	2.32	-118.1		5.80
450	1057	2.5	7.12	953	18.50	2.26	-120.0		5.80
-	1102	3	7.13	952	18.49	2.29	-121.5		5.81
450	1106	3.5	7.14	948	18.46	2.19	-122.9		-
	1108	3.75	7.14	948	18.46	2.22	-123.7		

Well Integrity: good - spider-webby

Bottle Inventory (check applicable rows) Day/Time Sampled: 8/11/2023 1110

Quantity:	Container:	Preservatives:	Filtered (type):	Remarks:
All Wells				
4 ~~2~~	500 mL AG	HCl		NWTPH-Dx
3	40mL VOA	HCl		NWTPH-G
MS/MSD Samples				
3	40mL VOA	HCl		NWTPH-G

Maritime Operations: (206) 787-3751 Call if wells are covered. Kelli Goodwin is our main point of contact at Ops.

Signature:

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GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: CP-106A

Sampling Event: August 2023

Sample #:

Project Number: JG1601	Date: 8/11/2023
Project Name: Terminal 91 (T91)	Location: tank farm
Project Address: 2001 W Garfield St.	Sampled By: AP
Client Name: Port of Seattle	Purged By: AP
Laboratory: OnSite Environmental, Redmond, WA + FaB	Date Sent to Lab:
Chain-of-Custody (**yes**/no):	Field CC Sample Number:
Shipment Method:	Sample Split:

Depth to Water (feet): 6.93	Purge Volume Measurement Method: cal. bucket
Depth of Well (feet): 15.00	Purge Date/Time: 8/11/2023 1140
Reference Point: top of casing, N side if no notch	Purging Equipment: Peristaltic Pump
Sampling Equipment: Peristaltic Pump	Water Level Probe Used:

Casing Volume Constants (CVC): 2-inch = **0.16** gpf ; 4-inch = **0.656** gpf ; 6-inch = **1.47** gpf PV=($\pi r^2 h$) (7.48 gal/ft³)

Purge Volume = ft of water _____ x CVC _____ x Casing Volumes _____ = _____ gallons

Q (mL/min)	TIME (2400 hr)	CUMULATIVE VOLUME (gal)	pH (units)	EC (umhos/cm 25 c)	Temp. (C)	Diss O_2 (mg/L)	ORP (mV)	TURBIDITY (visual)	DTW (ft)
450	1146	0.5	6.89	1308	20.81	9.26	-90.7	bacteria	6.98
	1151	1	6.87	1318	20.92	3.58	-95.3	↓	6.98
450	1156	1.5	6.86	1339	20.92	2.92	-99.0	↓	6.98
450	1201	2	6.85	1360	20.98	2.55	-101.7	small flecks	6.97
475	1205	2.5	6.85	1359	20.91	2.45	-103.2	↓	6.97
	1208	2.75	6.85	1369	20.90	2.45	-104.3	↓	6.98
	1210	3	6.85	1369	20.90	2.43	-105.0	clear	

Well Integrity: good

slight fuel odor

Bottle Inventory (check applicable rows) Day/Time Sampled: 8/11/2023 1215

Quantity:	Container:	Preservatives:	Filtered (type):	Remarks:
All Wells				
2	500 mL AG	HCl		NWTPH-Dx
3	40mL VOA	HCl		NWTPH-G
MS/MSD Samples				
3	40mL VOA	HCl		NWTPH-G

Maritime Operations: (206) 787-3751 Call if wells are covered. Kelli Goodwin is our main point of contact at Ops.

Signature:

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GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: CP-108A

Sampling Event: August 2023

Sample #:

Project Number: JG1601	Date: 8/11/2023
Project Name: Terminal 91 (T91)	Location: tank farm
Project Address: 2001 W Garfield St.	Sampled By: AP
Client Name: Port of Seattle	Purged By: AP
Laboratory: OnSite Environmental, Redmond, WA	Date Sent to Lab:
Chain-of-Custody (**yes**/no):	Field CC Sample Number:
Shipment Method:	Sample Split:

Depth to Water (feet): 6.63	Purge Volume Measurement Method: Cal. bucket
Depth of Well (feet): 15.00	Purge Date/Time: 8/11/2023 1241
Reference Point: top of casing, N side if no notch	Purging Equipment: Peristaltic Pump
Sampling Equipment: Peristaltic Pump	Water Level Probe Used: waterline 200 - Plaid orange

Casing Volume Constants (CVC): 2-inch = **0.16** gpf ; 4-inch = **0.656** gpf ; 6-inch = **1.47** gpf PV=(π r² h) (7.48 gal/ft³)

Purge Volume = ft of water 8.37 x CVC 0.16 x Casing Volumes 1 = 1.34 gallons (3 = 4.02)

Q (mL/min)	TIME (2400 hr)	CUMULATIVE VOLUME (gal)	pH (units)	EC (umhos/cm 25 c)	Temp. (C)	Diss O_2 (mg/L)	ORP (mV)	TURBIDITY (visual)	DTW (ft)
400	1247	0.5	6.59	685	17.41	7.26	-47.3	sl cloudy	7.32
325	1253	1	6.68	715	17.91	3.60	-57.4	" "	7.34
375	1259	1.5	6.79	804	18.03	2.95	-73.5		7.41
350	1304	2	6.89	827	18.02	2.65	-85.7		7.39
<350	1309	2.5	7.02	838	17.98	2.42	-100.5		7.38
375	1315	3	7.10	836	17.93	2.32	-110.2		7.43
350	1321	3.5	7.14	837	17.93	2.42	-117.1	↓	7.44
350	1324	~3.75	7.15	837	17.93	2.27	-120.2	clear	
	1327	~4	7.17	840	17.92	2.23	-123.1	clear	

Well Integrity: no bolts

fuel odor throughout purging

Bottle Inventory (check applicable rows) Day/Time Sampled: 8/11/2023 1330

Quantity:	Container:	Preservatives:	Filtered (type):	Remarks:
All Wells				
4	500 mL AG	HCl		NWTPH-Dx
3	40mL VOA	HCl		NWTPH-G
MS/MSD Samples				
3	40mL VOA	HCl		NWTPH-G

Maritime Operations: (206) 787-3751 Call if wells are covered. Kelli Goodwin is our main point of contact at Ops.

Signature:

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GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: CP- 203B

Sampling Event: _____ Sample #: _____

Project Number: JG1601	Date: 8/11/2023
Project Name: Terminal 91 (T91)	Location:
Project Address: 2001 W Garfield St.	Sampled By:
Client Name: Port of Seattle	Purged By: ER
Laboratory: OnSite Environmental, Redmond, WA	Date Sent to Lab:
Chain-of-Custody (**yes**/no):	Field CC Sample Number:
Shipment Method:	Sample Split:

Depth to Water (feet): 8.76 @ 1056	Purge Volume Measurement Method:
Depth of Well (feet): 59.95	Purge Date/Time:
Reference Point: top of casing, N side if no notch	Purging Equipment: Peristaltic Pump
Sampling Equipment: Peristaltic Pump	Water Level Probe Used:

Casing Volume Constants (CVC): 2-inch = **0.16** gpf ; 4-inch = **0.656** gpf ; 6-inch = **1.47** gpf PV=($\pi r^2 h$) (7.48 gal/ft³)

Purge Volume = ft of water 51.19 x CVC 0.16 x Casing Volumes 1 = 8.19 (8.25) gallons

TIME (2400 hr)	CUMULATIVE VOLUME (gal)	pH (units)	EC ~~umhos~~ mS/cm 25 c)	Temp. (C)	Diss O_2 (mg/L)	ORP (mV)	TURBIDITY (visual)	
1058	8.80 0	7.22	0.574	16.61	3.05	-43.8		500 mL/min
1101	8.81 0.5	7.24	0.577	15.52	2.64	-54.6		1
1105	8.81 1	7.26	0.574	14.87	2.35	-59.5		
1109	8.80 1.5	7.28	0.572	14.49	2.17	-61.3		
1112	8.82 2	7.29	0.570	14.22	2.01	-623		800 mL/min
1115	8.82 2.5	7.30	0.570	14.20	1.88	-628		
1117	8.83 3	7.31	0.570	14.23	1.75	-63.1		
1120	8.83 3.5	7.32	0.570	14.24	1.64	-63.2		
1123	8.83 4	7.34	0.572	14.25	1.37	-637		

Well Integrity:

Bottle Inventory (check applicable rows) Day/Time Sampled: _____

Quantity:	Container:	Preservatives:	Filtered (type):	Remarks:
All Wells				
2	500 mL AG	HCl		NWTPH-Dx
3	40mL VOA	HCl		NWTPH-G
MS/MSD Samples				
3	40mL VOA	HCl		NWTPH-G

Maritime Operations: (206) 787-3751 Call if wells are covered. Kelli Goodwin is our main point of contact at Ops.

Signature: _____

PgG

GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: CP-203B

Sampling Event: _____ Sample #: _____

Project Number:	JG1601	Date:	
Project Name:	Terminal 91 (T91)	Location:	
Project Address:	2001 W Garfield St.	Sampled By:	
Client Name:	Port of Seattle	Purged By:	
Laboratory:	OnSite Environmental, Redmond, WA	Date Sent to Lab:	
Chain-of-Custody (**yes**/no):		Field CC Sample Number:	
Shipment Method:		Sample Split:	

Depth to Water (feet): _____ Purge Volume Measurement Method: _____

Depth of Well (feet): _____ Purge Date/Time: _____

Reference Point: top of casing, N side if no notch Purging Equipment: Peristaltic Pump

Sampling Equipment: Peristaltic Pump Water Level Probe Used: _____

Casing Volume Constants (CVC): 2-inch = **0.16** gpf ; 4-inch = **0.656** gpf ; 6-inch = **1.47** gpf PV=(π r^2 h) (7.48 gal/ft^3)

Purge Volume = ft of water _____ x CVC _____ x Casing Volumes _____ = _____ gallons

TIME (2400 hr)	CUMULATIVE VOLUME (gal)	pH (units)	EC (umhos/cm 25 c)	Temp. (C)	Diss O_2 (mg/L)	ORP (mV)	TURBIDITY (visual)
1126	8.82 4.5	7.36	0.574	14.26	1.28	-64.6	
1129	8.81 5	7.38	0.575	14.29	1.24	-64.8	
1132	8.82 5.5	7.39	0.576	14.27	1.17	-65.5	
1134	8.81 6	7.40	0.577	14.28	1.11	-65.4	
1137	8.80 6.5	7.41	0.577	14.30	1.06	-65.2	
1139	8.81 7	7.41	0.578	14.29	0.99	-64.9	
1142	8.81 7.5	7.42	0.578	14.30	0.94	-64.7	
1145	8	7.42	0.578	14.29	0.93	-64.5	
	8.5						

Well Integrity:

1147

Bottle Inventory (check applicable rows) Day/Time Sampled: _____

Quantity:	Container:	Preservatives:	Filtered (type):	Remarks:
All Wells				
2	500 mL AG	HCl		NWTPH-Dx
3	40mL VOA	HCl		NWTPH-G
MS/MSD Samples				
3	40mL VOA	HCl		NWTPH-G

Maritime Operations: (206) 787-3751 Call if wells are covered. Kelli Goodwin is our main point of contact at Ops.

Signature: _____

PgG

GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: CP-GP01B

Sampling Event: _____ Sample #: _____

Project Number: JG1601
Project Name: Terminal 91 (T91)
Project Address: 2001 W Garfield St.
Client Name: Port of Seattle
Laboratory: OnSite Environmental, Redmond, WA
Chain-of-Custody (**yes**/no): _____
Shipment Method: _____

Date: 8/11/2023
Location: _____
Sampled By: _____
Purged By: ER
Date Sent to Lab: _____
Field CC Sample Number: _____
Sample Split: _____

Depth to Water (feet): 9.80 @ 1321
Depth of Well (feet): 64.5
Reference Point: top of casing, N side if no notch
Sampling Equipment: Peristaltic Pump

Purge Volume Measurement Method: _____
Purge Date/Time: _____
Purging Equipment: Peristaltic Pump
Water Level Probe Used: _____

Casing Volume Constants (CVC): 2-inch = **0.16** gpf ; 4-inch = **0.656** gpf ; 6-inch = **1.47** gpf PV=($\pi r^2 h$) (7.48 gal/ft³)

Purge Volume = ft of water 54 x CVC 0.16 x Casing Volumes 1 = 8.75 gallons

TIME (2400 hr)	CUMULATIVE VOLUME (gal)	pH (units)	EC ~~(umhos/cm 25 c)~~ mS	Temp. (C)	Diss O_2 (mg/L)	ORP (mV)	TURBIDITY (visual)
1322	0	8.26	4.879	18.44	2.28	-135.2	700
1325 9.78	0.5	8.35	4858	17.45	1.05	-143.4	
1328 9.76	1	8.42	4.851	16.47	0.83	-157.5	
1330 9.75	1.5	8.45	4.827	16.15	0.45	-162.8	
1333 9.7	2	8.46	4.827	15.89	1.01	-167.7	
1336 9.68	2.5	8.45	4.828	15.86	0.83	-168.1	
1339 9.65	3	8.46	4.818	15.86	0.35	-167.8	
1342 9.61	3.5	8.46	4.826	15.84	0.71	-166.7	
1345 9.59	4	8.46	4.822	15.83	0.67	-166.0	

Well Integrity: water is brown. HC/sulfur odor.

Bottle Inventory (check applicable rows) Day/Time Sampled: _____

Quantity:	Container:	Preservatives:	Filtered (type):	Remarks:
All Wells				
2	500 mL AG	HCl		NWTPH-Dx
3	40mL VOA	HCl		NWTPH-G
MS/MSD Samplles				
3	40mL VOA	HCl		NWTPH-G

Maritime Operations: (206) 787-3751 Call if wells are covered. Kelli Goodwin is our main point of contact at Ops.

Signature: _____

PgG

GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: CPGP01B

Sampling Event: _____ Sample #: _____

Project Number: JG1601	Date:
Project Name: Terminal 91 (T91)	Location:
Project Address: 2001 W Garfield St.	Sampled By:
Client Name: Port of Seattle	Purged By:
Laboratory: OnSite Environmental, Redmond, WA	Date Sent to Lab:
Chain-of-Custody (**yes**/no):	Field CC Sample Number:
Shipment Method:	Sample Split:

Depth to Water (feet): _____ Purge Volume Measurement Method: _____

Depth of Well (feet): _____ Purge Date/Time: _____

Reference Point: top of casing, N side if no notch Purging Equipment: Peristaltic Pump

Sampling Equipment: Peristaltic Pump Water Level Probe Used: _____

Casing Volume Constants (CVC): 2-inch = **0.16** gpf ; 4-inch = **0.656** gpf ; 6-inch = **1.47** gpf PV=($\pi r^2 h$) (7.48 gal/ft³)

Purge Volume = ft of water _____ x CVC _____ x Casing Volumes _____ = _____ gallons

TIME (2400 hr)	CUMULATIVE VOLUME (gal)	pH (units)	EC (umhos/cm 25 c)	Temp. (C)	Diss O_2 (mg/L)	ORP (mV)	TURBIDITY (visual)
1348	9.55 4.5	8.47	4.839	15.79	0.63	-164.9	700 mL/min
1351	9.53 5	8.46	4.857	15.76	0.62	-163.2	
1353	9.50 5.5	8.50	5.236	15.73	0.60	-164.4	
1356	9.44 6	8.52	5.380	15.69	0.59	-166.3	
1358	9.43 6.5	8.52	5.549	15.71	0.57	-168.5	
1401	9.40 7	8.54	5.688	15.67	0.55	-168.9	
1404	9.36 7.5	8.53	5.773	15.68	0.55	-166.6	
1406	9.32 8	8.54	5.777	15.67	0.56	-168.2	
1409	9.32 8.5	8.54	5.792	15.69	0.59	-167.6	

Well Integrity:

1410

Bottle Inventory (check applicable rows) Day/Time Sampled: _____

Quantity:	Container:	Preservatives:	Filtered (type):	Remarks:
All Wells				
2	500 mL AG	HCl		NWTPH-Dx
3	40mL VOA	HCl		NWTPH-G
MS/MSD Samples				
3	40mL VOA	HCl		NWTPH-G

Maritime Operations: (206) 787-3751 Call if wells are covered. Kelli Goodwin is our main point of contact at Ops.

Signature: _____

PgG

GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: CP-GP02

Sampling Event: August 2023

Sample #:

Project Number: JG1601	Date: 8/11/2023
Project Name: Terminal 91 (T91)	Location: entrance gate
Project Address: 2001 W Garfield St.	Sampled By: AP
Client Name: Port of Seattle	Purged By: AP
Laboratory: OnSite Environmental, Redmond, WA	Date Sent to Lab:
Chain-of-Custody (**yes**/no):	Field CC Sample Number:
Shipment Method:	Sample Split:

Depth to Water (feet): 7.69	Purge Volume Measurement Method: cal. bucket
Depth of Well (feet): 20.10	Purge Date/Time: 8/11/2023 1353
Reference Point: top of casing, N side if no notch	Purging Equipment: Peristaltic Pump
Sampling Equipment: Peristaltic Pump	Water Level Probe Used: waterline 200 - PGG orange

Casing Volume Constants (CVC): 2-inch = **0.16** gpf ; 4-inch = **0.656** gpf ; 6-inch = **1.47** gpf PV=($\pi r^2 h$) (7.48 gal/ft³)

Purge Volume = ft of water 12.41 x CVC 0.16 x Casing Volumes 1 = 1.99 gallons (3=5.96)

TIME (2400 hr)	CUMULATIVE VOLUME (gal)	pH (units)	EC (umhos/cm 25 c)	Temp. (C)	Diss O_2 (mg/L)	ORP (mV)	TURBIDITY (visual)	DTW (ft)
Q (mL/min)								
400 1400	0.5	6.77	2341	18.50	3.30	-103.2	floaters	8.02
350 1405	1	6.76	2277	18.18	2.77	-107.7	" "	7.98
350 1408	1.25	6.78	2217	18.21	2.75	-108.9		7.97
375 1416	2	6.77	2111	17.95	2.78	-107.6		7.99
1421	2.5	6.77	2048	17.92	2.87	-107.1		7.99
<400 1427	3	6.77	2005	17.92	2.90	-106.5		7.99
1429	3.25	6.77	1996	17.89	2.89	-106.4		
1432	3.5	6.77	1967	17.90	2.85	-105.9		
1435	3.75	6.77	1958	17.92	2.92	-105.7		7.99

Well Integrity:

no bolts - tubing barely long enough

Bottle Inventory (check applicable rows) Day/Time Sampled: 8/11/2023 1440

Quantity:	Container:	Preservatives:	Filtered (type):	Remarks:
All Wells				
4 ~~3~~	500 mL AG	HCl		NWTPH-Dx
3	40mL VOA	HCl		NWTPH-G
MS/MSD Samples				
3	40mL VOA	HCl		NWTPH-G

+MS/MSD = 14 total bottles

Maritime Operations: (206) 787-3751 Call if wells are covered. Kelli Goodwin is our main point of contact at Ops.

Signature:

PgG

GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: CP-GP08

Sampling Event: _____ Sample #: _____

Project Number: JG1601
Project Name: Terminal 91 (T91)
Project Address: 2001 W Garfield St.
Client Name: Port of Seattle
Laboratory: OnSite Environmental, Redmond, WA
Chain-of-Custody (**yes**/no): _____
Shipment Method: _____

Date: 8/11/2023
Location: _____
Sampled By: ER
Purged By: _____
Date Sent to Lab: _____
Field CC Sample Number: _____
Sample Split: _____

Depth to Water (feet): 8.36 @ 1224
Depth of Well (feet): 18.00
Reference Point: top of casing, N side if no notch 9.64
Sampling Equipment: Peristaltic Pump

Purge Volume Measurement Method: _____
Purge Date/Time: 8/11/23 @ 1224
Purging Equipment: Peristaltic Pump
Water Level Probe Used: _____

Casing Volume Constants (CVC): 2-inch = **0.16** gpf ; 4-inch = **0.656** gpf ; 6-inch = **1.47** gpf PV=($\pi r^2 h$) (7.48 gal/ft³)

Purge Volume = ft of water 9.64 x CVC 0.16 x Casing Volumes 1 = 1.5 gallons x 3 = 4.5

TIME (2400 hr)	CUMULATIVE VOLUME (gal)	pH (units)	EC (umhos/cm 25 c)	Temp. (C)	Diss O_2 (mg/L)	ORP (mV)	TURBIDITY (visual)
1225	8.89 0	7.18	0.801	17.36	1.96	-13.6	600
1228	8.92 0.5	7.16	0.793	17.04	1.28	-13.8	
1231	8.94 1	7.15	0.769	16.95	0.68	-11.8	
1234	8.96 1.5	7.16	0.764	16.89	0.90	-11.9	
1237	8.97 2	7.16	0.756	16.88	0.80	-11.6	
1240	8.97 2.5	7.17	0.752	16.88	0.74	-11.5	
1244	8.99 3	7.17	0.750	16.87	0.70	-11.6	

Well Integrity:

1245

Bottle Inventory (check applicable rows) Day/Time Sampled: _____

Quantity:	Container:	Preservatives:	Filtered (type):	Remarks:
All Wells				
2	500 mL AG	HCl		NWTPH-Dx
3	40mL VOA	HCl		NWTPH-G
MS/MSD Samples				
3	40mL VOA	HCl		NWTPH-G

Maritime Operations: (206) 787-3751 Call if wells are covered. Kelli Goodwin is our main point of contact at Ops.

Signature: _____

PgG

GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: CP-GP09R

Sampling Event: August 2023

Sample #:

Project Number: JG1601	Date: 8/9/2023
Project Name: Terminal 91 (T91)	Location: Piex 91
Project Address: 2001 W Garfield St.	Sampled By: AP
Client Name: Port of Seattle	Purged By: AP
Laboratory: OnSite Environmental, Redmond, WA	Date Sent to Lab:
Chain-of-Custody (yes/no):	Field CC Sample Number:
Shipment Method:	Sample Split:

Depth to Water (feet): 9.06	Purge Volume Measurement Method: cal. bucket
Depth of Well (feet): 18.00	Purge Date/Time: 8/9/23 1334
Reference Point: top of casing, N side if no notch	Purging Equipment: Peristaltic Pump
Sampling Equipment: Peristaltic Pump	Water Level Probe Used: waterline 200 - PGG orange

Casing Volume Constants (CVC): 2-inch = **0.16** gpf ; 4-inch = **0.656** gpf ; 6-inch = **1.47** gpf PV=(π r² h) (7.48 gal/ft³)

Purge Volume = ft of water 9 x CVC 0.16 x Casing Volumes 1 = 1.44 gallons (3 = 4.32)

Q (mL/min)	TIME (2400 hr)	CUMULATIVE VOLUME (gal)	pH (units)	EC (umhos/cm 25 c)	Temp. (C)	Diss O_2 (mg/L)	ORP (mV)	TURBIDITY (visual)	DTW (ft)
350	1342	0.5	7.00	11650	16.85	4.22	715	clear	9.01
350	1345	0.75	7.01	11720	16.87	3.12	65.9	clear	9.02
350	1349	1	7.01	11770	16.84	2.62	62.3		9.02
375	1351	1.25	7.01	11790	16.82	2.54	60.9		9.02
375	1354	1.5	7.01	11810	16.83	2.35	59.3		9.02
400	1358	2	7.02	11880	16.81	1.87	56.5		9.02
400	1401	2.25	7.02	11900	16.83	1.78	55.5		9.02
400	1406	2.75	7.02	11950	16.87	1.56	56.0		9.02
400	1411	3.25	7.01	12050	16.96	1.39	56.5		9.01

Well Integrity: no screws - otherwise good

Bottle Inventory (check applicable rows) Day/Time Sampled: 8/9/2023 1430

Quantity:	Container:	Preservatives:	Filtered (type):	Remarks:
All Wells				
4 2	500 mL AG	HCl		NWTPH-Dx
3	40mL VOA	HCl		NWTPH-G
MS/MSD Samples				
3	40mL VOA	HCl		NWTPH-G

Maritime Operations: (206) 787-3751 Call if wells are covered. Kelli Goodwin is our main point of contact at Ops.

Signature:

PGG

GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: CP-GP09R

Sampling Event: August 2023

Sample #:

Project Number: JG1601
Project Name: Terminal 91 (T91)
Project Address: 2001 W Garfield St.
Client Name: Port of Seattle
Laboratory: OnSite Environmental, Redmond, WA
Chain-of-Custody (**yes**/no):
Shipment Method:

Date: 8/9/2023
Location: Pier 91
Sampled By: AP
Purged By: AP
Date Sent to Lab:
Field CC Sample Number:
Sample Split:

Depth to Water (feet):
Depth of Well (feet):
Reference Point: top of casing, N side if no notch
Sampling Equipment: Peristaltic Pump

Purge Volume Measurement Method:
Purge Date/Time:
Purging Equipment: Peristaltic Pump
Water Level Probe Used:

Casing Volume Constants (CVC): 2-inch = **0.16** gpf ; 4-inch = **0.656** gpf ; 6-inch = **1.47** gpf PV=($\pi r^2 h$) (7.48 gal/ft³)

Purge Volume = ft of water _____ x CVC _____ x Casing Volumes _____ = _____ gallons

TIME (2400 hr)	CUMULATIVE VOLUME (gal)	pH (units)	EC (umhos/cm 25 c)	Temp. (C)	Diss O_2 (mg/L)	ORP (mV)	TURBIDITY (visual)
1417	3.75	7.01	12120	16.96	1.31	56.6	clear
1419	4	7.01	12160	16.96	1.30	56.4	clear
1424	4.5	7.01	12200	16.98	0.91	56.7	clear
1426	4.75	7.01	12240	17.05	0.93	57.0	
1428	5	7.01	12260	17.06	1.30	56.9	

Q (mL/min): 400, 400

DTW (ft): 9.01, 9.00, 9.00

Well Integrity:

Bottle Inventory (check applicable rows) Day/Time Sampled: 8/9/2023 1430

Quantity:	Container:	Preservatives:	Filtered (type):	Remarks:
All Wells				
4 ~~2~~	500 mL AG	HCl		NWTPH-Dx
3	40mL VOA	HCl		NWTPH-G
MS/MSD Samples				
3	40mL VOA	HCl		NWTPH-G

Maritime Operations: (206) 787-3751 Call if wells are covered. Kelli Goodwin is our main point of contact at Ops.

Signature:

PgG

GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: CP-GP10

Sampling Event: _____ Sample #: _____

Project Number: JG1601	Date: 8/9/23
Project Name: Terminal 91 (T91)	Location: T-91
Project Address: 2001 W Garfield St.	Sampled By: E. Richardson
Client Name: Port of Seattle	Purged By: E. Richardson
Laboratory: OnSite Environmental, Redmond, WA	Date Sent to Lab:
Chain-of-Custody (yes/no):	Field CC Sample Number:
Shipment Method:	Sample Split:

Depth to Water (feet): 9.52 — Purge Volume Measurement Method: _____

Depth of Well (feet): 17.85 — Purge Date/Time: 8/9/23 1340

Reference Point: top of casing, N side if no notch — Purging Equipment: Peristaltic Pump

Sampling Equipment: Peristaltic Pump — Water Level Probe Used: _____

Casing Volume Constants (CVC): 2-inch = **0.16** gpf ; 4-inch = **0.656** gpf ; 6-inch = **1.47** gpf PV=($\pi r^2 h$) (7.48 gal/ft³)

Purge Volume = ft of water 8.33 x CVC 0.16 x Casing Volumes _____ = 1.7 gallons

TIME (2400 hr)		CUMULATIVE VOLUME (gal)	pH (units)	EC ms/cm (umhos/cm 25 c)	Temp. (C)	Diss O_2 (mg/L)	ORP (mV)	TURBIDITY (visual)	
1344	9.52	0	7.29	38.30	17.82	7.55	96.2	clear	200 mL/min
1349	9.53	0.25	7.35	37.94	17.21	7.29	95.8	clear	300 mL/min
1351	9.52	0.5	7.36	37.93	17.07	7.16	95.9	clear	300 mL/min
1355	9.51	0.75	7.37	37.65	16.96	6.96	96.7	clear	300 mL/min
1358	9.52	1.0	7.36	37.43	16.95	6.88	97.2	clear	300 mL/min
1401	9.52	1.25	7.37	37.36	16.91	6.85	97.8	clear	300 mL/min
1405	9.52	1.5	7.37	37.41	16.92	6.83	98.4	clear	300 mL/min
1408	9.53	1.75	7.37	37.20	16.94	7.07	98.5	clear	300 mL/min

Well Integrity:

1410

Bottle Inventory (check applicable rows) Day/Time Sampled: _____

Quantity:	Container:	Preservatives:	Filtered (type):	Remarks:
All Wells				
2	500 mL AG	HCl		NWTPH-Dx
3	40mL VOA	HCl		NWTPH-G
MS/MSD Samples				
3	40mL VOA	HCl		NWTPH-G

Maritime Operations: (206) 787-3751 Call if wells are covered. Kelli Goodwin is our main point of contact at Ops.

Signature: _____ Page 1 of 1 PgG

GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: CP-GP11

Sampling Event: _____ Sample #: _____

Project Number: JG1601	Date: 8/11/23
Project Name: Terminal 91 (T91)	Location:
Project Address: 2001 W Garfield St.	Sampled By: EE
Client Name: Port of Seattle	Purged By: EE
Laboratory: OnSite Environmental, Redmond, WA	Date Sent to Lab:
Chain-of-Custody (**yes**/no):	Field CC Sample Number:
Shipment Method:	Sample Split:

Depth to Water (feet): ~~9.43~~ 6.48 — Purge Volume Measurement Method:

Depth of Well (feet): 20 — Purge Date/Time: 8/11/2023 @ 0851

Reference Point: top of casing, N side if no notch — Purging Equipment: Peristaltic Pump

Sampling Equipment: Peristaltic Pump — Water Level Probe Used:

Casing Volume Constants (CVC): 2-inch = **0.16** gpf ; 4-inch = **0.656** gpf ; 6-inch = **1.47** gpf PV=(π r² h) (7.48 gal/ft³)

Purge Volume = ft of water 13.52 x CVC 0.16 x Casing Volumes 1 = 2.16 gallons (x3 = 6.48)

TIME (2400 hr)	CUMULATIVE VOLUME (gal)	pH (units)	EC (~~umhos~~ mS/cm 25 c)	Temp. (C)	Diss O_2 (mg/L)	ORP (mV)	TURBIDITY (visual)	
0853	6.81 0	7.34	3.812	18.03	1.58	-77.2		600 mL/min
0857	6.81 0.5	7.19	3.544	18.68	1.11	-65.4		
0859	6.82 1.0	7.17	3.367	19.41	0.95	-94.3		
0902	6.82 1.5	7.17	3.563	19.97	0.89	-147.2		
0906	6.82 2.0	7.24	5.048	20.07	0.81	-204.0		
0908	6.82 2.25	7.25	5.140	20.06	0.80	-209.4		
0910	6.82 2.5	7.27	5.288	20.04	0.78	-216.5		
0912	6.81 2.75	7.30	5.453	20.02	0.75	-226.0		
0914	6.81 3.0	7.31	5.507	20.02	0.74	-230.0		

Well Integrity:

Bottle Inventory (check applicable rows) Day/Time Sampled: _____

Quantity:	Container:	Preservatives:	Filtered (type):	Remarks:
All Wells				
2	500 mL AG	HCl		NWTPH-Dx
3	40mL VOA	HCl		NWTPH-G
MS/MSD Samples				
3	40mL VOA	HCl		NWTPH-G

Maritime Operations: (206) 787-3751 Call if wells are covered. Kelli Goodwin is our main point of contact at Ops.

Signature: _____

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GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: CP-GP11

Sampling Event: T-91

Sample #: CP-GP11

Project Number:	JG1601	Date:	8/11/23
Project Name:	Terminal 91 (T91)	Location:	
Project Address:	2001 W Garfield St.	Sampled By:	ER
Client Name:	Port of Seattle	Purged By:	ER
Laboratory:	OnSite Environmental, Redmond, WA	Date Sent to Lab:	
Chain-of-Custody (**yes**/no):		Field CC Sample Number:	
Shipment Method:		Sample Split:	

Depth to Water (feet): 6.48

Depth of Well (feet): 20.00

Purge Volume Measurement Method:

Purge Date/Time: 8/11/23 0851

Reference Point: top of casing, N side if no notch

Purging Equipment: Peristaltic Pump

Sampling Equipment: Peristaltic Pump

Water Level Probe Used:

Casing Volume Constants (CVC): 2-inch = **0.16** gpf ; 4-inch = **0.656** gpf ; 6-inch = **1.47** gpf PV=($\pi r^2 h$) (7.48 gal/ft³)

Purge Volume = ft of water _____ x CVC _____ x Casing Volumes _____ = 2.16 gallons (6.48 = 3x)

TIME (2400 hr)	CUMULATIVE VOLUME (gal)	pH (units)	EC (umhos/cm 25 c)	Temp. (C)	Diss O_2 (mg/L)	ORP (mV)	TURBIDITY (visual)
0914	6.81 3.25	7.32	5.667	19.99	0.72	-239.3	
0916	6.80 3.5	7.34	5.815	20.00	0.72	-245.3	
0918	6.79 3.75	7.34	5.893	20.05	0.71	-247.1	
0920	6.79 4.0	7.35	5.958	20.05	0.71	-253.0	

600 mL/min

Well Integrity:

0920

Bottle Inventory (check applicable rows) Day/Time Sampled:

Quantity:	Container:	Preservatives:	Filtered (type):	Remarks:
All Wells				
2	500 mL AG	HCl		NWTPH-Dx
3	40mL VOA	HCl		NWTPH-G
MS/MSD Samples				
3	40mL VOA	HCl		NWTPH-G

Maritime Operations: (206) 787-3751 Call if wells are covered. Kelli Goodwin is our main point of contact at Ops.

Signature:

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GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: CP-GP14

Sampling Event: August 2023

Sample #:

Project Number:	JG1601	Date:	8/11/2023
Project Name:	Terminal 91 (T91)	Location:	
Project Address:	2001 W Garfield St.	Sampled By:	AP
Client Name:	Port of Seattle	Purged By:	AP
Laboratory:	OnSite Environmental, Redmond, WA + FAB	Date Sent to Lab:	
Chain-of-Custody (**yes**/no):		Field CC Sample Number:	
Shipment Method:		Sample Split:	

Depth to Water (feet): 8.09

Depth of Well (feet): 20.00

Purge Volume Measurement Method: cal bucket

Purge Date/Time: 8/11/2023 0913

Reference Point: top of casing, N side if no notch

Purging Equipment: Peristaltic Pump

Sampling Equipment: Peristaltic Pump

Water Level Probe Used: waterline 200 - Pink orange

Casing Volume Constants (CVC): 2-inch = **0.16** gpf ; 4-inch = **0.656** gpf ; 6-inch = **1.47** gpf PV=($\pi r^2 h$) (7.48 gal/ft³)

Purge Volume = ft of water 11.91 x CVC 0.16 x Casing Volumes 1 = 1.91 gallons (3 = 5.73)

Q (mL/min)	TIME (2400 hr)	CUMULATIVE VOLUME (gal)	pH (units)	EC (umhos/cm 25 c)	Temp. (C)	Diss O_2 (mg/L)	ORP (mV)	TURBIDITY (visual)	DTW (ft)
425	0922	0.75	7.14	20080	13.90	5.68	-141.3	clear	8.11
7400	0929	1.5	7.12	17980	13.97	4.03	-131.9	clear	8.12
425	0933	2	7.11	17600	14.00	3.80	-129.9	clear	8.11
450	0939	2.5	7.11	17220	14.01	3.29	-128.5	clear	8.12
450	0942	3	7.10	16970	14.02	3.21	-127.8	clear	8.12
7450	0946	3.5	7.10	16720	14.03	3.13	-126.8	clear	8.13
	0951	~4	7.09	16540	14.01	3.08	-125.7	clear	8.13
	0954	~4.5	7.09	16420	14.03	3.16	-124.8	clear	8.13
	0958	~5	7.09	16310	14.01	3.19	-123.7	clear	

Well Integrity:

Sulfur odor

Bottle Inventory (check applicable rows) Day/Time Sampled: 8/11/2023 1000

Quantity:	Container:	Preservatives:	Filtered (type):	Remarks:
All Wells				
4 2	500 mL AG	HCl		NWTPH-Dx
3	40mL VOA	HCl		NWTPH-G
MS/MSD Samples				
3	40mL VOA	HCl		NWTPH-G

Maritime Operations: (206) 787-3751 Call if wells are covered. Kelli Goodwin is our main point of contact at Ops.

Signature:

PgG

GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: PNO-MW02

Sampling Event: T-91

Sample #:

Project Number:	JG1601	Date:	8/11/23
Project Name:	Terminal 91 (T91)	Location:	
Project Address:	2001 W Garfield St.	Sampled By:	ER
Client Name:	Port of Seattle	Purged By:	ER
Laboratory:	OnSite Environmental, Redmond, WA	Date Sent to Lab:	
Chain-of-Custody (yes/no):		Field CC Sample Number:	
Shipment Method:		Sample Split:	

Depth to Water (feet): 8.49 @0747

Depth of Well (feet): 17.00

Purge Volume Measurement Method:

Purge Date/Time:

Reference Point: top of casing, N side if no notch

Purging Equipment: Peristaltic Pump

Sampling Equipment: Peristaltic Pump

Water Level Probe Used:

Casing Volume Constants (CVC): 2-inch = **0.16** gpf ; 4-inch = **0.656** gpf ; 6-inch = **1.47** gpf PV=($\pi r^2 h$) (7.48 gal/ft³)

Purge Volume = ft of water 8.51 x CVC 0.16 x Casing Volumes 1 = 1.36 gallons (x3 = 4.08)

TIME (2400 hr)	CUMULATIVE VOLUME (gal)	pH (units)	EC (~~µmhos~~ mS/cm 25 c)	Temp. (C)	Diss O_2 (mg/L)	ORP (mV)	TURBIDITY (visual)	
0750 8.82	0	6.48	1.208	17.87	5.76	-102.0		600mL/min
0752 8.91	0.5	6.54	1.162	18.28	3.32	-102.9		400 mL/min
0757 8.86	1	6.63	1.153	18.91	2.32	-103.3		
0802 8.87	1.5	6.65	1.151	19.00	1.80	-100.1		
0807 8.89	2	6.65	1.150	19.00	1.58	-100.2		
0812 8.90	2.5	6.65	1.140	18.99	1.42	-97.6		
0816 8.91	3.0	6.65	1.135	18.98	1.28	-96.4		
0821 8.92	3.5	6.65	1.126	18.99	1.23	-93.6		
0825	4.0	6.64	1.121	18.98	1.15	-91.2		

Well Integrity:

0826

Bottle Inventory (check applicable rows) Day/Time Sampled: 0826

Quantity:	Container:	Preservatives:	Filtered (type):	Remarks:
All Wells				
2	500 mL AG	HCl		NWTPH-Dx
3	40mL VOA	HCl		NWTPH-G
MS/MSD Samples				
3	40mL VOA	HCl		NWTPH-G

Maritime Operations: (206) 787-3751 Call if wells are covered. Kelli Goodwin is our main point of contact at Ops.

Signature:

Page 1 of 1

PgG

GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: PNO-MW06A

Sampling Event: August 2023

Sample #:

Project Number: JG1601	Date: 8/11/2023
Project Name: Terminal 91 (T91)	Location: Pier 91
Project Address: 2001 W Garfield St.	Sampled By: AP
Client Name: Port of Seattle	Purged By: AP
Laboratory: OnSite Environmental, Redmond, WA	Date Sent to Lab:
Chain-of-Custody (**yes**/no):	Field CC Sample Number:
Shipment Method:	Sample Split:

Depth to Water (feet): 8.76	Purge Volume Measurement Method:
Depth of Well (feet): 17.50	Purge Date/Time: 8/11/2023 0743
Reference Point: top of casing, N side if no notch	Purging Equipment: Peristaltic Pump
Sampling Equipment: Peristaltic Pump	Water Level Probe Used:

Casing Volume Constants (CVC): 2-inch = **0.16** gpf ; 4-inch = **0.656** gpf ; 6-inch = **1.47** gpf PV=(π r² h) (7.48 gal/ft³)

Purge Volume = ft of water 8.74 x CVC 0.16 x Casing Volumes 1 = 1.4 gallons (3 = 4.2)

Q (mL/min)	TIME (2400 hr)	CUMULATIVE VOLUME (gal)	pH (units)	EC (umhos/cm 25 c)	Temp. (C)	Diss O_2 (mg/L)	ORP (mV)	TURBIDITY (visual)	DTW (ft)
300	0749	0.25	6.86	4001	18.09	3.16	-63.9	clear	9.47
225	0753	0.5	6.92	3933	18.38	2.98	-82.1	black flecks	9.46
250	0757	0.75	6.94	3930	18.60	2.92	-91.8	↓	9.49
250	0802	1	6.88	3978	18.71	2.93	-94.9	↓	9.53
250	0807	1.25	6.84	3964	18.72	2.97	-95.0	↓	9.54
225	0811	1.5	6.83	3961	18.71	2.95	-96.4	smaller flecks	9.55
250	0815	1.75	6.84	3942	18.66	2.96	-98.2	↓	9.57
225	0820	2	6.85	3930	18.64	2.99	-100.6	↓	9.60
250	0824	2.25	6.86	3930	18.63	2.89	-102.4	↓	9.61

Well Integrity: good

fuel odor

Bottle Inventory (check applicable rows) Day/Time Sampled: 8/11/2023 0840

Quantity:	Container:	Preservatives:	Filtered (type):	Remarks:
All Wells				
4	500 mL AG	HCl		NWTPH-Dx
3	40mL VOA	HCl		NWTPH-G
MS/MSD Samples				
3	40mL VOA	HCl		NWTPH-G

Maritime Operations: (206) 787-3751 Call if wells are covered. Kelli Goodwin is our main point of contact at Ops.

Signature:

PgG

GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: PNO-MW06A

Sampling Event: August 2023

Sample #:

Project Number: JG1601	Date: 8/11/2023
Project Name: Terminal 91 (T91)	Location:
Project Address: 2001 W Garfield St.	Sampled By: AP
Client Name: Port of Seattle	Purged By: AP
Laboratory: OnSite Environmental, Redmond, WA	Date Sent to Lab:
Chain-of-Custody (**yes**/no):	Field CC Sample Number:
Shipment Method:	Sample Split:

Depth to Water (feet):	Purge Volume Measurement Method:
Depth of Well (feet):	Purge Date/Time:
Reference Point: top of casing, N side if no notch	Purging Equipment: Peristaltic Pump
Sampling Equipment: Peristaltic Pump	Water Level Probe Used:

Casing Volume Constants (CVC): 2-inch = **0.16** gpf ; 4-inch = **0.656** gpf ; 6-inch = **1.47** gpf PV=($\pi r^2 h$) (7.48 gal/ft³)

Purge Volume = ft of water _____ x CVC _____ x Casing Volumes _____ = _____ gallons

Q (mL/min) 250

TIME (2400 hr)	CUMULATIVE VOLUME (gal)	pH (units)	EC (umhos/cm 25 c)	Temp. (C)	Diss O_2 (mg/L)	ORP (mV)	TURBIDITY (visual)	DTW (ft)
0828	2.5	6.87	3929	18.64	2.91	-104.5	small flecks	9.62
0831	2.75	6.88	3925	18.65	2.88	-105.7		9.63
0835	3	6.88	3905	18.64	2.80	-106.8		

Well Integrity:

Bottle Inventory (check applicable rows) Day/Time Sampled: 8/11/2023 0840

Quantity:	Container:	Preservatives:	Filtered (type):	Remarks:
All Wells				
4 ✓	500 mL AG	HCl		NWTPH-Dx
3	40mL VOA	HCl		NWTPH-G
MS/MSD Samples				
3	40mL VOA	HCl		NWTPH-G

Maritime Operations: (206) 787-3751 Call if wells are covered. Kelli Goodwin is our main point of contact at Ops.

Signature:

PgG

GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: PNO-MW06B

Sampling Event: August 2023

Sample #:

Project Number:	JG1601	Date:	8/9/2023
Project Name:	Terminal 91 (T91)	Location:	Pier 91
Project Address:	2001 W Garfield St.	Sampled By:	AP
Client Name:	Port of Seattle	Purged By:	AP
Laboratory:	OnSite Environmental, Redmond, WA	Date Sent to Lab:	
Chain-of-Custody (**yes**/no):		Field CC Sample Number:	
Shipment Method:		Sample Split:	

Depth to Water (feet): 8.36

Depth of Well (feet): 55.40

Purge Volume Measurement Method: cal. bucket

Purge Date/Time: 8/9/2023 1514

Reference Point: top of casing, N side if no notch

Purging Equipment: Peristaltic Pump

Sampling Equipment: Peristaltic Pump

Water Level Probe Used: Waterline 200 - PG&G orange

Casing Volume Constants (CVC): 2-inch = **0.16** gpf ; 4-inch = **0.656** gpf ; 6-inch = **1.47** gpf PV=($\pi r^2 h$) (7.48 gal/ft³)

Purge Volume = ft of water 47.04 x CVC 0.16 x Casing Volumes 1 = 7.53 gallons

Q (mL/min)	TIME (2400 hr)	CUMULATIVE VOLUME (gal)	pH (units)	EC (umhos/cm 25 c)	Temp. (C)	Diss O_2 (mg/L)	ORP (mV)	TURBIDITY (visual)	DTW (ft)
<500	1520	0.5	7.32	2568	15.61	2.13	-109.2	Clear	8.40
425	1526	1	7.30	2627	15.68	1.64	-120.6		8.41
<450	1530	1.5	7.29	2649	15.59	1.39	-127.6		8.42
425	1534	2	7.30	2648	15.60	1.21	-131.1		8.44
350	1539	2.5	7.30	2639	15.64	1.14	-131.0		8.44
	1545	3	7.29	2633	15.70	1.09	-136.2		8.45
	1551	3.5	7.28	2609	15.73	1.04	-138.5		8.47
350	1558	4	7.28	2588	15.76	1.03	-135.0		8.50
	1604	4.5	7.28	2581	15.73	1.03	-131.6		8.52

Well Integrity: good

slight fuel odor while purging

Bottle Inventory (check applicable rows) Day/Time Sampled: 8/9/2023 1635

Quantity:	Container:	Preservatives:	Filtered (type):	Remarks:
All Wells				
4 2	500 mL AG	HCl		NWTPH-Dx
3	40mL VOA	HCl		NWTPH-G
MS/MSD Samples				
3	40mL VOA	HCl		NWTPH-G

Maritime Operations: (206) 787-3751 Call if wells are covered. Kelli Goodwin is our main point of contact at Ops.

Signature:

PgG

GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: PND-MW06B

Sampling Event: August 2023

Sample #:

Project Number: JG1601	Date: 8/9/2023
Project Name: Terminal 91 (T91)	Location: Pier 91
Project Address: 2001 W Garfield St.	Sampled By: AP
Client Name: Port of Seattle	Purged By: AP
Laboratory: OnSite Environmental, Redmond, WA	Date Sent to Lab:
Chain-of-Custody (**yes**/no):	Field CC Sample Number:
Shipment Method:	Sample Split:

Depth to Water (feet):

Depth of Well (feet):

Purge Volume Measurement Method: cal. bucket

Purge Date/Time:

Reference Point: top of casing, N side if no notch

Purging Equipment: Peristaltic Pump

Sampling Equipment: Peristaltic Pump

Water Level Probe Used:

Casing Volume Constants (CVC): 2-inch = **0.16** gpf ; 4-inch = **0.656** gpf ; 6-inch = **1.47** gpf PV=($\pi r^2 h$) (7.48 gal/ft³)

Purge Volume = ft of water _____ x CVC _____ x Casing Volumes _____ = _____ gallons

TIME (2400 hr)	CUMULATIVE VOLUME (gal)	pH (units)	EC (umhos/cm 25 c)	Temp. (C)	Diss O_2 (mg/L)	ORP (mV)	TURBIDITY (visual)	Q (mL/min)	DTW (ft)
1608	4.75	7.28	2570	15.73	0.98	-128.4	clear		8.53
1614	5.25	7.28	2556	15.71	1.00	-128.1			8.57
1616	5.5	7.28	2556	15.68	0.96	-127.2			8.57
1620	5.75	7.27	2546	15.67	0.93	-125.4		325	8.58
1622	6	7.28	2540	15.666	0.89	-124.1			
1626	6.25	7.28	2536	15.67	0.89	-124.0			
1629	6.5	7.27	2535	15.71	0.88	-121.7			
1632	6.75	7.28	2534	15.70	0.86	-120.1			

Well Integrity:

Bottle Inventory (check applicable rows) Day/Time Sampled: 8/9/2023 1635

Quantity:	Container:	Preservatives:	Filtered (type):	Remarks:
All Wells				
2	500 mL AG	HCl		NWTPH-Dx
3	40mL VOA	HCl		NWTPH-G
MS/MSD Samples				
3	40mL VOA	HCl		NWTPH-G

Maritime Operations: (206) 787-3751 Call if wells are covered. Kelli Goodwin is our main point of contact at Ops.

Signature:

PgG

GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: PNO-MW 103

Sampling Event: _____ Sample #: _____

Project Number: JG1601	Date: 8/9/23
Project Name: Terminal 91 (T91)	Location: T-91
Project Address: 2001 W Garfield St.	Sampled By: EK
Client Name: Port of Seattle	Purged By: EK
Laboratory: OnSite Environmental, Redmond, WA	Date Sent to Lab:
Chain-of-Custody (**yes**/no):	Field CC Sample Number:
Shipment Method:	Sample Split:

Depth to Water (feet): 8.69	Purge Volume Measurement Method:
Depth of Well (feet): 17	Purge Date/Time: 8/9/23 1457
Reference Point: top of casing, N side if no notch	Purging Equipment: Peristaltic Pump
Sampling Equipment: Peristaltic Pump	Water Level Probe Used:

Casing Volume Constants (CVC): 2-inch = **0.16** gpf ; 4-inch = **0.656** gpf ; 6-inch = **1.47** gpf PV=($\pi r^2 h$) (7.48 gal/ft³)

Purge Volume = ft of water _____ x CVC 0 x Casing Volumes 3 = 5 gallons

TIME (2400 hr)	CUMULATIVE VOLUME (gal)	pH (units)	EC ~~(umhos/cm 25 c)~~ mS/cm	Temp. (C)	Diss O_2 (mg/L)	ORP (mV)	TURBIDITY (visual)	
1459 8.79	0	6.82	1.797	19.62	2.84	-90.7		400 mL/min
1502 8.80	0.25	6.73	1.410	19.30	2.57	-97.5		400 mL/min
1504 8.81	0.5	6.73	1.338	19.34	2.46	-103.1		
1506 8.82	0.75	6.73	1.320	19.44	2.62	-107.4		
1508 8.82	1.00	6.74	1.312	19.47	2.75	-111.7		
1513 8.83	1.50	6.72	1.305	19.50	3.82	-116.2		
1517 8.85	2.0	6.74	1.297	19.51	4.41	-118.0		500 mL/min
1521 8.85	2.5	6.72 ✓	1.285 ✓	19.70 ✓	4.79	-119.6 ✓		
1524 8.85	3.0	6.72	1.283	19.81	4.92	-120.5		

Well Integrity:

Bottle Inventory (check applicable rows) Day/Time Sampled: _____

Quantity:	Container:	Preservatives:	Filtered (type):	Remarks:
All Wells				
2	500 mL AG	HCl		NWTPH-Dx
3	40mL VOA	HCl		NWTPH-G
MS/MSD Samples				
3	40mL VOA	HCl		NWTPH-G

Maritime Operations: (206) 787-3751 Call if wells are covered. Kelli Goodwin is our main point of contact at Ops.

Signature: _____

PgG

GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: PNO-MW-103

Sampling Event: _____ Sample #: _____

Project Number: JG1601
Project Name: Terminal 91 (T91)
Project Address: 2001 W Garfield St.
Client Name: Port of Seattle
Laboratory: OnSite Environmental, Redmond, WA
Chain-of-Custody (**yes**/no): _____
Shipment Method: _____

Date: 8/9/23
Location: _____
Sampled By: _____
Purged By: _____
Date Sent to Lab: _____
Field CC Sample Number: _____
Sample Split: _____

Depth to Water (feet): _____
Depth of Well (feet): _____
Reference Point: top of casing, N side if no notch
Sampling Equipment: Peristaltic Pump

Purge Volume Measurement Method: _____
Purge Date/Time: 8/9/23 @ 1457
Purging Equipment: Peristaltic Pump
Water Level Probe Used: _____

Casing Volume Constants (CVC): 2-inch = **0.16** gpf ; 4-inch = **0.656** gpf ; 6-inch = **1.47** gpf PV=(π r² h) (7.48 gal/ft³)
Purge Volume = ft of water _____ x CVC _____ x Casing Volumes _____ = _____ gallons

TIME (2400 hr)	CUMULATIVE VOLUME (gal)	pH (units)	EC (umhos/cm 25 c)	Temp. (C)	Diss O_2 (mg/L)	ORP (mV)	TURBIDITY (visual)	
1528	8.85 3.5	6.71	1.283	19.89	5.32	-121.6		500 mL/min
1531	8.86 4.0	6.71	1.286	19.92	5.20	-122.1		
1534	8.86 4.5	6.71	1.286	19.99	4.97	-122.8		
1537	8.86 5.0	6.71	1.286	20.03	4.80	-123.0		

Well Integrity:

1540

Bottle Inventory (check applicable rows) Day/Time Sampled: _____

Quantity:	Container:	Preservatives:	Filtered (type):	Remarks:
All Wells				
2	500 mL AG	HCl		NWTPH-Dx
3	40mL VOA	HCl		NWTPH-G
MS/MSD Samplles				
3	40mL VOA	HCl		NWTPH-G

Maritime Operations: (206) 787-3751 Call if wells are covered. Kelli Goodwin is our main point of contact at Ops.

Signature: _____

PgG

Terminal 91 Water Level Snapshot Sheet

Staff: E. Richardson

Date:

Sounder:

Well	Time	DTW 1	DTW 2	DTW 3	Area	LNAPL	Aquifer	Elev.	Depth	Comments
UT-MW39-3						X	Shallow	17.33	14.00	Decommissioned
CP-GP01A	0927	8.40	8.41		P-90		Shallow	17.68	19.20	
CP-GP01B	0923	10.92	10.93		P-90		Deep	17.60	64.50	
CP-GP02	0939	7.65	7.65		P-90		Shallow	17.39	20.10	
CP-GP08	0919	8.32	8.32		P-90		Shallow	17.37	18.00	
CP-GP03AR ✓					P-91		Shallow	17.77	19.85	
CP-GP03BR ✓					P-91		Deep	17.74	64.50	
CP-GP04R ✓					P-91		Shallow	17.90	19.83	
CP-GP07R ✓					P-91		Shallow	18.08	19.85	
CP-GP09R ✓					P-91		Shallow	17.45	18.00	
CP-GP10 ✓	1337	9.52	9.52		P-91		Shallow	17.92	17.85	
PNO-MW02 ✓					P-91		Shallow	17.71	17.00	
PNO-MW06A ✓					P-91		Shallow	18.05	17.50	
PNO-MW06B ✓					P-91		Deep	17.98	55.40	
PNO-MW103 ✓					P-91		Shallow	17.48	17.00	
B1-93 ✓	1242	24.38			TF-90		Shallow	17.24	30.00	
CP-103A ✓					TF-90		Shallow	17.11	15.00	
CP-104A	1049	5.75	5.75		TF-90		Shallow	17.13	15.00	
CP-104B	1051	5.90	5.90		TF-90		Deep	16.86	50.00	
CP-106A	0957	~~8.50~~ 6.57	6.57		TF-90		Shallow	18.00	15.00	
CP-106B	1000	6.94	6.98		TF-90		Deep	17.91	41.50	
CP-108A	0946	6.61	6.61		TF-90		Shallow	16.58	15.00	
CP-108B	0948	9.68	9.68		TF-90		Deep	16.77	60.00	
CP-113	1057	5.73	5.73		TF-90		Shallow	17.29	17.00	
CP-114	1014	6.27	6.27		TF-90		Shallow	17.94	14.00	
CP-115A	1021	6.05	6.05		TF-90		Shallow	17.74	21.00	
CP-115B	1019	6.34	6.38		TF-90		Shallow	17.64	42.50	
CP-121 ? ✓					TF-90		Shallow	17.61	21.00	
CP-122B ? ✓	1236	5.91	5.91		TF-90		Deep	16.90	42.50	
CP-203B	1213	8.32	8.33		TF-90		Deep	16.99	59.95	
CP-205A	1035	5.95	5.95		TF-90		Shallow	17.74	14.00	
CP-205B	1032	5.93	5.98		TF-90		Deep	17.73	50.00	
CP-W210 ✓	1225	7.41	7.41		TF-90		Shallow	17.11	14.95	
CP-107 LNAPL					TF-91	X	Shallow	17.15	20.00	
CP-110 LNAPL					TF-91	X	Shallow	17.42	16.50	
CP-111 ✓					TF-91		Shallow	17.64	15.00	
CP-112	1120	5.85	5.86		TF-91		Shallow	17.04	15.00	
CP-GP05 ✓					TF-91		Shallow	17.44	10.00	
CP-GP06 ✓					TF-91		Shallow	17.46	17.50	
CP-GP11	1144	6.32	6.33		TF-91		Shallow	16.94	20.00	
CP-GP12	1205	6.70	6.70		TF-91		Shallow	17.42	20.00	
CP-GP13 ✓					TF-91		Shallow	17.01	20.00	
CP-GP14 ✓					TF-91		Shallow	17.63	20.00	
CP-PR-13	1142	6.85	6.85		TF-91		Shallow	17.31	12.90	
PNO-MW101 ?	1620	8.45			TF-91		Shallow	17.74	16.30	
PNO-MW104 LNAPL					TF-91	X	Shallow	17.43	17.40	
UT-MW39-1 ✓	1110	5.33	5.33		TF-91		Shallow	16.65	17.50	

Notes: Maritime Operations: (206) 787-3751 Call if wells are covered. Kelli Goodwin is our main point of contact at Ops.

LNAPL = Light non-aqueous phase liquid, well with historic LNAPL presence

T-90 and TF-91 are arbitrary divisions that refer to portions of the TFAA on the Pier 90/91 side of the alley.

Record prodcut thickness at tagged LNAPL wells and TFAA trench ends.

PGG

Terminal 91 Water Level Snapshot Sheet

Date:

Staff: Ashley Parkhurst MM

Sounder:

Well	Time	DTW 1	DTW 2	DTW 3	Area	LNAPL	Aquifer	Elev.	Depth	Comments
~~UT-MW39-3~~							~~Shallow~~	~~17.28~~	~~14.00~~	~~Decommissioned~~
CP-GP01A					P-90		Shallow	17.68	19.20	
CP-GP01B					P-90		Deep	17.60	64.50	
CP-GP02					P-90		Shallow	17.39	20.10	
CP-GP08					P-90		Shallow	17.37	18.00	
CP-GP03AR	0934	9.12	9.15	9.12	P-91	no	Shallow	17.77	19.85	screws ineffective; standing water
CP-GP03BR	could not open				P-91		Deep	17.74	64.50	could not open
CP-GP04R	1035	8.51	8.55	8.54	P-91	no	Shallow	17.90	19.83	under large machinery, but accessible
CP-GP07R	1049	8.06	8.15	8.15	P-91	no	Shallow	18.08	19.85	
CP-GP09R	1327	8.97	9.00	9.00	P-91		Shallow	17.45	18.00	
CP-GP10					P-91		Shallow	17.92	17.85	
PNO-MW02	1014	8.42	8.42		P-91	no	Shallow	17.71	17.00	
PNO-MW06A	1021	8.67	8.68	8.69	P-91	no	Shallow	18.05	17.50	
PNO-MW06B	1028	10.05	10.03	10.02	P-91	no	Deep	17.98	55.40	
PNO-MW103	0947	8.89	8.89		P-91	no	Shallow	17.48	17.00	
B1-93					TF-90		Shallow	17.24	30.00	
CP-103A	1212	10.71	10.71		TF-90	no	Shallow	17.11	15.00	orange bact + build-up in well mon.
CP-104A					TF-90		Shallow	17.13	15.00	
CP-104B					TF-90		Deep	16.86	50.00	
CP-106A					TF-90		Shallow	18.00	15.00	
CP-106B					TF-90		Deep	17.91	41.50	
CP-108A					TF-90		Shallow	16.58	15.00	
CP-108B					TF-90		Deep	16.77	60.00	
CP-113					TF-90		Shallow	17.29	17.00	
CP-114					TF-90		Shallow	17.94	14.00	
CP-115A					TF-90		Shallow	17.74	21.00	
CP-115B					TF-90		Shallow	17.64	42.50	
CP-121	1234	10.01	10.01		TF-90	no	Shallow	17.61	21.00	plant material on sounder
CP-122B					TF-90		Deep	16.90	42.50	
CP-203B					TF-90		Deep	16.99	59.95	
CP-205A					TF-90		Shallow	17.74	14.00	
CP-205B					TF-90		Deep	17.73	50.00	
CP-W210					TF-90		Shallow	17.11	14.95	
CP-107					TF-91	X	Shallow	17.15	20.00	
CP-110					TF-91	X	Shallow	17.42	16.50	
CP-111	1201	7.30	7.30		TF-91	no	Shallow	17.64	15.00	lots of small bugs
CP-112					TF-91		Shallow	17.04	15.00	
CP-GP05	1129	8.12	8.12		TF-91		Shallow	17.44	10.00	sheen on standing water in monument
CP-GP06	1120	7.89	7.89		TF-91	no	Shallow	17.46	17.50	bolts ineffective
CP-GP11					TF-91		Shallow	16.94	20.00	
CP-GP12					TF-91		Shallow	17.42	20.00	
CP-GP13	1140	6.98			TF-91	no	Shallow	17.01	20.00	thick black sediment in monument + orange bacteria
CP-GP14	1112	7.96	7.96		TF-91	no	Shallow	17.63	20.00	
CP-PR-13					TF-91		Shallow	17.31	12.90	
PNO-MW101					TF-91		Shallow	17.74	16.30	
PNO-MW104					TF-91	X	Shallow	17.43	17.40	
UT-MW39-1					TF-91		Shallow	16.65	17.50	

Notes: Maritime Operations: (206) 787-3751 Call if wells are covered. Kelli Goodwin is our main point of contact at Ops.

LNAPL = Light non-aqueous phase liquid, well with historic LNAPL presence

T-90 and TF-91 are arbitrary divisions that refer to portions of the TFAA on the Pier 90/91 side of the alley.

Record prodcut thickness at tagged LNAPL wells and TFAA trench ends.

PgG

LNAPL MEASUREMENT AND RECOVERY FIELD DATA SHEET

Sampling Event: _____

Project Number: JG1601
Project Name: Terminal 91 (T91)
Project Address: 2001 W Garfield St.
Client Name: Port of Seattle

Date: 8/11/2023
Location: _____
Measured By: ER
Measuring Tool: AECOM probe

Location	Time	MP	Depth Set 1 LNAPL	Depth Set 1 Water	Depth Set 1 Thickness	Depth Set 2 LNAPL	Depth Set 2 Water	Depth Set 2 Thickness
Trench 2E	1516			10.72	0		1	0
Trench 2W	1520			7.67	0			
Trench 3E	1503		8.55	8.6	0.05	8.55	8.60	0.05
Trench 3W	unable to open trench cover							
Trench 5E	1525		5.48	5.48	0	5.48	5.48	0
Trench 5W	1528		5.48	5.58	0.1	5.48	5.58	0.1
PNO-104	1535		7.27	7.52		7.27	7.52	
CP-107								
CP-110	1535			7.08	0		7.08	0

LNAPL Recovery Notes

O&M Plan says recover if thickness > 0.25 ft. Use peristaltic to pump into safe container.

Location	Date	Start Time	End Time	Quantity	Notes:

Maritime Operations: (206) 787-3751 Call if wells are covered. Kelli Goodwin is our main point of contact at Ops.

Signature: _____

PgG

LNAPL MEASUREMENT AND RECOVERY FIELD DATA SHEET

Sampling Event: August 2023

Project Number: JG1601
Project Name: Terminal 91 (T91)
Project Address: 2001 W Garfield St.
Client Name: Port of Seattle

Date: 8/11/2023
Location: T91
Measured By: AP
Measuring Tool: PGG GeoTech Int Probe

Location	Time	MP	Depth Set 1 LNAPL	Depth Set 1 Water	Depth Set 1 Thickness	Depth Set 2 LNAPL	Depth Set 2 Water	Depth Set 2 Thickness
Trench 2E								
Trench 2W								
Trench 3E								
Trench 3W	unable to open trench cover							
Trench 5E								
Trench 5W								
PNO-104								
CP-107	1530	N	6.34	6.34	0.00'	6.34	6.34	0.00'
CP-110								

LNAPL Recovery Notes

O&M Plan says recover if thickness > 0.25 ft. Use peristaltic to pump into safe container.

Location	Date	Start Time	End Time	Quantity	Notes:

Maritime Operations: (206) 787-3751 Call if wells are covered. Kelli Goodwin is our main point of contact at Ops.

Signature: _____

PGG

FIELD INSTRUMENT CALIBRATION SHEET

Terminal 91 SD10 O&M
Groundwater monitoring Event - August 2023

Date/Time	Personnel	Instrument Name and Model	Instrument Serial Number	Calibration Standard	Meter Reading	Calibration Notes
8/11/23	SR/AP	YSI 556	08896OX	pH - 7.0	7.02	
↓	↓	↓	↓	pH - 10.0	10.02	
↓	↓	↓	↓	pH - 4.0	3.99	
↓	↓	↓	↓	SPC - 1490 µs/cm	1491	
8/11/23	ER/AP	YSI 556	01140781X	pH - 7.0	6.96	
				pH - 10.0	9.87	
				pH - 4.0	4.02	
				SPC - 1490 µs/cm	1405	

Sample Chain of Custody

Company: Mott MacDonald / PGG
Project Name: Terminal 91
Project Number: 518300033
Project Manager: Glen Wallace
Phone Number: (206) 212-0302
E-mail: glen.wallace@mottmac.com; alla.skaskevych@mottmac.com
Sampled By: Ashley Parkhurst/Richardson Emily

Laboratory: Fridman & Bruya, Inc
Contact: Eric Young
Address: 5500 4th Ave S
Seattle, WA 98108
Phone Number: (206) 683-1731
eyoung@friedmanandbruya.com

Laboratory Use

Turnaround: Standard

Sample Information

Lab ID	Sample ID	Date Sampled	Time Sampled	Matrix	# Containers	Analyses: NWTPH-Dx (acid silica gel cleanup)	Analyses: NWTPH-G	Comments
	CP-GP11	8/1/23	0922	W	5	x	x	
	CP-GP14	8/11/23	1000	W	5	x	x	
	D-10-08092023	8/11/23	1600	W	5	x	x	
	PNO—MW02	8/11/23	0826	W	5	x	x	
	PNO—MW06A	8/11/23	0840	W	5	x	x	
	PNO-MW06B	8/9/23	1635	W	5	x	x	
	PNO-MW103	8/9/23	1540	W	5	x	x	

	Signature	Company	Date	Time
Relinquished		Mott MacDonald	8/11/2023	1653
Received		FBI	8-11-23	1653
Relinquished				
Received				
Relinquished				
Received				

Comments / Special Instructions

Acid silica gel cleanup for all water NWTPH-Dx analyses.

Level 2 data package

EDD in PGG, EIM, and Port of Seattle formats

Sample Chain of Custody

Company: Mott MacDonald / PGG	Laboratory: Fridman & Bruya, Inc	**Laboratory Use**
Project Name: Terminal 91	Contact: Eric Young	
Project Number: 507108502	Address: 5500 4th Ave S	
Project Manager: Glen Wallace	Seattle, WA 98108	
Phone Number: (206) 212-0302	Phone Number: (206) 683-1731	
E-mail: glen.wallace@mottmac.com; alla.skaskevych@mottmac.com	eyoung@friedmanandbruya.com	
Sampled By: Ashley Parkhurst/Richardson Emily		**Turnaround: Standard**

Sample Information						Analyses									
Lab ID	Sample ID	Date Sampled	Time Sampled	Matrix	# Containers	NWTPH-Dx (acid silica gel cleanup)	NWTPH-G								Comments
	CP-103A	8/11/23	1035	W	5	x	x								
	CP-104A	8/11/23	1110	W	5	x	x								
	CP-106A	8/11/23	1215	W	5	x	x								
	CP-108A	8/11/23	1330	W	5	x	x								
	CP-203B	8/11/23	1147	W	5	x	x								
	CP-GP01B	8/11/23	1410	W	5	x	x								
	CP-GP02	8/11/23	1440	W	10	x	x								MS/MSD collected
	CP-GP08	8/11/23	1245	W	5	x	x								
	CP-GP09R	8/9/23	1930	W	5	x	x								
	CP-GP10	8/9/23	1410	W	5	x	x								

	Signature	Company	Date	Time
Relinquished		Mott MacDonald	8/11/23	1653
Received		FB1	8-11-23	1653
Relinquished				
Received				
Relinquished				
Received				

Comments / Special Instructions

Acid silica gel cleanup for all water NWTPH-Dx analyses.

Level 2 data package

EDD in PGG, EIM, and Port of Seattle formats

LNAPL MEASUREMENT AND RECOVERY FIELD DATA SHEET

Sampling Event: 2023 Q2 MAY 1st, 2023

Project Number: JG1601
Project Name: Terminal 91 (T91)
Project Address: 2001 W Garfield St.
Client Name: Port of Seattle

Date: 5/1/2023
Location: T91
Measured By: EW
Measuring Tool: LNAPL INTERFACE PROBE

Location	Time	MP	Depth Set 1 LNAPL	Depth Set 1 Water	Depth Set 1 Thickness	Depth Set 2 LNAPL	Depth Set 2 Water	Depth Set 2 Thickness
Trench 2E	1245		9.89	9.89	0.00	9.90	9.91	0.01
Trench 2W	1237		6.83	6.83	0.00	6.82	6.82	0.00
Trench 3E	1225		7.71	7.72	0.01	7.71	7.71	0.00
Trench 3W	1210		6.50	6.51	0.01	6.50	6.51	0.01
Trench 5E	1154		4.38	4.40	0.02	4.38	4.39	0.01
Trench 5W	1136		4.37	4.43	0.06	4.36	4.43	0.07
PNO-104	1102		6.64	6.83	0.19	6.64	6.83	0.19
CP-107	1124		5.37	5.38	0.01	5.37	5.37	0.00
CP-110	1112		6.29	6.30	0.01	6.29	6.30	0.01

LNAPL Recovery Notes
O&M Plan says recover if thickness > 0.25 ft. Use peristaltic to pump into safe container.

Location	Date	Start Time	End Time	Quantity	Notes:

Maritime Operations: (206) 787-3751 Call if wells are covered. Kelli Goodwin is our main point of contac

Signature:

LNAPL MEASUREMENT AND RECOVERY FIELD DATA SHEET

Sampling Event: 2023 Q1

Project Number: JG1601
Project Name: Terminal 91 (T91)
Project Address: 2001 W Garfield St.
Client Name: Port of Seattle

Date: 2/27/23
Location: T91
Measured By: EAW
Measuring Tool: Oil/Water Interface Probe

SET 3 LNAPL H2O

Location	Time	MP	Depth Set 1 LNAPL	Depth Set 1 Water	Depth Set 1 Thickness	Depth Set 2 LNAPL	Depth Set 2 Water	Depth Set 2 Thickness
Trench 2E		TOP OF PVC	LATCH BROKEN; UNABLE TO SAMPLE					
Trench 2W	1402		6.61	6.62	0.01	6.61	6.62	0.01
Trench 3E	1601		7.49	7.50	0.01	7.49	7.50	0.01
Trench 3W	1419		6.29	6.30	0.01	6.29	6.30	0.01
Trench 5E	1432		4.15	4.17	0.02	4.14	4.16	0.02
Trench 5W	1500		4.13	4.15	0.02	4.12	4.16	0.04
~~PNO-104~~	~~1542~~							
CP-107	1515		5.12	5.13	0.01	5.12	5.13	0.01
CP-110	1535		6.68	6.69	0.01	6.67	6.68	0.01
PNO-104	1547		6.44	6.62	0.18	6.45	6.61	0.16

4.13 4.16 → 0.03

6.45 6.63 → 0.18

LNAPL Recovery Notes
O&M Plan says recover if thickness > 0.25 ft. Use peristaltic to pump into safe container.

Location	Date	Start Time	End Time	Quantity	Notes:

Maritime Operations: (206) 787-3751 Call if wells are covered. Kelli Goodwin is our main point of contac

Signature:

LNAPL MEASUREMENT AND RECOVERY FIELD DATA SHEET

Sampling Event: November 2022

Project Number: ~~JG1601~~
Project Name: Terminal 91 (T91)
Project Address: 2001 W Garfield St.
Client Name: Port of Seattle

Date: 11/9/2022
Location: T91
Measured By: GSW
Measuring Tool: Interface Blue

Location	Time	MP	Depth Set 1 LNAPL	Depth Set 1 Water	Depth Set 1 Thickness	Depth Set 2 LNAPL	Depth Set 2 Water	Depth Set 2 Thickness
Trench 2E ~~3E~~			8.82	8.84		8.82	8.85	
Trench 2W ~~3W~~			5.63	5.65		5.64	5.65	
Trench ~~3E~~ 2E			9.97	9.97	NMT	9.97	9.97	0
Trench ~~3W~~ 2W			7.91	7.91	NMT	7.90	7.90	NMT
Trench 5E			5.20	5.22	0.02	5.20	5.22	0.02
Trench 5W	1550		5.18	5.19	0.01	5.18	5.19	0.01
PNO-104	1545	TOC	6.44	7.15	0.17	6.55	7.12	0.17
CP-107	1540		6.03	6.03	NMT	6.03	6.03	NMT
CP-110	1550		6.73	6.74	0.01	6.73	6.74	0.01

LNAPL Recovery Notes

O&M Plan says recover if thickness > 0.25 ft. Use peristaltic to pump into safe container.

Location	Date	Start Time	End Time	Quantity	Notes:

Maritime Operations: (206) 787-3751 Call if wells are covered. Kelli Goodwin is our main point of contact at Ops.

Signature: _____

PgG

B. Laboratory Data Reports and Data Comparison (Electronic Only)

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Vineta Mills, M.S.
Eric Young, B.S.

5500 4th Avenue South
Seattle, WA 98108
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

August 23, 2023

Glen Wallace, Project Manager
Mott MacDonald/PGG
1601 5th Ave, 850
Seattle, WA 98101

Dear Mr.Wallace:

Included are the results from the testing of material submitted on August 11, 2023 from the Terminal 91 507108502, F&BI 308215 project. There are 8 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
MMD0823R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on August 11, 2023 by Friedman & Bruya, Inc. from the Mott MacDonald/PGG Terminal 91 507108502, F&BI 308215 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Mott MacDonald/PGG
308215 -01	CP-103A
308215 -02	CP-104A
308215 -03	CP-106A
308215 -04	CP-108A
308215 -05	CP-203B
308215 -06	CP-GP01B
308215 -07	CP-GP02
308215 -08	CP-GP08
308215 -09	CP-GP09R
308215 -10	CP-GP10
308215 -11	CP-GP11
308215 -12	CP-GP14
308215 -13	D-100-08092023
308215 -14	PNO-MW02
308215 -15	PNO-MW06A
308215 -16	PNO-MW06B
308215 -17	PNO-MW103
308215 -18	Trip Blank

All quality control requirements were acceptable.

Date of Report: 08/23/23
Date Received: 08/11/23
Project: Terminal 91 507108502, F&BI 308215
Date Extracted: 08/15/23
Date Analyzed: 08/15/23

RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS GASOLINE USING METHOD NWTPH-Gx

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Gasoline Range	Surrogate (% Recovery) (Limit 50-150)
CP-103A 308215-01	380	116
CP-104A 308215-02	450	127
CP-106A 308215-03	940	123
CP-108A 308215-04	450	118
CP-203B 308215-05	300	115
CP-GP01B 308215-06	<100	118
CP-GP02 308215-07	360	115
CP-GP08 308215-08	<100	113
CP-GP09R 308215-09	<100	112
CP-GP10 308215-10	<100	111
CP-GP11 308215-11	130	113

Date of Report: 08/23/23
Date Received: 08/11/23
Project: Terminal 91 507108502, F&BI 308215
Date Extracted: 08/15/23
Date Analyzed: 08/15/23

RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS GASOLINE USING METHOD NWTPH-Gx

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Gasoline Range	Surrogate (% Recovery) (Limit 50-150)
CP-GP14 308215-12	<100	113
D-100-08092023 308215-13	<100	112
PNO-MW02 308215-14	<100	113
PNO-MW06A 308215-15	<100	116
PNO-MW06B 308215-16	140	114
PNO-MW103 308215-17	410	116
Method Blank 03-1640 MB	<100	112

Date of Report: 08/23/23
Date Received: 08/11/23
Project: Terminal 91 507108502, F&BI 308215
Date Extracted: 08/14/23
Date Analyzed: 08/21/23

RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL AND MOTOR OIL USING METHOD NWTPH-Dx
Sample Extracts Passed Through a Silica Gel Column Prior to Analysis
Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Diesel Range (C_{10}-C_{25})	Motor Oil Range (C_{25}-C_{36})	Surrogate (% Recovery) (Limit 41-152)
CP-103A 308215-01	310 x	<250	102
CP-104A 308215-02	340 x	<250	111
CP-106A 308215-03	450 x	<250	114
CP-108A 308215-04	340 x	<250	111
CP-203B 308215-05	210 x	<250	113
CP-GP01B 308215-06	<50	<250	103
CP-GP02 308215-07	220 x	<250	96
CP-GP08 308215-08	<50	<250	110
CP-GP09R 308215-09	<50	<250	120
CP-GP10 308215-10	<50	<250	109
CP-GP11 308215-11	<50	<250	105

Date of Report: 08/23/23
Date Received: 08/11/23
Project: Terminal 91 507108502, F&BI 308215
Date Extracted: 08/14/23
Date Analyzed: 08/21/23

RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL AND MOTOR OIL USING METHOD NWTPH-Dx
Sample Extracts Passed Through a Silica Gel Column Prior to Analysis
Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Diesel Range (C_{10}-C_{25})	Motor Oil Range (C_{25}-C_{36})	Surrogate (% Recovery) (Limit 41-152)
CP-GP14 308215-12	<50	<250	114
D-100-08092023 308215-13 1/1.2	<60	<300	106
PNO-MW02 308215-14	<55	<250	102
PNO-MW06A 308215-15	140 x	<250	85
PNO-MW06B 308215-16	150 x	<250	116
PNO-MW103 308215-17	680 x	<250	119
Method Blank 03-1923 MB	<50	<250	118

Date of Report: 08/23/23
Date Received: 08/11/23
Project: Terminal 91 507108502, F&BI 308215

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TPH AS GASOLINE USING METHOD NWTPH-Gx

Laboratory Code: 308215-07 Matrix Spike

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Gasoline	ug/L (ppb)	1,000	350	97	97	50-150	0

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Gasoline	ug/L (ppb)	1,000	100	70-130

Date of Report: 08/23/23
Date Received: 08/11/23
Project: Terminal 91 507108502, F&BI 308215

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL EXTENDED USING METHOD NWTPH-Dx

Laboratory Code: 308215-07 (Matrix Spike) Silica Gel

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	ug/L (ppb)	2,500	<50	104	100	50-150	4

Laboratory Code: Laboratory Control Sample Silica Gel

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Diesel Extended	ug/L (ppb)	2,500	92	65-151

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria, biased low; or, the calibration results for the analyte were outside of acceptance criteria, biased high, with a detection for the analyte in the sample. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The analyte is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits due to sample matrix effects.

j - The analyte concentration is reported below the standard reporting limit. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

k – The calibration results for the analyte were outside of acceptance criteria, biased high, and the analyte was not detected in the sample.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

308215

08/N/23 F3/VW4

Sample Chain of Custody

Company: Mott MacDonald / PGG	Laboratory: Fridman & Bruya, Inc	**Laboratory Use**
Project Name: Terminal 91	Contact: Eric Young	
Project Number: 507108502	Address: 5500 4th Ave S	
Project Manager: Glen Wallace	Seattle, WA 98108	
Phone Number: (206) 212-0302	Phone Number: (206) 683-1731	
E-mail: glen.wallace@mottmac.com; alla.skaskevych@mottmac.com	eyoung@friedmanandbruya.com	
Sampled By: Ashley Parkhurst/Richardson Emily		**Turnaround: Standard**

	Lab ID	Sample ID	Date Sampled	Time Sampled	Matrix	# Containers	NWTPH-Dx (acid silica gel cleanup)	NWTPH-G								Comments
		Sample Information					**Analyses**									
-01	A-E	CP-103A	8/11/23	1035	W	5	x	x								
-02		CP-104A	8/11/23	1110	W	5	x	x								
-03		CP-106A	8/11/23	1215	W	5	x	x								
-04		CP-108A	8/11/23	1330	W	5	x	x								
-05		CP-203B	8/11/23	1147	W	5	x	x								
-06		CP-GP01B	8/11/23	1410	W	5	x	x								
-07	A-J	CP-GP02	8/11/23	1440	W	10	x	x								MS/MSD collected
-08	A-E	CP-GP08	8/11/23	1245	W	5	x	x								
-09		CP-GP09R	8/9/23	1430	W	5	x	x								
-10		CP-GP10	8/9/23	1410	W	5	x	x								

	Signature	Company	Date	Time
Relinquished		Mott MacDonald	8/11/23	1653
Received		FBI	8-11-23	1653
Relinquished				
Received				
Relinquished				
Received				

Comments / Special Instructions

Acid silica gel cleanup for all water NWTPH-Dx analyses.

Level 2 data package

EDD in PGG, EIM, and Port of Seattle formats

Samples received at 4 °C

308215

08/11/23 F3/VW4

Sample Chain of Custody

Company: Mott MacDonald / PGG	Laboratory: Fridman & Bruya, Inc	**Laboratory Use**
Project Name: Terminal 91	Contact: Eric Young	
Project Number: 518300033	Address: 5500 4th Ave S	
Project Manager: Glen Wallace	Seattle, WA 98108	
Phone Number: (206) 212-0302	Phone Number: (206) 683-1731	
E-mail: glen.wallace@mottmac.com; alla.skaskevych@mottmac.com	eyoung@friedmanandbruya.com	
Sampled By: Ashley Parkhurst/Richardson Emily		**Turnaround: Standard**

	Sample Information						Analyses									
	Lab ID	Sample ID	Date Sampled	Time Sampled	Matrix	# Containers	NWTPH-Dx (acid silica gel cleanup)	NWTPH-G								Comments
-11	A-E	CP-GP11	8/11/23	0922	W	5	X	X								
-12		CP-GP14	8/11/23	1000	W	5	X	X								
-13		D-100-08092023	8/11/23	1600	W	5	X	X								
-14		PNO-MW02	8/11/23	0826	W	5	X	X								
-15		PNO-MW06A	8/11/23	0840	W	5	X	X								
-16		PNO-MW06B	8/9/23	1635	W	5	X	X								
-17		PNO-MW103	8/9/23	1540	W	5	X	X								
18	A-B	Trip Blank	—	—	W	2										Added at lab (NP) 8/11/23

	Signature	Company	Date	Time
Relinquished		Mott MacDonald	8/11/2023	1653
Received		FBI	8-11-23	16:53
Relinquished				
Received				
Relinquished				
Received				

Comments / Special Instructions

Acid silica gel cleanup for all water NWTPH-Dx analyses.

Level 2 data package

EDD in PGG, EIM, and Port of Seattle formats

Samples received at 4 °C

OnSite Environmental Inc.
14648 NE 95th Street, Redmond, WA 98052 • (425) 883-3881

August 21, 2023

Glen Wallace
Pacific Groundwater Group
2377 Eastlake Avenue E, Suite 200
Seattle, WA 98102

Re: Analytical Data for Project 507108502
Laboratory Reference No. 2308-145

Dear Glen:

Enclosed are the analytical results and associated quality control data for samples submitted on August 11, 2023.

The standard policy of OnSite Environmental Inc. is to store your samples for 30 days from the date of receipt. If you require longer storage, please contact the laboratory.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the data, or need additional information, please feel free to call me.

Sincerely,

David Baumeister
Project Manager

Enclosures

Date of Report: August 21, 2023
Samples Submitted: August 11, 2023
Laboratory Reference: 2308-145
Project: 507108502

ANALYTICAL REPORT FOR SAMPLES

Client ID	Laboratory ID	Matrix	Date Sampled	Date Received	Notes
CP-103A	08-145-01	Water	8-11-23	8-11-23	
CP-104A	08-145-02	Water	8-11-23	8-11-23	
CP-106A	08-145-03	Water	8-11-23	8-11-23	
CP-108A	08-145-04	Water	8-11-23	8-11-23	
CP-203B	08-145-05	Water	8-11-23	8-11-23	
CP-GP01B	08-145-06	Water	8-11-23	8-11-23	
CP-GP02	08-145-07	Water	8-11-23	8-11-23	
CP-GP08	08-145-08	Water	8-11-23	8-11-23	
CP-GP09R	08-145-09	Water	8-9-23	8-11-23	
CP-GP10	08-145-10	Water	8-9-23	8-11-23	
CP-GP11	08-145-11	Water	8-11-23	8-11-23	
CP-GP14	08-145-12	Water	8-11-23	8-11-23	
D-100-08092023	08-145-13	Water	8-11-23	8-11-23	
PNO-MW02	08-145-14	Water	8-11-23	8-11-23	
PNO-MW06A	08-145-15	Water	8-11-23	8-11-23	
PNO-MW06B	08-145-16	Water	8-9-23	8-11-23	
PNO-MW103	08-145-17	Water	8-9-23	8-11-23	

Date of Report: August 21, 2023
Samples Submitted: August 11, 2023
Laboratory Reference: 2308-145
Project: 507108502

Case Narrative

Samples were collected on August 9 and 11, 2023 and received by the laboratory on August 11, 2023. They were maintained at the laboratory at a temperature of 2°C to 6°C. Please see Sample/Cooler Receipt form at the end of the report.

General QA/QC issues associated with the analytical data enclosed in this laboratory report will be indicated with a reference to a comment or explanation on the Data Qualifier page. More complex and involved QA/QC issues will be discussed in detail below.

NWTPH-Dx Analysis

The diesel sample duplicate RPD is outside of control limits due to sample inhomogeneity. The higher value was reported. All other QC was within limits.

Any other QA/QC issues associated with this extraction and analysis will be indicated with a footnote reference and discussed in detail on the Data Qualifier page.

Date of Report: August 21, 2023
Samples Submitted: August 11, 2023
Laboratory Reference: 2308-145
Project: 507108502

DIESEL AND HEAVY OIL RANGE ORGANICS
NWTPH-Dx

Matrix: Water
Units: mg/L (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**CP-103A**					
Laboratory ID:	08-145-01					
Diesel Range Organics	**0.57**	0.22	NWTPH-Dx	8-14-23	8-15-23	X1
Lube Oil Range Organics	**0.23**	0.22	NWTPH-Dx	8-14-23	8-15-23	X1
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*79*	*50-150*				
Client ID:	**CP-104A**					
Laboratory ID:	08-145-02					
Diesel Range Organics	**1.3**	0.20	NWTPH-Dx	8-14-23	8-15-23	X1
Lube Oil Range Organics	**0.56**	0.20	NWTPH-Dx	8-14-23	8-15-23	N1,X1
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*95*	*50-150*				
Client ID:	**CP-106A**					
Laboratory ID:	08-145-03					
Diesel Range Organics	**2.3**	0.20	NWTPH-Dx	8-14-23	8-14-23	X1
Lube Oil Range Organics	**0.81**	0.20	NWTPH-Dx	8-14-23	8-14-23	N1,X1
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*85*	*50-150*				
Client ID:	**CP-108A**					
Laboratory ID:	08-145-04					
Diesel Range Organics	**0.63**	0.20	NWTPH-Dx	8-14-23	8-14-23	X1
Lube Oil Range Organics	**0.33**	0.20	NWTPH-Dx	8-14-23	8-14-23	X1
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*113*	*50-150*				
Client ID:	**CP-203B**					
Laboratory ID:	08-145-05					
Diesel Range Organics	**0.50**	0.24	NWTPH-Dx	8-14-23	8-15-23	X1
Lube Oil Range Organics	**0.28**	0.24	NWTPH-Dx	8-14-23	8-15-23	X1
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*78*	*50-150*				
Client ID:	**CP-GP01B**					
Laboratory ID:	08-145-06					
Diesel Range Organics	**ND**	0.20	NWTPH-Dx	8-14-23	8-15-23	X1
Lube Oil Range Organics	**ND**	0.20	NWTPH-Dx	8-14-23	8-15-23	X1
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*80*	*50-150*				

Date of Report: August 21, 2023
Samples Submitted: August 11, 2023
Laboratory Reference: 2308-145
Project: 507108502

DIESEL AND HEAVY OIL RANGE ORGANICS
NWTPH-Dx

Matrix: Water
Units: mg/L (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**CP-GP02**					
Laboratory ID:	08-145-07					
Diesel Range Organics	**1.8**	0.20	NWTPH-Dx	8-14-23	8-14-23	X1
Lube Oil Range Organics	**0.52**	0.20	NWTPH-Dx	8-14-23	8-14-23	X1
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*102*	*50-150*				
Client ID:	**CP-GP08**					
Laboratory ID:	08-145-08					
Diesel Range Organics	**ND**	0.078	NWTPH-Dx	8-14-23	8-15-23	X1
Lube Oil Range Organics	**0.29**	0.21	NWTPH-Dx	8-14-23	8-15-23	X1
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*82*	*50-150*				
Client ID:	**CP-GP09R**					
Laboratory ID:	08-145-09					
Diesel Range Organics	**ND**	0.20	NWTPH-Dx	8-14-23	8-14-23	X1
Lube Oil Range Organics	**ND**	0.20	NWTPH-Dx	8-14-23	8-14-23	X1
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*95*	*50-150*				
Client ID:	**CP-GP10**					
Laboratory ID:	08-145-10					
Diesel Range Organics	**ND**	0.21	NWTPH-Dx	8-14-23	8-14-23	X1
Lube Oil Range Organics	**ND**	0.21	NWTPH-Dx	8-14-23	8-14-23	X1
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*81*	*50-150*				
Client ID:	**CP-GP11**					
Laboratory ID:	08-145-11					
Diesel Range Organics	**ND**	0.22	NWTPH-Dx	8-14-23	8-14-23	X1
Lube Oil Range Organics	**ND**	0.22	NWTPH-Dx	8-14-23	8-14-23	X1
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*88*	*50-150*				
Client ID:	**CP-GP14**					
Laboratory ID:	08-145-12					
Diesel Range Organics	**ND**	0.20	NWTPH-Dx	8-14-23	8-14-23	X1
Lube Oil Range Organics	**ND**	0.20	NWTPH-Dx	8-14-23	8-14-23	X1
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*92*	*50-150*				

Date of Report: August 21, 2023
Samples Submitted: August 11, 2023
Laboratory Reference: 2308-145
Project: 507108502

DIESEL AND HEAVY OIL RANGE ORGANICS
NWTPH-Dx

Matrix: Water
Units: mg/L (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**D-100-08092023**					
Laboratory ID:	08-145-13					
Diesel Range Organics	**ND**	0.20	NWTPH-Dx	8-14-23	8-14-23	X1
Lube Oil Range Organics	**ND**	0.20	NWTPH-Dx	8-14-23	8-14-23	X1
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*92*	*50-150*				
Client ID:	**PNO-MW02**					
Laboratory ID:	08-145-14					
Diesel Range Organics	**0.27**	0.22	NWTPH-Dx	8-14-23	8-14-23	X1
Lube Oil Range Organics	**ND**	0.22	NWTPH-Dx	8-14-23	8-14-23	X1
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*104*	*50-150*				
Client ID:	**PNO-MW06A**					
Laboratory ID:	08-145-15					
Diesel Range Organics	**3.8**	0.20	NWTPH-Dx	8-14-23	8-14-23	X1
Lube Oil Range Organics	**0.85**	0.20	NWTPH-Dx	8-14-23	8-14-23	N1,X1
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*124*	*50-150*				
Client ID:	**PNO-MW06B**					
Laboratory ID:	08-145-16					
Diesel Range Organics	**1.9**	0.20	NWTPH-Dx	8-14-23	8-14-23	X1
Lube Oil Range Organics	**0.69**	0.20	NWTPH-Dx	8-14-23	8-14-23	N1,X1
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*112*	*50-150*				
Client ID:	**PNO-MW103**					
Laboratory ID:	08-145-17					
Diesel Range Organics	**1.8**	0.21	NWTPH-Dx	8-14-23	8-15-23	X1
Lube Oil Range Organics	**0.26**	0.21	NWTPH-Dx	8-14-23	8-15-23	X1
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*63*	*50-150*				

Date of Report: August 21, 2023
Samples Submitted: August 11, 2023
Laboratory Reference: 2308-145
Project: 507108502

DIESEL AND HEAVY OIL RANGE ORGANICS
NWTPH-Dx
QUALITY CONTROL

Matrix: Water
Units: mg/L (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0814W1					
Diesel Range Organics	**ND**	0.060	NWTPH-Dx	8-14-23	8-14-23	X1
Lube Oil Range Organics	**ND**	0.16	NWTPH-Dx	8-14-23	8-14-23	X1
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*86*	*50-150*				

Analyte	Result		Spike Level		Source Result	Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE											
Laboratory ID:	08-145-07										
	ORIG	DUP									
Diesel Range Organics	**1.78**	**1.05**	NA	NA		NA		NA	52	40	L
Lube Oil Range Organics	**0.518**	**0.341**	NA	NA		NA		NA	41	40	L
Surrogate:											
o-Terphenyl						*102*	*85*	*50-150*			
Laboratory ID:	SB0814W1										
	ORIG	DUP									
Diesel Fuel #2	**0.481**	**0.417**	NA	NA		NA		NA	14	40	X1
Surrogate:											
o-Terphenyl						*89*	*71*	*50-150*			
SPIKE BLANK											
Laboratory ID:	SB0814W1 ACU										
Diesel Fuel #2	**0.481**		0.500		NA	**96**		53-126	NA	NA	X1
Surrogate:											
o-Terphenyl						*89*		*50-150*			

OnSite Environmental Inc.

Data Qualifiers

A - Due to a high sample concentration, the amount spiked is insufficient for meaningful MS/MSD recovery data.

B - The analyte indicated was also found in the blank sample.

C - The duplicate RPD is outside control limits due to high result variability when analyte concentrations are within five times the quantitation limit.

E - The value reported exceeds the quantitation range and is an estimate.

F - Surrogate recovery data is not available due to the high concentration of coeluting target compounds.

H - The analyte indicated is a common laboratory solvent and may have been introduced during sample preparation, and be impacting the sample result.

I - Compound recovery is outside of the control limits.

J - The value reported was below the practical quantitation limit. The value is an estimate.

K - Sample duplicate RPD is outside control limits due to sample inhomogeneity. The sample was re-extracted and re-analyzed with similar results.

L - The RPD is outside of the control limits.

M - Hydrocarbons in the gasoline range are impacting the diesel range result.

M1 - Hydrocarbons in the gasoline range (toluene-napthalene) are present in the sample.

N - Hydrocarbons in the lube oil range are impacting the diesel range result.

N1 - Hydrocarbons in diesel range are impacting lube oil range results.

O - Hydrocarbons indicative of heavier fuels are present in the sample and are impacting the gasoline result.

P - The RPD of the detected concentrations between the two columns is greater than 40.

Q - Surrogate recovery is outside of the control limits.

S - Surrogate recovery data is not available due to the necessary dilution of the sample.

T - The sample chromatogram is not similar to a typical _____.

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

U1 - The practical quantitation limit is elevated due to interferences present in the sample.

V - Matrix Spike/Matrix Spike Duplicate recoveries are outside control limits due to matrix effects.

W - Matrix Spike/Matrix Spike Duplicate RPD are outside control limits due to matrix effects.

X - Sample extract treated with a mercury cleanup procedure.

X1- Sample extract treated with a sulfuric acid/silica gel cleanup procedure.

Y - The calibration verification for this analyte exceeded the 20% drift specified in methods 8260 & 8270, and therefore the reported result should be considered an estimate. The overall performance of the calibration verification standard met the acceptance criteria of the method.

Y1 - Negative effects of the matrix from this sample on the instrument caused values for this analyte in the bracketing continuing calibration verification standard (CCVs) to be outside of 20% acceptance criteria. Because of this, quantitation limits and sample concentrations should be considered estimates.

Z -

Sample Chain of Custody

08-145

Company: Mott MacDonald / PGG	Laboratory: OnSite Environmental	**Laboratory Use**
Project Name: Terminal 91	Contact: David Baumeister	
Project Number: 507108502	Address: 14648 NE 95th Street	
Project Manager: Glen Wallace	Redmond, WA 98052	
Phone Number: (206) 212-0302	Phone Number: (425) 883-3881	
E-mail: glen.wallace@mottmac.com; alla.skaskevych@mottmac.com	Web: www.onsite-env.com	
Sampled By: Ashley Parkhurst/Richardson Emily		**Turnaround: Standard**

Sample Information						Analyses									
Lab ID	Sample ID	Date Sampled	Time Sampled	Matrix	# Containers	NWTPH-Dx (acid silica gel cleanup)									Comments
1	CP-103A	8/11/23	1035	W	2	X									
2	CP-104A	8/11/23	1110	W	2	X									
3	CP-106A	8/11/23	1215	W	2	X									
4	CP-108A	8/11/23	1380	W	2	X									
5	CP-203B	8/11/23	1147	W	2	X									
6	CP-GP01B	8/11/23	1410	W	2	X									
7	CP-GP02	8/11/23	1440	W	4	X									MS/MSD collected
8	CP-GP08	8/11/23	1245	W	2	X									
9	CP-GP09R	8/9/23	1430	W	2	X									
10	CP-GP10	8/9/23	1410	W	2	X									

	Signature	Company	Date	Time
Relinquished		Aecom	8/11/23	1730
Received		OSE	8/11/23	1730
Relinquished				
Received				
Relinquished				
Received				

Comments / Special Instructions

Acid silica gel cleanup for all water NWTPH-Dx analyses.

Level 2 data package

EDD in PGG, EIM, and Port of Seattle formats

Sample Chain of Custody

08-145

Company: Mott MacDonald / PGG	Laboratory: OnSite Environmental	**Laboratory Use**
Project Name: Terminal 91	Contact: David Baumeister	
Project Number: 518300033	Address: 14648 NE 95th Street	
Project Manager: Glen Wallace	Redmond, WA 98052	
Phone Number: (206) 212-0302	Phone Number: (425) 883-3881	
E-mail: glen.wallace@mottmac.com; alla.skaskevych@mottmac.com	Web: www.onsite-env.com	
Sampled By: Ashley Parkhurst/Richardson Emily		**Turnaround: Standard**

Sample Information						Analyses									
Lab ID	Sample ID	Date Sampled	Time Sampled	Matrix	# Containers	NWTPH-Dx (acid silica gel cleanup)									Comments
11	CP-GP11	8/11/23	0922	W	2	X									
12	CP-GP14	8/11/23	1000	W	2	X									
13	D-100-08092023	8/11/23	1600	W	2	X									
14	PNO-MW02	8/11/23	0826	W	2	X									
15	PNO-MW06A	8/11/23	0840	W	2	X									
16	PNO-MW06B	8/9/23	1635	W	2	X									
17	PNO-MW103	8/9/23	1540	W	2	X									

	Signature	Company	Date	Time
Relinquished		AECOM	8/11/23	1730
Received		AECOM	8/11/23	1730
Relinquished				
Received				
Relinquished				
Received				

Comments / Special Instructions

Acid silica gel cleanup for all water NWTPH-Dx analyses.

Level 2 data package

EDD in PGG, EIM, and Port of Seattle formats

Sample/Cooler Receipt and Acceptance Checklist

Client: POS PEG

Client Project Name/Number: 507108502

OnSite Project Number: 08-145

Initiated by: MV

Date Initiated: 8/11/23

1.0 Cooler Verification

1.1 Were there custody seals on the outside of the cooler?	Yes	(No)	N/A	1 2 3 4
1.2 Were the custody seals intact?	Yes	No	(N/A)	1 2 3 4
1.3 Were the custody seals signed and dated by last custodian?	Yes	No	(N/A)	1 2 3 4
1.4 Were the samples delivered on ice or blue ice?	(Yes)	No	N/A	1 2 3 4
1.5 Were samples received between 0-6 degrees Celsius?	(Yes)	No	N/A	Temperature: 6, 6
1.6 Have shipping bills (if any) been attached to the back of this form?	Yes	(N/A)		
1.7 How were the samples delivered?	(Client)	Courier	UPS/FedEx	OSE Pickup / Other

2.0 Chain of Custody Verification

2.1 Was a Chain of Custody submitted with the samples?	(Yes)	No		1 2 3 4
2.2 Was the COC legible and written in permanent ink?	(Yes)	No		1 2 3 4
2.3 Have samples been relinquished and accepted by each custodian?	(Yes)	No		1 2 3 4
2.4 Did the sample labels (ID, date, time, preservative) agree with COC?	(Yes)	No		1 2 3 4
2.5 Were all of the samples listed on the COC submitted?	(Yes)	No		1 2 3 4
2.6 Were any of the samples submitted omitted from the COC?	Yes	(No)		1 2 3 4

3.0 Sample Verification

3.1 Were any sample containers broken or compromised?	Yes	(No)		1 2 3 4
3.2 Were any sample labels missing or illegible?	Yes	(No)		1 2 3 4
3.3 Have the correct containers been used for each analysis requested?	(Yes)	No		1 2 3 4
3.4 Have the samples been correctly preserved?	Yes	(No)	N/A	1 2 3 4
3.5 Are volatiles samples free from headspace and bubbles greater than 6mm?	Yes	No	(N/A)	1 2 3 4
3.6 Is there sufficient sample submitted to perform requested analyses?	(Yes)	No		1 2 3 4
3.7 Have any holding times already expired or will expire in 24 hours?	Yes	(No)		1 2 3 4
3.8 Was method 5035A used?	Yes	No	(N/A)	1 2 3 4
3.9 If 5035A was used, which sampling option was used (#1, 2, or 3).	#		(N/A)	1 2 3 4

Explain any discrepancies:

3.4) #4) pH 4 - ambers
#5) pH 7 - 1 amber
#7) pH 4,5 - ambers

1 - Discuss issue in Case Narrative

2 - Process Sample As-is

3 - Client contacted to discuss problem

4 - Sample cannot be analyzed or client does not wish to proceed

Comparison of Diesel Analytical Results

Diesel range petroleum at Terminal 91 upland areas is affected by both biodegradation and the presence of background organic material. The Compliance Monitoring Plan (CMP; PES 2013) specifies the use of silica gel cleanup sample preparation methods.

Sample splits from the August 2023 groundwater sampling event were sent to both Friedman & Bruya and OnSite as a quality assurance step in preparation for transitioning laboratory analyses to Friedman & Bruya. Sample splits were only analyzed for NWTPH-Dx for this comparison due to the observation of significant variability in prior analytical results for diesel range petroleum.

Analytical results from the split diesel analyses show relative percent differences (RPD) between 84% and 2614% (Table A1); RPD was calculated as OnSite vs Friedman & Bruya results. These RPDs exceed the 25% target for water samples in the Quality Assurance Project Plan (PES 2013). The results show a systematic bias to higher concentrations in the analytical results from OnSite.

Table A1: Comparison of Diesel Results

Port of Seattle Terminal 91

Sample Name	Friedman & Bruya Result	OnSite Result	Relative Percent Difference
CP-103A	0.31	0.57	84%
CP-104A	0.34	1.30	282%
CP-106A	0.45	2.30	411%
CP-108A	0.34	0.63	85%
CP-203B	0.21	0.50	138%
CP-GP01B	0.05 U	0.20 U	U
CP-GP02	0.22	1.80	718%
CP-GP08	0.05 U	0.078 U	U
CP-GP09R	0.05 U	0.20 U	U
CP-GP10	0.05 U	0.21 U	U
CP-GP11	0.05 U	0.22 U	U
CP-GP14	0.05 U	0.20 U	U
PNO-MW02	0.055 U	0.27	U
PNO-MW06A	0.14	3.80	2614%
PNO-MW06B	0.15	1.90	1167%
PNO-MW103	0.68	1.80	165%

Notes:
U: not detected at reporting limit shown.
All results in milligrams per liter (mg/L)

Chromatograms for NWTPH-Dx diesel range were requested from both labs and are shown on the following pages. Mott MacDonald discussed the comparison of chromatograms with Eric

Young, analytical chemist at Friedman & Bruya, on October 27, 2023. OnSite chromatograms indicate more organic material appears to be passing through the silica gel sample preparation than shown in the Friedman & Bruya chromatograms. See chromatograms for PNO-MW-06A, PNO-MW06B, and PNO-MW103 for examples of this. The rounded chromatograms in the 10-14 minute range in the OnSite chromatograms are consistent with what would be expected for a weathered or organic rich sample with incomplete or no silica gel cleanup. See the weathered chromatogram from Figure 1 of the *Environmental Effects-Based Concentrations for Weathered Diesel-Range Organics* (Ecology 2020) below for comparison. Silica gel cleanup should remove polar molecules leaving a crisper chromatogram with more distinct peaks for the non-polar petroleum molecules more similar to the fresh diesel example.

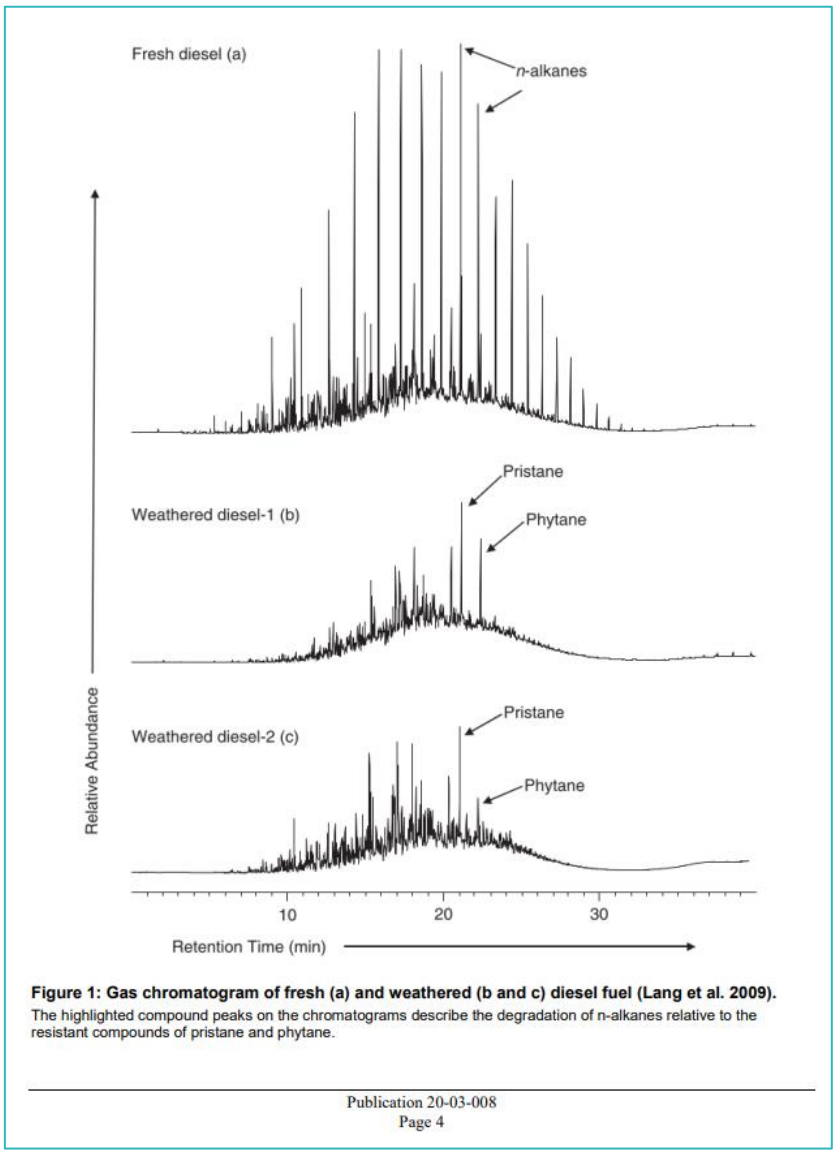

Figure 1: Gas chromatogram of fresh (a) and weathered (b and c) diesel fuel (Lang et al. 2009).
The highlighted compound peaks on the chromatograms describe the degradation of n-alkanes relative to the resistant compounds of pristane and phytane.

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Page 4

The chromatograms from the Friedman & Bruya analyses are more representative of the non-polar molecules in the diesel range that the CMP is intended to analyze. The CMP requires silica gel cleanup as part of the sample analysis to reduce the influence of background organic material and weathered petroleum on the analytical results. The likely incomplete removal of these compounds in the silica gel treatment in the OnSite chromatograms results in a reported value that is biased high.

We recommend continuing with the transition to Friedman & Bruya for future analysis of NWTPH-Dx for this project. Historical variability between Fremont Analytical and OnSite and within OnSite results may be due to differences in polar molecule removal efficiency between sampling events.

NWTPH-Dx Chromatograms

The top insets are the sample logs for cross-referencing between laboratory sample names and well-based sample names. Chromatogram images use the laboratory sample names and include the well sample name and reported diesel results for each sample split.

CASE NARRATIVE

This case narrative encompasses samples received on August 11, 2023 by Friedman & Bruya, Inc. from the Mott MacDonald/PGG Terminal 91 507108502, F&BI 308215 project. Samples were logged in under the laboratory ID's listed below.

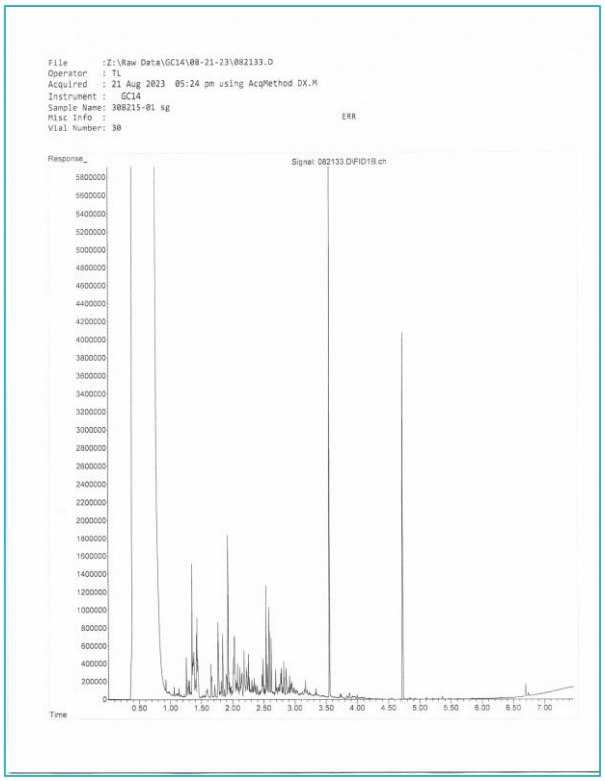
Laboratory ID	Mott MacDonald/PGG
308215 -01	CP-103A
308215 -02	CP-104A
308215 -03	CP-106A
308215 -04	CP-108A
308215 -05	CP-203B
308215 -06	CP-GP01B
308215 -07	CP-GP02
308215 -08	CP-GP08
308215 -09	CP-GP09R
308215 -10	CP-GP10
308215 -11	CP-GP11
308215 -12	CP-GP14
308215 -13	D-100-08092023
308215 -14	PNO-MW02
308215 -15	PNO-MW06A
308215 -16	PNO-MW06B
308215 -17	PNO-MW103
308215 -18	Trip Blank

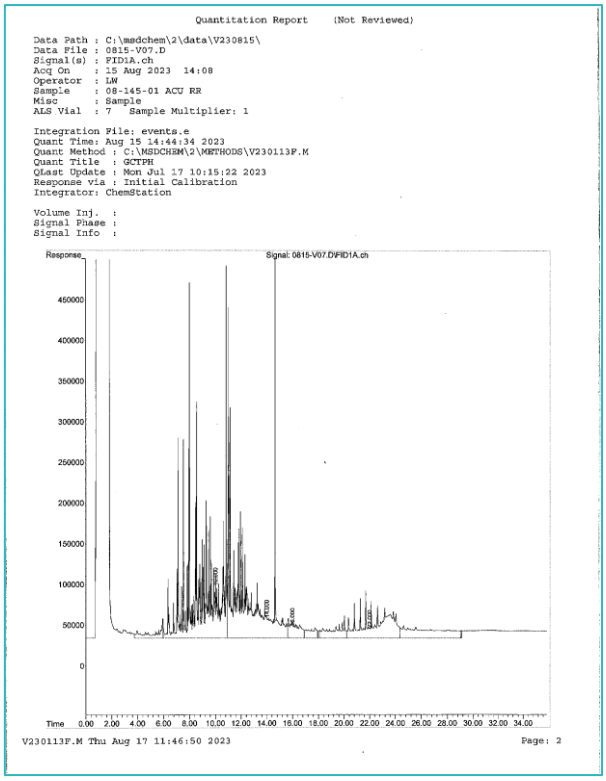
Date of Report: August 21, 2023
Samples Submitted: August 11, 2023
Laboratory Reference: 2308-145
Project: 507108502

ANALYTICAL REPORT FOR SAMPLES

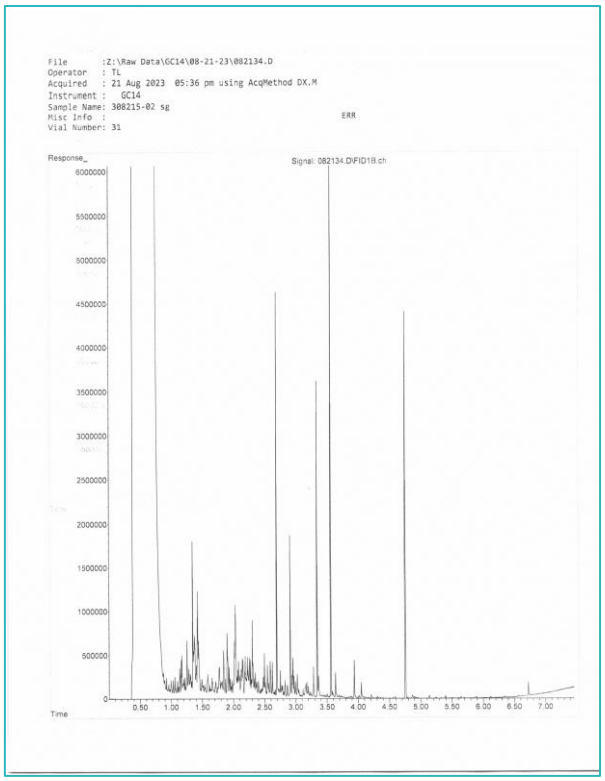
Client ID	Laboratory ID	Matrix	Date Sampled	Date Received	Notes
CP-103A	08-145-01	Water	8-11-23	8-11-23	
CP-104A	08-145-02	Water	8-11-23	8-11-23	
CP-106A	08-145-03	Water	8-11-23	8-11-23	
CP-108A	08-145-04	Water	8-11-23	8-11-23	
CP-203B	08-145-05	Water	8-11-23	8-11-23	
CP-GP01B	08-145-06	Water	8-11-23	8-11-23	
CP-GP02	08-145-07	Water	8-11-23	8-11-23	
CP-GP08	08-145-08	Water	8-11-23	8-11-23	
CP-GP09R	08-145-09	Water	8-9-23	8-11-23	
CP-GP10	08-145-10	Water	8-9-23	8-11-23	
CP-GP11	08-145-11	Water	8-11-23	8-11-23	
CP-GP14	08-145-12	Water	8-11-23	8-11-23	
D-100-08092023	08-145-13	Water	8-11-23	8-11-23	
PNO-MW02	08-145-14	Water	8-11-23	8-11-23	
PNO-MW06A	08-145-15	Water	8-11-23	8-11-23	
PNO-MW06B	08-145-16	Water	8-9-23	8-11-23	
PNO-MW103	08-145-17	Water	8-9-23	8-11-23	

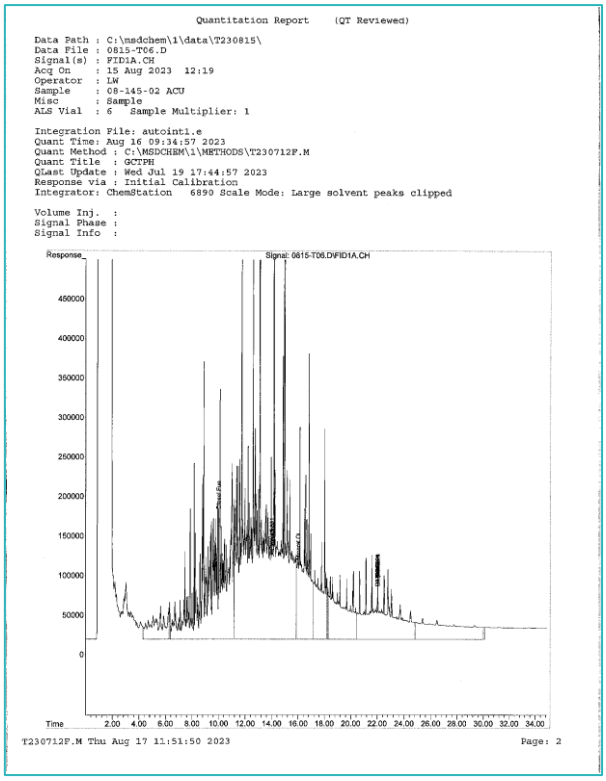
CP-103A - Friedman and Bruya 0.31 mg/L; OnSite 0.57 mg/L



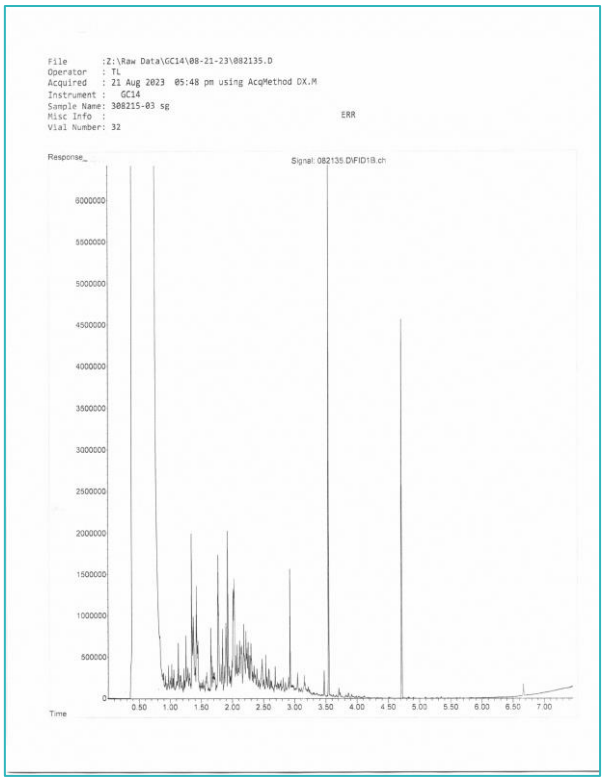


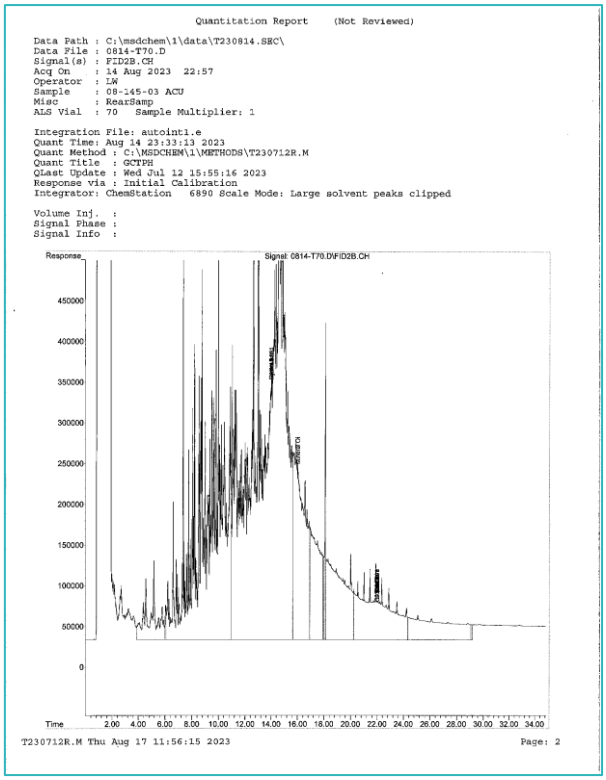
CP-104a - Friedman and Bruya 0.34 mg/L; OnSite 1.30 mg/L



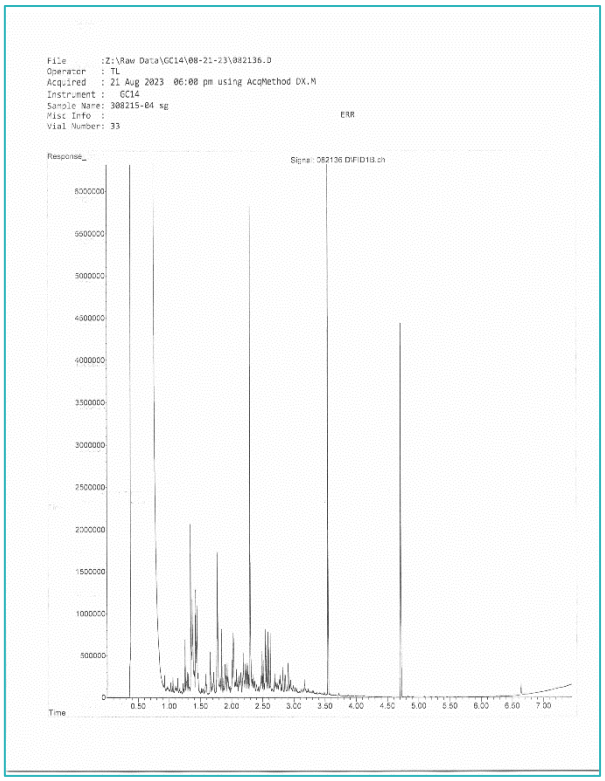


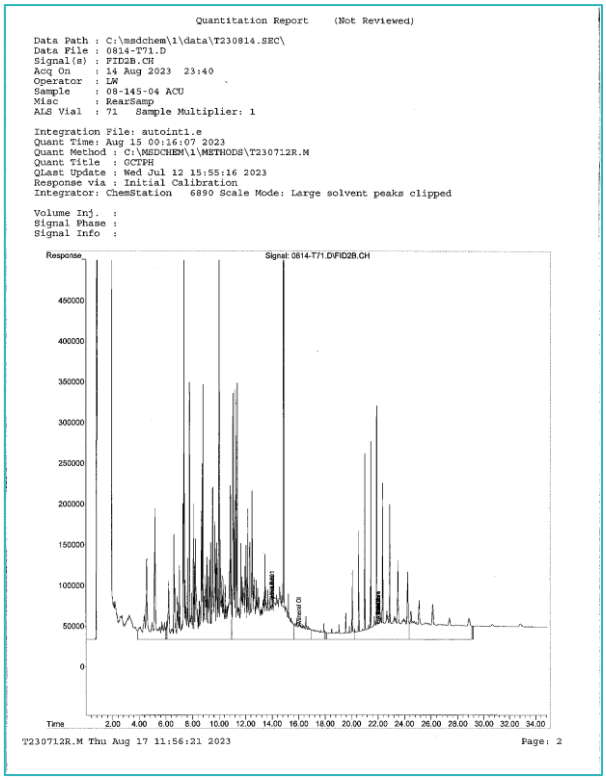
CP-106A - Friedman and Bruya 0.45 mg/L; OnSite 2.30 mg/L





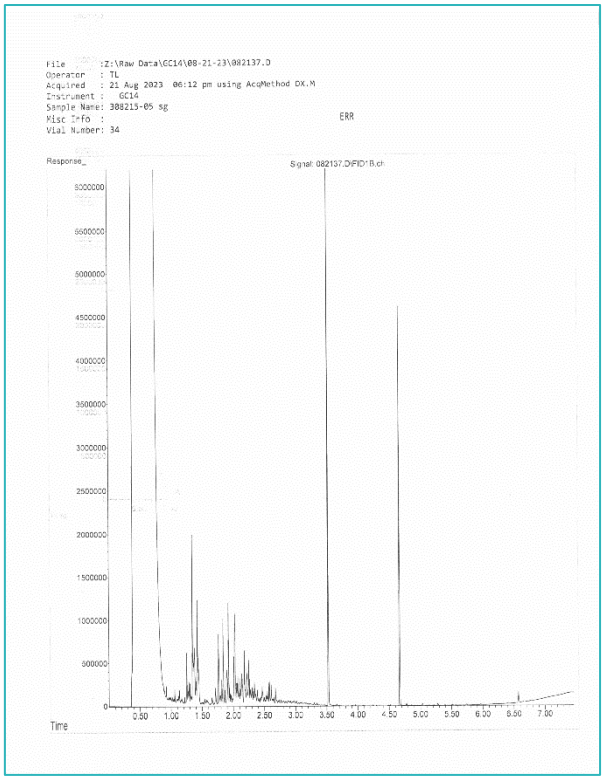
CP-108A - Friedman and Bruya 0.34 mg/L; OnSite 0.63 mg/L

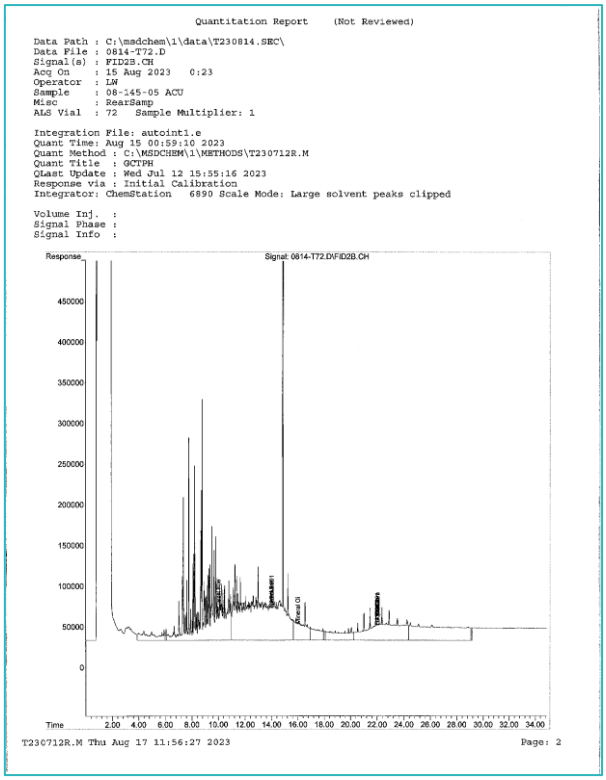




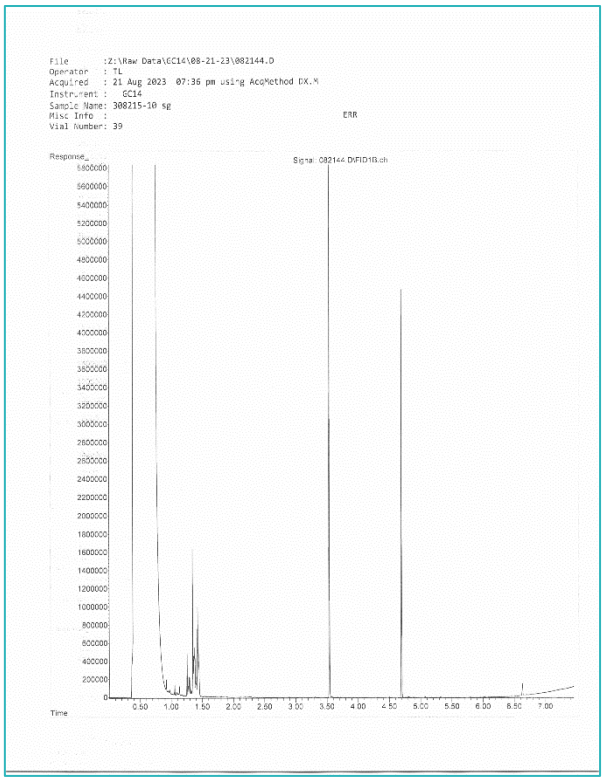
CP-203B - Friedman and Bruya 0.21 mg/L; OnSite

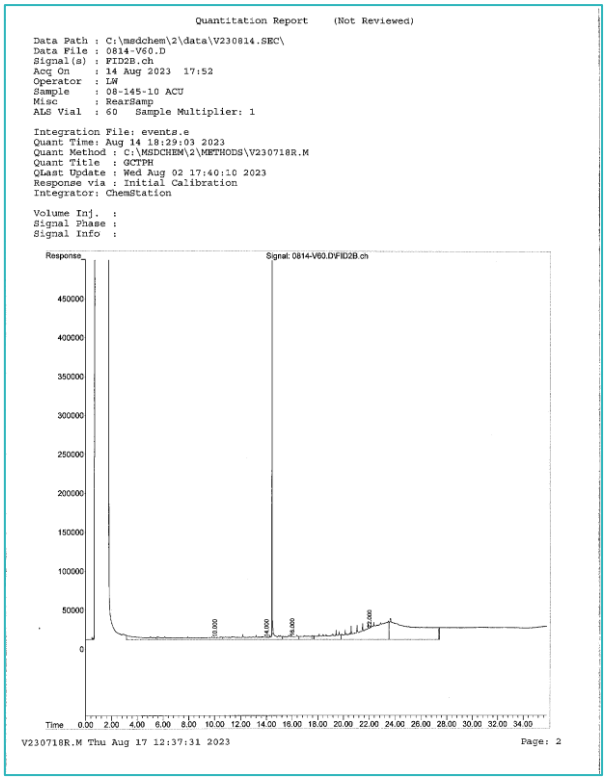
0.50 mg/L



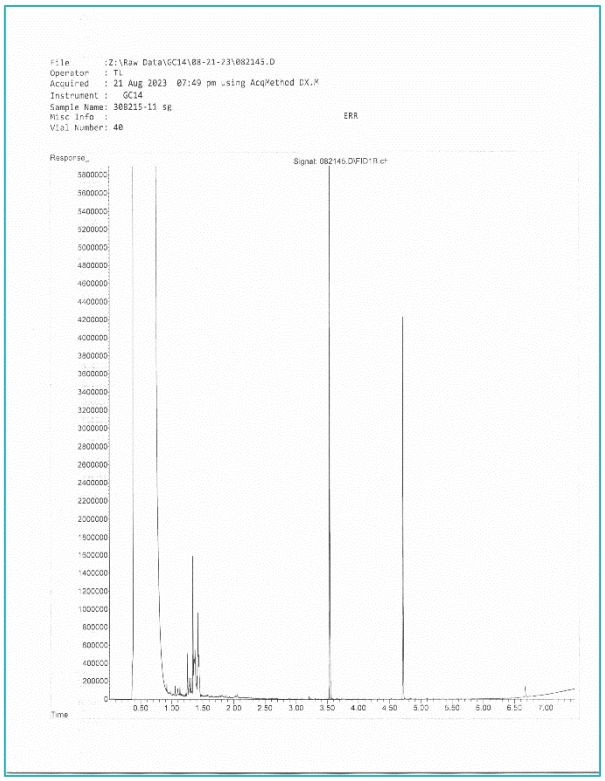


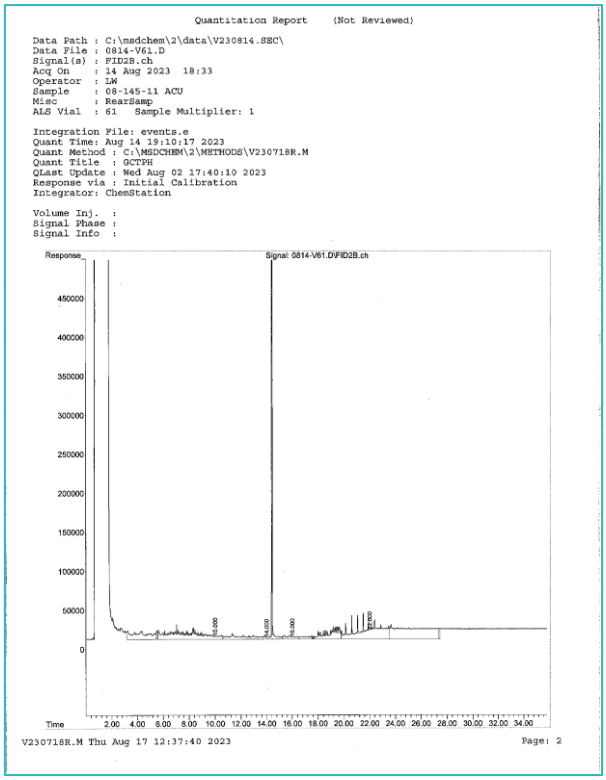
CP-GP10 - Friedman and Bruya 0.05 U mg/L; OnSite 0.21 U mg/L



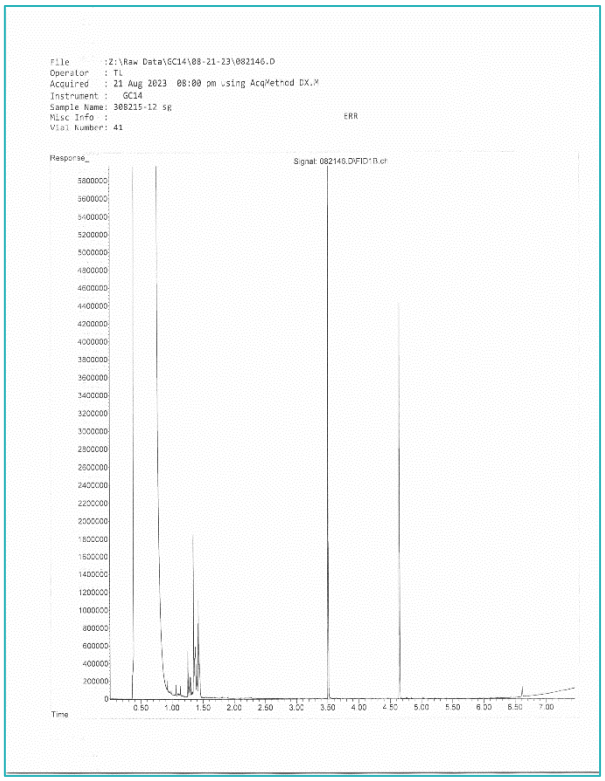


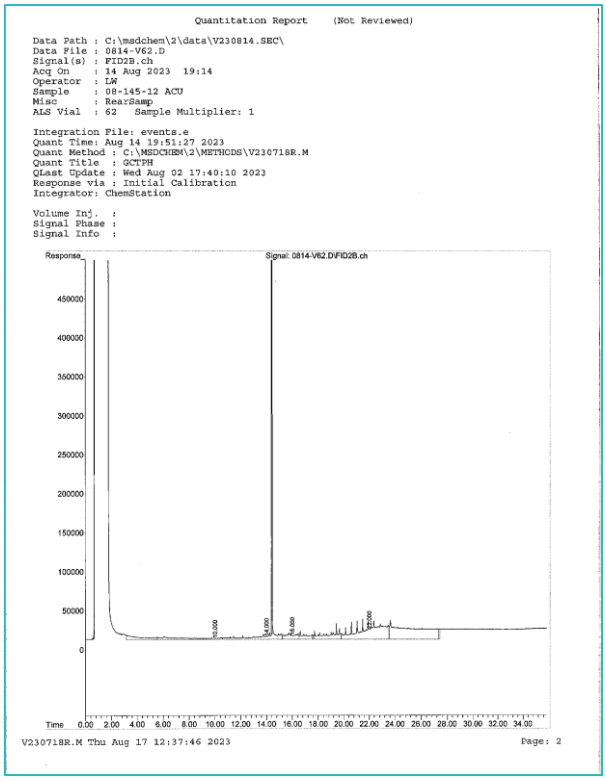
CP-GP11 - Friedman and Bruya 0.05 U mg/L; OnSite 0.22 U mg/L



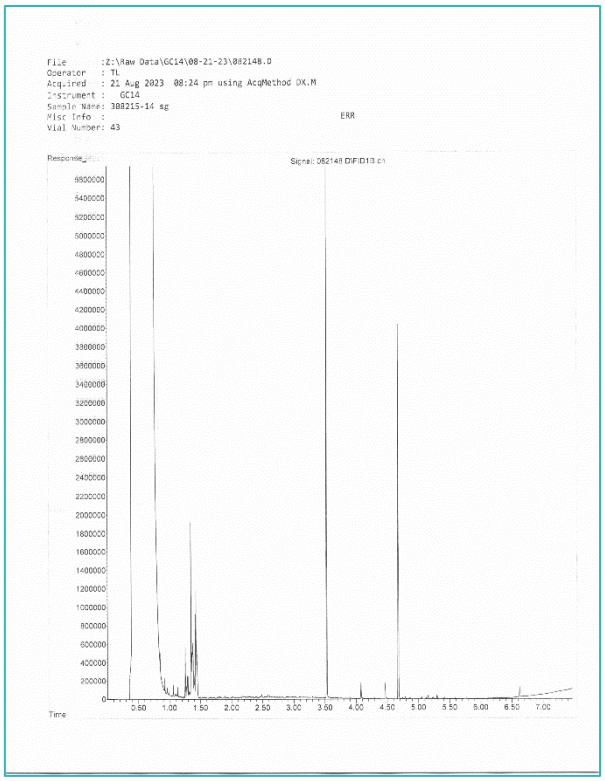


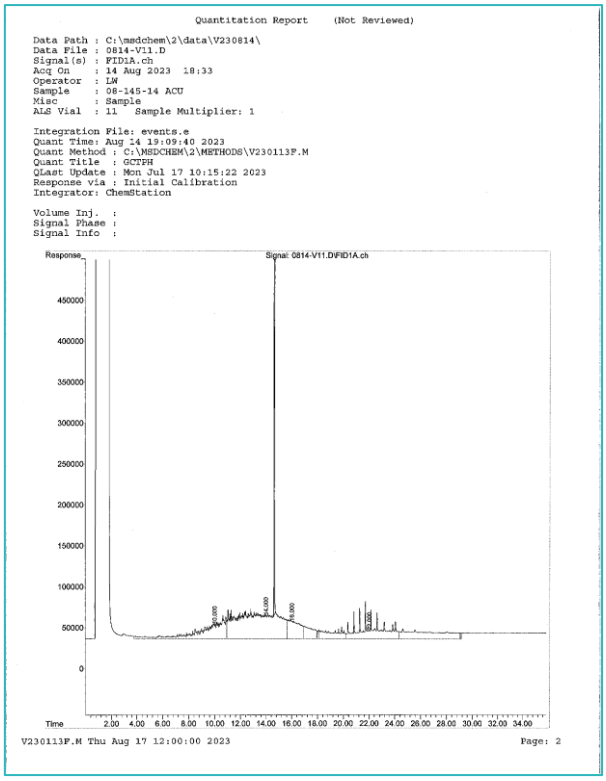
CP-GP14 - Friedman and Bruya 0.05 U mg/L; OnSite 0.20 U mg/L



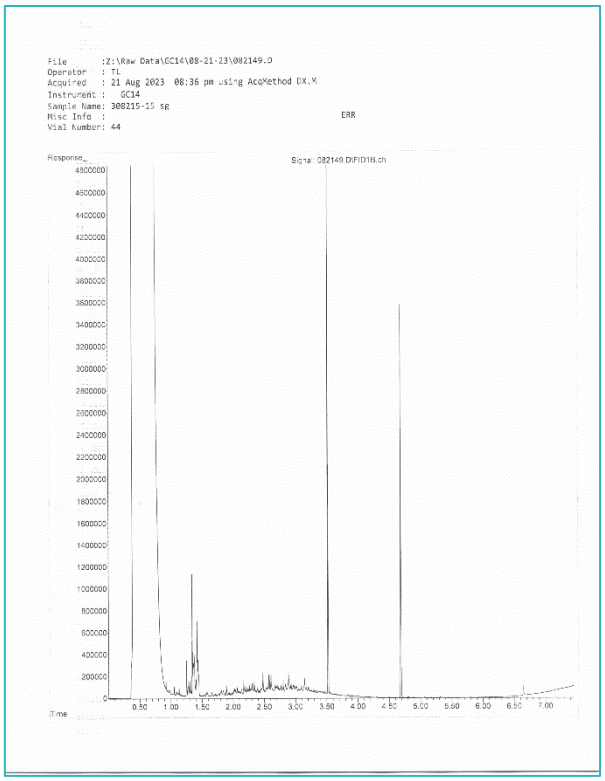


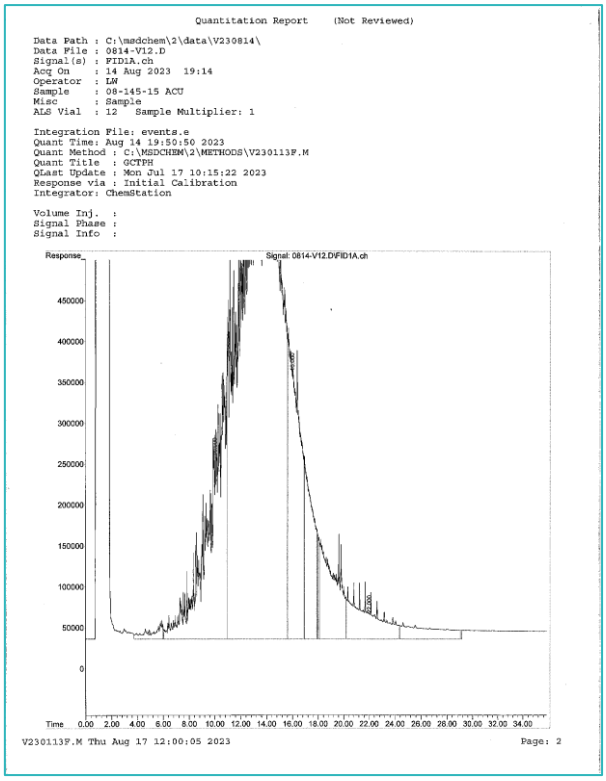
PNO-MW02 - Friedman and Bruya 0.05 U mg/L; OnSite 0.27 mg/L



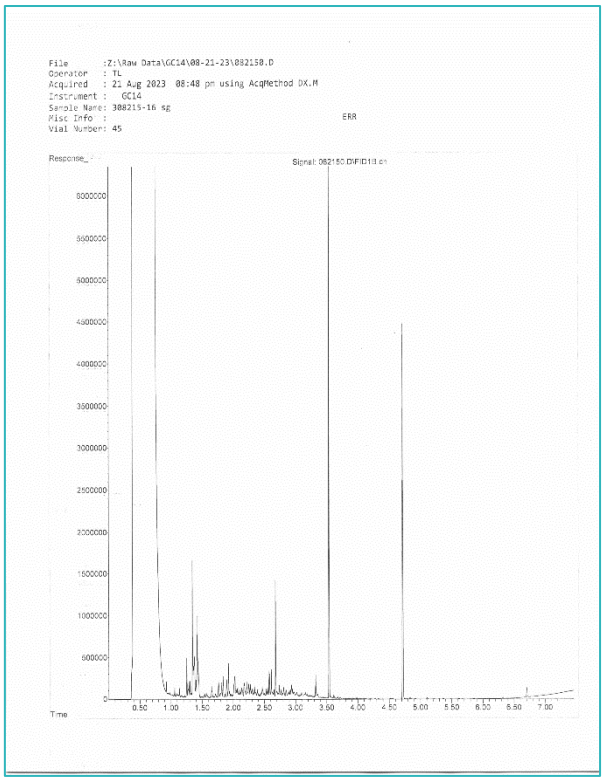


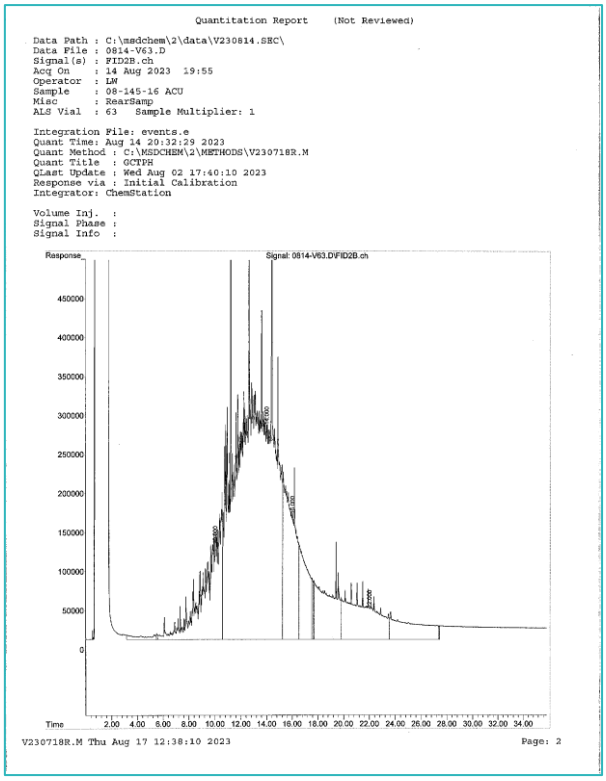
PNO-MW06A - Friedman and Bruya 0.14 mg/L; OnSite 3.80 mg/L



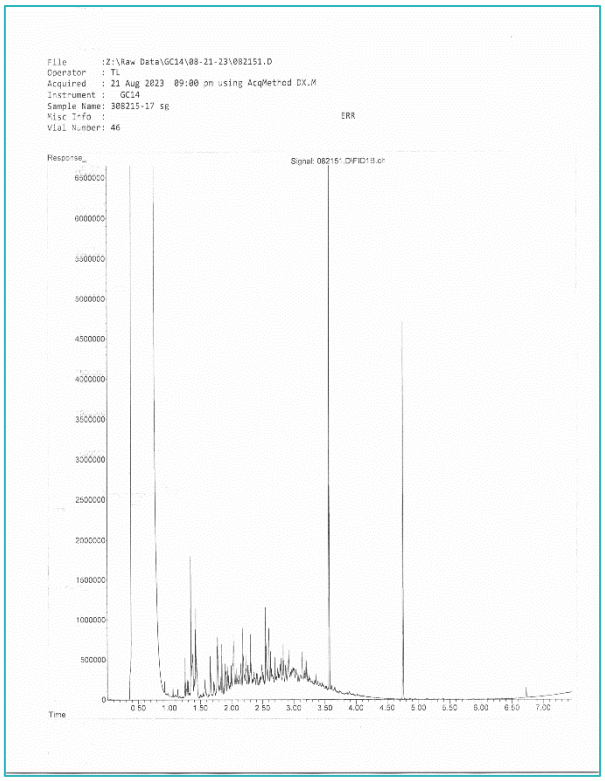


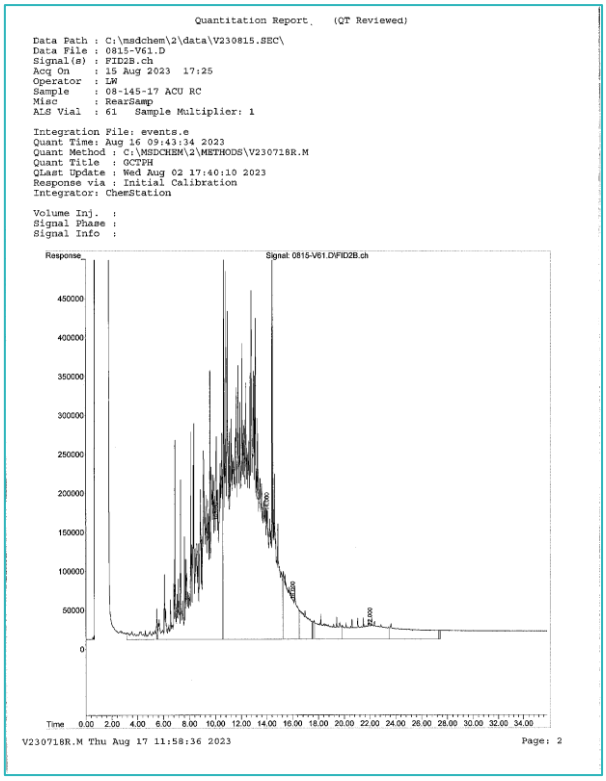
PNO-MW06B - Friedman and Bruya 0.15 mg/L; OnSite 1.90 mg/L





PNO-MW103 - Friedman and Bruya 0.68 mg/L; OnSite 1.80 mg/L





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