



2024 Second Quarter Progress Report and First Quarter Groundwater Performance Monitoring Report

SeaPort Seattle Terminal
(Former ARCO/BP Harbor Island Terminal)
Cleanup Site ID 4426
Consent Decree No. 00-2-05714-8SEA

July 2024

Submitted to:

Washington State Department of Ecology
Northwest Regional Office
15700 Dayton Avenue North
Shoreline, Washington 98133

Prepared for:

TLP Management Services LLC
1670 Broadway
Suite 3100
Denver, Colorado 80202

Prepared by:

TechSolve Environmental, Inc.
7518 NE 169th Street
Kenmore, Washington 98028
www.techsolveinc.com



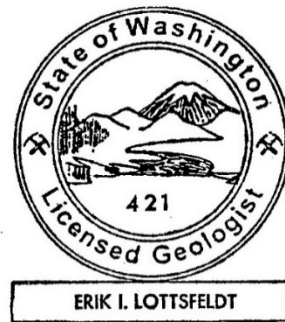
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Erik I. Lottsfeldt, LG
Project Manager, WA Licensed Geologist
TechSolve Environmental, Inc.



Larry E. Roberts, LG, LHG
Principal, WA Licensed Geologist/Hydrogeologist
TechSolve Environmental, Inc.

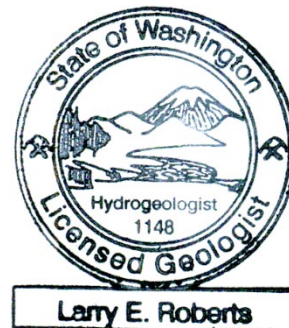


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ACRONYMS AND ABBREVIATIONS

AG&M	ARCADIS Geraghty & Miller
ARCO	Atlantic Richfield Company
BP	British Petroleum West Coast Products Company
CAP	Cleanup Action Plan
CCR	Construction Completion Report
CUL	cleanup level
Ecology	Washington State Department of Ecology
EDR	Engineering Design Report
GPM	gallons per minute
GWCMCP	Groundwater Compliance Monitoring and Contingency Program
IHS	indicator hazardous substance
KCDNRP	King County Department of Natural Resources and Parks
LNAPL	light non-aqueous phase liquid
MNA	Monitored Natural Attenuation
NAVD88	North American Vertical Datum of 1988
NGVD29	National Geodetic Vertical Datum of 1929
O&M	operation and maintenance
POC	point of compliance
RI/FS	Remedial Investigation/Feasibility Study
SVE	soil vapor extraction
TechSolv	TechSolv Consulting Group, Inc. (predecessor of TechSolve Environmental, Inc.)
TechSolve	TechSolve Environmental, Inc.
TPH	total petroleum hydrocarbons
TPH-D	total petroleum hydrocarbons as diesel
TPH-G	total petroleum hydrocarbons as gasoline
TPH-O	total petroleum hydrocarbons as oil
WAC	Washington Administrative Code

EXECUTIVE SUMMARY

This report summarizes the operation of remediation systems during the 2024 second quarter (April through June) and groundwater monitoring conducted in the first quarter (January through March) at the SeaPort Seattle Terminal (the Site). The Site is located on Harbor Island at 1652 SW Lander Street in Seattle, Washington.

There were no anomalous conditions noted in the remediation systems or during groundwater monitoring conducted during the second quarter. One monitoring well, GM-14S, showed an elevated concentration of one dissolved-phase Indicator Hazardous Substance (IHS) above the cleanup level (CUL) during the first quarter groundwater performance monitoring. The benzene concentration detected in Well GM-14S is similar to concentrations previously detected and is on a decreasing trend. Concentrations of IHSs in other wells were below the CULs.

In accordance with Washington State Department of Ecology (Ecology) Consent Decree No. 00-2-05714-8SEA (Ecology 2000), the 2024 third quarter progress report and second quarter groundwater monitoring report will be the next report submitted to Ecology. That report will include further evaluations of data trends and the results of additional monitoring activities requested by Ecology (including at wells in the vicinity of soil staining observed near the waterfront in the northwest corner of the Site and at the waterfront piezometers). The report will be submitted to Ecology by October 15, 2024.

1 INTRODUCTION

TechSolve Environmental, Inc. (TechSolve) is submitting this report on behalf of TLP Management Services LLC to summarize the 2024 operation and maintenance of the waterfront remediation system during the second quarter (April through June) and groundwater monitoring conducted in the first quarter (January through March) for the SeaPort Seattle Terminal (the Site) (Figure 1). The Site is located on Harbor Island at 1652 SW Lander Street in Seattle, Washington, and is the location of the former Atlantic Richfield Company (ARCO)/British Petroleum West Coast Products Company (BP) Terminal site. These two summary reports are combined based upon an Ecology recommendation (Ecology 2004a) and is further discussed in Section 3 of this report. This progress report satisfies reporting requirements pursuant to Ecology Consent Decree No. 00-2-05714-8SEA (Ecology 2000).

2 REMEDIATION SYSTEM OPERATIONS

Remediation systems were installed and completed at the Site in accordance with specifications of the Engineering Design Report (EDR) prepared by TechSolv Consulting Group, Inc. (TechSolv), predecessor of TechSolve Environmental, Inc., and ARCADIS Geraghty & Miller (AG&M) (TechSolv and AG&M 2000), and the Site Cleanup Action Plan (CAP) (Ecology 1999). A waterfront groundwater/light non-aqueous phase liquid (LNAPL) remediation system has operated at the Site since 1992 (an interim system and the final system) to remove free-phase LNAPL and dissolved-phase petroleum hydrocarbons from groundwater at Plant 1 (Figure 1), as further detailed below.

2.1 Waterfront System Operations

Installation, startup, and testing of the final waterfront remediation system was completed in 2002 and 2003. An interim recovery system was installed along the waterfront in 1992 and operated until the installation of the final system. Standard operation of the final system began once testing demonstrated that the system operated as designed. System construction, operation, and maintenance (O&M) are detailed in the Construction Completion Report (CCR) (TechSolv 2003a) and in the Final O&M Manual (TechSolv 2003b), which were approved by Ecology (Ecology 2004b). The O&M Manual is updated as practices or procedures change or as systems are altered. Operation of various portions of the remediation systems have been ongoing since startup and have been modified/revised as needed, as discussed in the following sections.

O&M activities are conducted on the recovery systems to ensure they operate as designed and in accordance with applicable operating limits. These activities include, but are not limited to:

- weekly checks of groundwater recovery system pumping rates;
- weekly inspections of system components and waste storage containers for integrity per the requirements of Washington Administrative Code (WAC) 173-303-320;
- monthly sampling of recovered groundwater influent and effluent streams to ensure compliance with King County Department of Natural Resources and Parks (KCDNRP) Discharge Permit 7592-06 for sample site A43262;
- monthly monitoring and calculation of system LNAPL recovery rates; and
- monthly sampling of system flow rates and hydrocarbon concentrations.

Additional maintenance activities are conducted as needed to maintain system operational integrity and to ensure discharges are within permitted ranges.

Operation of waterfront air sparging and soil vapor extraction (SVE) systems were discontinued in May 2008, as the bulk of available hydrocarbons had been recovered (TechSolv 2009). The results of monitoring showed that operation of these portions of the recovery system have achieved their objectives of recovering LNAPL to the maximum extent practicable and improving groundwater quality along the waterfront.

Combined LNAPL recovery (free-phase, residual, and dissolved-phase) from final SVE and groundwater/LNAPL recovery systems is approximately 14,559 gallons (October 2002 to June 2024) (Table 1). The interim systems, operated from 1992 through 2002, recovered an additional 15,223 gallons of LNAPL, for a total combined LNAPL recovery of 29,783 gallons. The majority of LNAPL recovered by final remediation systems was from enhanced biodegradation, calculated from carbon dioxide concentrations in SVE vapor.

The data collected from the groundwater/LNAPL recovery system (Table 1) show that influent concentrations of dissolved benzene, diesel, and gasoline in recovered groundwater (i.e., untreated water pumped from recovery wells that are screened in the shallow groundwater) have decreased over time. During 2024, influent concentrations of dissolved benzene and gasoline were all below the surface water cleanup levels (CULs), influent sampling for diesel was discontinued in 2009. The data included in Table 1 also show that measurable volumes of recovered free-phase LNAPL have not been generated since 2008, which was the last time sufficient LNAPL was recovered to warrant offsite shipment. These data correlate with the absence of recoverable free-phase LNAPL in the system recovery wells, other than minor amounts of sheen detected in two of the recovery wells (RW-2 and RW-4). The monitoring results indicate that the recovery system has captured the available free-phase LNAPL, and that operation of the recovery system should be discontinued and the efforts for continued protection of the waterfront should be focused on groundwater monitoring of the waterfront wells (TechSolve 2022d).

Effluent discharges from the groundwater/LNAPL recovery system to the sanitary sewer have been within KCDNRP's permitted ranges in 2024 (Table 1). Average monthly effluent flow rates ranged from 0.42 to 1.35 gallons per minute (GPM) in 2024. These rates are below KCDNRP's maximum permitted flow of 17.5 GPM and are consistent with past rates that have decreased over time.

Maintenance and repair of the remediation systems and wells are conducted to maintain integrity, effective operation, capture, and hydraulic control along the waterfront. Notable activities conducted in the second quarter of 2024 included the following:

- cleanout and service of treatment system process equipment,
- piping and system back flushing and preventative maintenance to maintain conveyance piping and pumping from the recovery wells, and
- recovery well redevelopment.

The data collected indicate that the system continues to operate as designed and in accordance with permit requirements.

2.1.1 Recovery Well Monitoring

Monitoring of the recovery wells for free-phase LNAPL, sheen, and concentrations of dissolved-phase Indicator Hazardous Substances (IHSs) is voluntary (e.g. not required by the Consent Decree) and is conducted semi-annually. The latest sampling was conducted in the second quarter 2024 (Table 2). This monitoring has shown that no recoverable LNAPL remains and that dissolved-phase IHSs in shallow groundwater are not likely to cause exceedances of IHS CULs at the deeper points of compliance (POCs) monitoring wells. These POCs are located along the waterfront and the monitoring wells are screened at depths where the groundwater and surface water exchange is occurring (i.e., below the base of the subsurface waterfront barriers of sheet piling and seawalls), as detailed in the Remedial Investigation/Feasibility Study (RI/FS) completed in 1997 (Geraghty & Miller, 1994, 1996, and 1997). The next round of recovery well sampling is scheduled to be completed in the fourth quarter of 2024, and the results will be presented in the subsequent quarterly progress report to be submitted in January 2025.

Recovery well monitoring for LNAPL conducted in June 2024 (Table 2) showed no measurable LNAPL (<0.01 feet) in any of the ten recovery wells (Figure 2). No sheen on groundwater was detectable in seven of the ten recovery wells. A medium sheen was detected in Well RW-2 and Well RW-4. A slight sheen was detected in GM-11S. Monitoring of shallow groundwater for dissolved-phase IHSs showed concentrations in eight of the ten recovery wells were below the IHS CULs for benzene and for total petroleum hydrocarbons (TPH) as gasoline (TPH-G). Concentrations in nine wells were below the IHS CULs for diesel (TPH-D) and in all wells were below the IHS CULs for oil (TPH-O). Shallow groundwater samples from one well (RW-2) exceeded the TPH-D CUL. Groundwater from two wells (RW-2 and GM-11S) exceeded the TPH-G CUL. Groundwater from two wells (RW-2 and RW-4) exceeded the benzene CUL. These data have been consistent over the past several years and are also consistent with the results of the Waterfront Probing Investigation (TechSolve, 2020). The investigation showed that no recoverable LNAPL remains present and that dissolved phase IHSs in shallow groundwater are not likely to cause exceedances of IHS CULs at the deeper POCs.

The trends in monitoring results from waterfront recovery wells and compliance monitoring wells support the conclusion that the cleanup objectives for the Site have been achieved, as detailed in the Annual Site Reports since 2019 (TechSolve 2020, 2021, 2022c, 2023a, and 2024). The data included in these reports document attainment of the Site cleanup objectives and show that moving to compliance monitoring exclusively is appropriate and consistent with the Consent Decree. Discussions with Ecology to further evaluate this transition are ongoing and additional monitoring of waterfront temporary piezometers is currently being conducted to support this monitoring transition, per Ecology's request (Ecology 2023).

2.2 Inland System Operations

An inland SVE system operated from 2008 through 2014 to improve soil and groundwater conditions along the southern boundary of Plant 1. The SVE system was decommissioned in 2018 following completion of the cleanup goals and has been discussed in the Annual Site Reports cited in the previous section. The in-ground SVE piping and control manifold for this system remain onsite as a contingency in case operation of the system is warranted in the future.

Groundwater monitoring data collected along Plant 1's southern boundary indicate the system improved groundwater conditions in this area of the Site, as discussed in previous progress reports as well as the Annual Site Report (TechSolve 2024).

2.3 Containment Boom Monitoring

Oil sorbent booms have been maintained on the West Duwamish Waterway adjacent to Plant 1 to contain oil sheens that have historically appeared on surface water. The boom locations have been adjusted over time with Ecology's concurrence as the sheens have been markedly reduced over time. One boom, the Northern Warehouse Boom, is currently maintained in the waterway adjacent to the warehouse (Figure 2). Boom locations have been selected to best contain occasional sheens historically observed on the West Duwamish Waterway directly adjacent to the Site. The boom and the waterway are monitored by TechSolve weekly, at a minimum, for boom integrity and for the presence of oil sheens and augmented by surveillance made by Terminal personnel. Booms are replaced as necessary based on their condition. The Northern Warehouse Boom was last replaced on June 7, 2023.

No sheens on surface water have been observed within the Northern Warehouse Boom during the second quarter of 2024. Use of the Southern Warehouse Boom was discontinued in the second quarter of 2022, following notification to Ecology (TechSolve 2022b), as no sheen had been observed in that area since August 2019. No sheen was observed near the northwest corner of the Site during this monitoring period as well. The Southern Warehouse Boom will be reinstalled and maintained if sheens attributable to the Seaport site are detected at this location in the future. Waterway sheen monitoring results will continue to be evaluated throughout the remainder of 2024 and into 2025, per Ecology's request (Ecology 2023). Maintenance and boom monitoring will be conducted until Ecology concurs that the performance standard for boom maintenance established by the Groundwater Compliance Monitoring and Contingency Program (GWCMCP) (TechSolv 1999) has been met.

3 SUMMARY OF GROUNDWATER PERFORMANCE MONITORING PROGRAM

The first quarter 2024 groundwater monitoring was conducted in accordance with requirements of the Consent Decree (Ecology 2000), CAP (Ecology 1999), and GWCMCP (TechSolv 1999). The monitoring also includes revisions requested by Ecology that are included in the EDR (TechSolv and AG&M 2000) and detailed below. The current groundwater monitoring schedule is summarized in Table 3. Monitoring well locations for Plant 1 are shown on Figure 2. The first quarter groundwater monitoring was conducted on March 26 and 27, 2024.

Wells monitored on a semi-annual basis are sampled in the first and third quarter, which typically correspond with seasonal groundwater highs and lows, respectively. As such, Wells AR-03, GM-14S, GM-15S, GM-16S, GM-17S, GM-24S, AMW-01, AMW-02, AMW-03, AMW-04, AMW-05, MW-1-T9, MW-2-T9, and MW-3-T9 were sampled in the first quarter of 2024. These wells will next be sampled in the third quarter of 2024.

Overall, first quarter 2024 groundwater elevations (Table 4) were higher than elevations measured in the second and third quarters of 2023. These data indicate that the seasonal groundwater high occurred in late 2023 to early 2024, corresponding with historic trends showing groundwater elevations rising to seasonal highs in the winter and spring months and falling to seasonal lows in the summer and autumn months.

Groundwater monitoring samples collected for the first quarter 2024 were submitted to OnSite Environmental, Inc., Redmond, Washington (Ecology Accreditation #C591) for laboratory analysis of IHSs identified in the CAP. The IHSs include TPH-G, TPH-D, TPH-O, and benzene.

Petroleum hydrocarbon monitoring results for the first quarter 2024 are included in Table 5 and Figure 2. The only detection of an IHS above a CUL was benzene in Well GM-14S. Concentrations from all other samples analyzed were below associated CULs. The benzene concentration detected in Well GM-14S is similar to concentrations previously detected and is on a decreasing trend. Further evaluations of data trends will be presented in the 2024 Annual Site Report, in accordance with Consent Decree requirements.

Three wells (GM-11S, GM-12S, and GM-13S) have been examined monthly for the presence of free phase LNAPL and sheens (Table 6). Historically, gauging for LNAPL at Plant 1 was conducted at four wells; however, gauging of Well GM-14S was discontinued in 2004, with concurrence from Ecology (Ecology 2004c), and converted to a monitoring well in 2007, as it has been free of LNAPL since 1999.

No measurable LNAPL was detected in Wells GM-11S, GM-12S, and GM-13S during the first and second quarters of 2024. A slight sheen was detected in GM-11S in January and June of 2024. Historic sheen monitoring data and trend analysis were presented in the 2023 Annual Site Report

(TechSolve 2024). Overall, LNAPL and sheen monitoring indicate that these wells meet the GWCMCP LNAPL performance standard of no measurable LNAPL. These three wells will continue to be gauged for sheen and LNAPL for the remainder of 2024, until Ecology concurs that the GWCMCP LNAPL performance standard has been met.

4 SUMMARY OF DATA VALIDATION

Laboratory analytical results were reported with associated laboratory quality assurance/quality control (QA/QC) data. Analytical reports were reviewed, and the data were validated. During this quarter, the TPH-G result for GM-24S was qualified as J (estimated value), as noted in Table 7. These results do not affect our interpretation of the Site data. All laboratory reports are retained by TechSolve.

5 ADDITIONAL ACTIVITIES

Ecology requested that additional groundwater sampling be conducted for four quarters from the waterfront piezometers and from wells in the vicinity of soil staining observed near the waterfront in the northwest corner of the Site (Figure 2). These sampling activities are summarized below.

Eleven temporary piezometers that were installed and sampled as part of the Hydraulic Evaluation (TechSolve 2022a) were resampled in March 2024 to monitor the shallow groundwater along the waterfront, as requested by Ecology (Ecology 2023). The monitoring was requested to support continuing evaluation and discussions with Ecology for discontinuing the active remediation along the waterfront and moving forward towards Site closure with groundwater monitoring (Techsolve 2022d). The piezometers were sampled for dissolved-phase IHSs (benzene, TPH-G, TPH-D, and TPH-O), as well as monitored natural attenuation (MNA) parameters (methane, total sulfate, total nitrate, total chloride, alkalinity, manganese, hardness, and ferrous iron). These results will be presented to Ecology following completion of four quarters of sampling (the last sampling is scheduled for July 2024).

Sampling was also conducted at three existing monitoring wells (B-007, HMW-01S, and GM-10S; Figure 2) located in the vicinity of some minor soil staining that was observed in this area following an extreme king tide early in 2023. The soil staining and remedial actions that were conducted in this area in the spring of 2023 were detailed in the 2022 and 2023 Annual Site Report (TechSolve 2023a, 2024). The monitoring was requested by Ecology (Ecology 2023) to further evaluate any potential groundwater impacts that could have occurred due to the soil staining. These wells were sampled for benzene, TPH-G, TPH-D, and TPH-O. These results will be presented to Ecology following completion of four quarters of sampling (the last sampling is also scheduled for July 2024).

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TABLES

1. Waterfront Groundwater System Petroleum Hydrocarbon Recovery Rates
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Table 1. Waterfront Groundwater System Petroleum Hydrocarbon Recovery Rates
Site: SeaPort Seattle Terminal (Former ARCO/BP Harbor Island Terminal)

GROUNDWATER SYSTEM EFFICIENCIES																						
SAMPLE DATE	UNITS	Influent Benzene	Effluent Benzene	% Reduction	Influent Diesel	Effluent Diesel	% Reduction	Influent Ethylbenzene	Effluent Ethylbenzene	% Reduction	Influent Gasoline	Effluent Gasoline	% Reduction	Influent Oil	Effluent Oil	% Reduction	Influent Toluene	Effluent Toluene	% Reduction	Influent Xylenes	Effluent Xylenes	% Reduction
2002 Averages	µg/L	225.3	14.3	91%	7,315	7,020	NA	55.2	6.2	75%	1,770	336	82%	831	804	NA	17.0	2.5	88%	88.8	9.9	87%
2003 Averages	µg/L	137.7	19.5	76%	4,945	4,648	NA	44.5	12.9	69%	1,854	678	62%	760	763	NA	42.7	5.4	61%	154.1	50.3	68%
2004 Averages	µg/L	93.5	3.2	82%	10,285	9,342	NA	76.8	4.7	79%	4,383	840	59%	762	1,026	NA	116.6	2.2	82%	356.6	23.0	75%
2005 Averages	µg/L	76.7	14.5	84%	4,162	5,987	NA	170.8	45.4	81%	10,090	3,229	70%	864	750	NA	566.9	121.0	84%	1,327.7	367.9	78%
2006 Averages	µg/L	38.9	1.2	89%	11,263	2,174	NA	42.1	0.9	90%	4,944	202	94%	665	666	NA	55.6	0.8	77%	485.1	5.2	96%
2007 Averages	µg/L	8.8	1.5	60%	1,223	906	NA	6.6	0.8	56%	407	115	63%	598	598	NA	1.0	0.5	21%	19.8	1.9	50%
2008 Averages	µg/L	10.0	1.1	70%	540	468	NA	5.5	0.7	39%	279	76	61%	505	504	NA	0.7	0.5	40%	10.6	1.6	65%
2009 Averages	µg/L	5.2	1.0	48%	369	561	NA	4.1	1.6	31%	407	182	46%	497	489	NA	0.8	0.7	44%	15.2	7.4	33%
2010 Averages	µg/L	3.9	0.7	76%		2,193	NA	6.8	1.7	78%	915	336	65%		410	NA	0.9	0.9	NA	26.3	6.7	69%
2011 Averages	µg/L	3.2	0.5	80%		1,714	NA	2.4	1.0	53%	439	89	69%		492	NA	1.0	1.0	NA	7.1	3.0	29%
2012 Averages	µg/L	3.6	1.3	48%		2,787	NA	1.9	1.2	37%	362	144	61%		636	NA	1.0	1.0	NA	5.7	3.4	48%
2013 Averages	µg/L	1.0	0.5	45%		1,333	NA	1.1	0.5	49%	356	124	57%		433	NA	0.5	0.5	NA	2.4	1.0	78%
2014 Averages	µg/L	1.7	0.3	61%		1,699	NA	0.6	0.3	46%	539	122	79%		236	NA	0.5	0.3	NA	1.5	0.5	61%
2015 Averages	µg/L	2.3	0.4	66%		5,175	NA	1.6	0.4	60%	1,146	406	64%		396	NA	0.5	0.4	NA	2.8	0.5	74%
2016 Averages	µg/L	2.2	0.6	76%		2,292	NA	2.3	0.5	81%	1,282	582	50%		248	NA	0.4	0.4	NA	2.9	1.0	62%
2017 Averages	µg/L	1.9	0.4	74%		4,325	NA	1.0	0.4	63%	1,421	641	56%		349	NA	0.5	0.4	NA	1.0	0.7	55%
2018 Averages	µg/L	1.1	0.7	60%		1,673	NA	0.7	0.7	7%	359	136	62%		346	NA	0.5	0.5	NA	1.3	0.9	30%
2019 Averages	µg/L	0.5	0.4	50%		1,539	NA	0.7	0.7	NA	231	68	60%		584	NA	0.7	0.7	NA	2.0	2.0	NA
2020 Averages	µg/L	0.7	0.5	NA		588	NA	1.0	1.0	NA	100	51	65%		750	NA	1.0	1.0	NA	3.0	3.0	NA
2021 Averages	µg/L	1.6	0.5	NA		756	NA	1.0	1.0	NA	110	50	NA		750	NA	1.0	1.0	NA	3.3	3.0	NA
2022 Averages	µg/L	1.0	0.5	NA		378	NA	1.0	1.0	NA	95	50	NA		750	NA	1.0	1.0	NA	3.0	3.0	NA
2023 Averages	µg/L	0.9	0.5	NA		482	NA	1.0	1.0	NA	86	50	NA		750	NA	1.0	1.0	NA	3.0	3.0	NA
1/31/2024	µg/L	0.8	0.5	35%		1,400	NA	1.0	1.0	NA	50	50	NA		750	NA	1.0	1.0	NA	3.0	3.0	NA
2/23/2024	µg/L	4.1	0.5	88%		1,800	NA	1.0	1.0	NA	160	50	69%		420	NA	1.0	1.0	NA	1.0	1.0	NA
3/21/2024	µg/L	4.4	0.5	89%		200	NA	1.0	1.0	NA	79	50	37%		200	NA	1.0	1.0	NA	1.0	1.0	NA
4/18/2024	µg/L	2.1	0.5	76%		630	NA	1.0	1.0	NA	50	50	NA		750	NA	1.0	1.0	NA	1.0	1.0	NA
5/23/2024	µg/L	0.5	0.5	7%		310	NA	1.0	1.0	NA	50	50	0%		750	NA	1.0	1.0	NA	1.0	1.0	NA
6/27/2024	µg/L	2.1	0.5	76%		250	NA	1.0	1.0	NA	53	50	6%		750	NA	1.0	1.0	NA	1.0	1.0	NA
2024 Averages	µg/L	2.3	0.5	NA		765	NA	1	1	NA	74	50	NA		603	NA	1	1	NA	1	1	NA
SURFACE WATER CLEANUP LEVELS		71 µg/L			10,000 µg/L			NA			1,000 µg/L			10,000 µg/L			NA			NA		
KCDNR DISCHARGE LIMITS		70 µg/L			100,000 µg/L			1,700 µg/L			NA			100,000 µg/L			1,400 µg/L			2,200 µg/L		

METRO DISCHARGE DATA

Observation Date	Days since last monitoring reading	Average flow (GPM)	Total Flow Between Observation dates (gallons, GW)	Pounds of Benzene Removed	Pounds of Gasoline Removed	Pounds of Diesel Removed	Pounds of Oil Removed	Pounds of Toluene Removed	Pounds of Ethylbenzene Removed	Pounds of Xylenes Recovered	Total Gallons Gas, Diesel, and Oil (dissolved)
2002 Totals and Averages	65	4.18	322,785	0.62	4.99	19.42	2.30	0.05	0.13	0.22	3.90
2003 Totals and Averages	361	8.03	4,114,867	4.43	62.20	169.14	26.05	1.18	1.47	5.05	37.76
2004 Totals and Averages	338	9.58	4,570,461	3.54	175.70	419.25	28.95	5.35	3.16	14.66	92.43
2005 Totals and Averages	359	11.17	5,827,144	3.43	447.43	155.78	41.55	25.29	7.69	59.98	100.52
2006 Totals and Averages	365	6.40	3,220,733	0.80	192.72	663.65	19.09	2.85	1.89	20.04	128.92
2007 Totals and Averages	360	3.17	1,599,607	0.15	9.08	18.30	8.40	0.02	0.11	0.48	5.20
2008 Totals and Averages	363	3.19	1,645,810	0.14	3.95	7.21	6.95	0.01	0.08	0.15	2.59
2009 Totals and Averages	369	2.98	1,569,390	0.07	5.75	7.81	6.40	0.01	0.06	0.22	2.89
2010 Totals and Averages	372	2.17	1,185,127	0.037	8.62	18.84	4.26	0.01	0.05	0.19	4.66
2011 Totals and Averages	356	1.90	949,880	0.026	5.13	17.55	3.54	0.01	0.03	0.13	3.81
2012 Totals and Averages	371	1.89	948,600	0.034	3.97	25.92	3.47	0.01	0.02	0.04	4.81
2013 Totals and Averages	365	1.33	700,450	0.014	2.26	8.80	3.43	0.003	0.01	0.02	2.08
2014 Totals and Averages	332	1.62	761,480	0.010	3.43	10.95	1.55	0.003	0.00	0.01	2.33
2015 Totals and Averages	358	1.71	874,680	0.015	6.56	36.53	2.92	0.004	0.01	0.02	6.68
2016 Totals and Averages	370	1.90	999,770	0.021	13.12	20.02	1.94	0.004	0.03	0.03	5.26
2017 Totals and Averages	364	1.65	866,030	0.014	11.96	33.39	2.62	0.004	0.01	0.01	7.52
2018 Totals and Averages	371	1.20	641,740	0.006	2.16	9.61	1.79	0.002	0.004	0.007	1.96
2019 Totals and Averages	357	1.26	611,500	0.002	1.30	8.72	2.89	0.003	0.003	0.009	1.84
2020 Totals and Averages	378	1.06	572,320	0.003	0.46	2.70	3.58	0.005	0.005	0.014	0.93
2021 Totals and Averages	358	1.01	572,321	0.008	0.47	3.72	3.19	0.004	0.004	0.014	1.03
2022 Totals and Averages	375	0.90	486,520	0.004	0.37	1.64	3.04	0.004	0.004	0.012	0.69
2023 Totals and Averages	371	0.91	495,900	0.005	0.42	1.87	3.10	0.004	0.004	0.012	0.74
January-24	34	1.35	66,310	0.0003	0.09	0.37	0.41	0.0006	0.0006	0.0017	0.12
February-24	23	0.82	27,140	0.0002	0.04	0.26	0.17	0.0002	0.0002	0.0007	0.06
March-24	27	1.31	50,810	0.0010	0.04	0.68	0.25	0.0004	0.0004	0.0008	0.14
April-24	28	0.79	31,770	0.0001	0.04	0.18	0.20	0.0003	0.0003	0.0008	0.06
May-24	35	0.46	23,430	0.0003	0.03	0.15	0.15	0.0002	0.0002	0.0004	0.05
June-24	35	0.42	20,940	0.0002	0.01	0.08	0.13	0.0002	0.0002	0.0002	0.03
2024 Totals and Averages	182	0.86	220,400	0.002	0.250	1.717	1.309	0.002	0.002	0.005	0.46
TOTALS:			33,757,515 gal	13.4	962.3	1662.5	182.4	34.8	14.8	101.3	
Maximum permitted GPM:		17.5	Gallons Gas, Diesel, & Oil Recovered:		156.5	238.2	23.9	Total Gallons Recovered:			418.99

TOTAL PETROLEUM RECOVERY	
Total lbs. Dissolved Gas, Diesel, and Oil Recovered in Groundwater (2002-Present)	2,807 lbs
Total Gallons Dissolved Gas, Diesel, and Oil Recovered in Groundwater (2002-Present)*	419 gal
Total Gallons LNAPL Recovered by Final Recovery System (2002-Present)	395 gal
Total Gallons LNAPL Recovered by Interim Recovery System (1992-2002)	9,312 gal
Total Gallons of TPH Vapor Recovered by Final SVE System (2003-2008)**	2,334 gal
Total Gallons of TPH Vapor Recovered by Interim SVE System (1996-2002)**	1,248 gal
Total Gallons TPH Recovered from Final SVE System due to Biodegradation (2003-2008)***	11,411 gal
Total Gallons TPH Recovered from Interim SVE System due to Biodegradation (1996-2002)***	4,664 gal
Total Gallons Recovered by Final Recovery Systems (2002-Present)	14,559 gal
Total Gallons Recovered by Interim Recovery Systems (1992-2002)	15,223 gal
Total Gallons of Petroleum Removed (1992-Present)	29,782.8

Definitions:

gal - gallons

GPM - Gallons per minute

NA - Not available or could not be calculated due to non-detection

LNAPL - Light non-aqueous phase liquid (oil)

SVE - Soil vapor extraction

TPH - Total petroleum hydrocarbons

µg/L - micrograms per liter

GW - Groundwater

Notes:

LNAPL recovery is recorded periodically when sufficient product has been accumulated to be transported off-site for disposal.

Influent diesel and oil samples are no longer analyzed. Influent and effluent samples are collected before and after, respectively, a diffused air stripper, which does not remove diesel or oil.

Effluent sample data are representative of the outflow water to King County Metro sanitary sewer.

The average µg/L of the preceding month and the month of reference are used to calculate pounds of compound removed.

Data presented in *italicized text* represent non-detections. The listed *italicized value* is the laboratory reporting limit

If influent concentrations are below the laboratories reporting limit, the percent reduction is calculated using the reporting limit. The actual percent reduction is ≥ the reported value.

* Calculation of lbs. of Recovered Product:
To convert µg/L to lbs./gallon - (µg/L)x(3.785/gal)=ug/gal, (ug/gal)x(µg/(2.2046x10-9lbs))=lbs./gal
lbs./gal of chemical constituent x total gallons recovered =lbs. of chemical recovered

Density of Gasoline utilized for conversions from pounds to gallons is 6.15 lbs./gal

Density of Diesel utilized for conversions from pounds to gallons 6.98 lbs./gal

Density of Oil utilized for conversions from pounds to gallons 7.63 lbs./gal

Benzene, toluene, ethylbenzene, and xylenes volumes are not included in the Total Gallons calculations, as they are assumed to be included in TPH as gasoline.

** / *** SVE Recovery Calculations for TPH and Biodegradation, which are maintained in separate tables.

C = Average Influent TPH concentration (ppmv)

Q = Influent Flow Rate (SCFM)

Mc = Molecular wt. of Carbon Dioxide = 44

Mg = Molecular wt. of Gasoline = 87

Density of Gasoline for conversions is 6.15 lbs./gal

** TPH recovered by SVE system was calculated in lbs./hr. = C x Q x Mg x 1.583 x 10⁻⁷

1.583 x 10⁻⁷ is a constant and is derived as follows:
10⁶ ppmv x 60min/1hr x 1 lb. Mole/379 cu.ft.
SVE TPH recovery calculations are based on TPH concentrations in the SVE stream, SVE hrs. of operation, and SVE measured flow rates.

Table 2. Groundwater/LNAPL Recovery Well Performance Monitoring
June 2024
Site: SeaPort Seattle Terminal (Former ARCO/BP Harbor Island Terminal)

Well	Date	Measurable LNAPL (>0.01')	Sheen on Groundwater (None, SS, MS, HS)	TPH-G NWTPH-Gx (mg/L)	TPH-D NWTPH-Dx (mg/L)	TPH-O NWTPH-Dx (mg/L)	Benzene EPA 8021 (µg/L)
RW-1	6/20/2024	No	None	0.16	ND	ND	ND
RW-2	6/20/2024	No	MS	2.90	59	ND	400
RW-4	6/20/2024	No	MS	0.51	8.60	ND	87
RW-5	6/20/2024	No	NS	0.07	ND	ND	0.82
RW-6	6/20/2024	No	NS	0.26	ND	ND	8.80
RW-7	6/20/2024	No	NS	ND	ND	ND	ND
RW-8	6/20/2024	No	NS	0.09	0.37	0.15	ND
RW-9	6/20/2024	No	NS	ND	1.30	0.68	ND
RW-10	6/20/2024	No	NS	ND	ND	ND	ND
GM-11S	6/20/2024	No	SS	1.20	3.60	0.70	0.50
Cleanup Level		No (<0.01')	No Sheen*	1*	10*	10*	71*
Method Reporting Limit				0.05	0.25	0.75	0.5

Notes:

* Listed cleanup levels and values in **bold** that exceed these levels are applicable at conditional points of compliance (CPoCs). Recovery wells are not CPoCs for parameters with a " * " and values above listed cleanup levels are not recognized as exceedances.

Definitions:

EPA 8021	EPA method of analysis for volatile organic compounds in water.
mg/L	Milligrams per liter.
µg/L	Micrograms per liter.
ND	Constituent not detected above reporting limit. A less than sign (<) preceeding a value indicates a ND at the listed value.
TPH	Total petroleum hydrocarbons.
TPH-D	Total petroleum hydrocarbons as diesel.
TPH-G	Total petroleum hydrocarbons as gasoline.
TPH-O	Total petroleum hydrocarbons as oil.
NWTPH-Dx	Northwest TPH method for analysis of diesel in water - extended.
NWTPH-Gx	Northwest TPH method for analysis of gasoline in water - extended.
SS	Slight sheen observed on groundwater.
MS	Meduim sheen obaserved on groundwater.
HS	Heavy sheen observed on groundwater.

Table 3. Groundwater Performance Monitoring Schedule

Site: SeaPort Seattle Terminal (Former ARCO/ BP Harbor Island Terminal)

Analyses Conducted by Quarter

Well	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Plant 1				
MW-1-T9	Benzene, TPH-G, TPH-D, TPH-O	(1)	Benzene, TPH-G, TPH-D, TPH-O	(1)
MW-2-T9	Benzene, TPH-G, TPH-D, TPH-O	(1)	Benzene, TPH-G, TPH-D, TPH-O	(1)
MW-3-T9	Benzene, TPH-G, TPH-D, TPH-O	(1)	Benzene, TPH-G, TPH-D, TPH-O	(1)
GM-14S	Benzene, TPH-G, TPH-D, TPH-O	Benzene, TPH-G, TPH-D, TPH-O	Benzene, TPH-G, TPH-D, TPH-O	Benzene, TPH-G, TPH-D, TPH-O
GM-15S	Benzene, TPH-G, TPH-D, TPH-O	(1)	Benzene, TPH-G, TPH-D, TPH-O	(1)
GM-16S	Benzene, TPH-G, TPH-D, TPH-O		Benzene, TPH-G, TPH-D, TPH-O	
GM-17S	Benzene, TPH-G, TPH-D, TPH-O		Benzene, TPH-G, TPH-D, TPH-O	
GM-24S	Benzene, TPH-G, TPH-D, TPH-O	Benzene, TPH-G, TPH-D, TPH-O	Benzene, TPH-G, TPH-D, TPH-O	Benzene, TPH-G, TPH-D, TPH-O
AR-03	Benzene, TPH-G, TPH-D, TPH-O	(1)	Benzene, TPH-G, TPH-D, TPH-O	(1)
AMW-01	Benzene, TPH-G, TPH-D, TPH-O	Benzene, TPH-G, TPH-D, TPH-O	Benzene, TPH-G, TPH-D, TPH-O	Benzene, TPH-G, TPH-D, TPH-O, cPAHs
AMW-02	Benzene, TPH-G, TPH-D, TPH-O	Benzene, TPH-G, TPH-D, TPH-O	Benzene, TPH-G, TPH-D, TPH-O	Benzene, TPH-G, TPH-D, TPH-O, cPAHs
AMW-03	Benzene, TPH-G, TPH-D, TPH-O	Benzene, TPH-G, TPH-D, TPH-O	Benzene, TPH-G, TPH-D, TPH-O	Benzene, TPH-G, TPH-D, TPH-O, cPAHs
AMW-04	Benzene, TPH-G, TPH-D, TPH-O	Benzene, TPH-G, TPH-D, TPH-O	Benzene, TPH-G, TPH-D, TPH-O	Benzene, TPH-G, TPH-D, TPH-O, cPAHs
AMW-05	Benzene, TPH-G, TPH-D, TPH-O	Benzene, TPH-G, TPH-D, TPH-O	Benzene, TPH-G, TPH-D, TPH-O	Benzene, TPH-G, TPH-D, TPH-O, cPAHs

Plant 2

All Plant 2 monitoring has been discontinued.

Notes: Field Duplicate and QA/QC samples collected from wells highlighted in bold.

TPH-G - Gasoline Range organics utilizing NWTPH-Gx method

TPH-D - Diesel Range Organics utilizing NWTPH-Dx

TPH-O - Extended Range Organics (Motor Oil) utilizing NWTPH-Dx

Benzene is analyzed for utilizing EPA 8021 or 8260B.

cPAHs - Carcinogenic Polycyclic Aromatic Hydrocarbons utilizing EPA 8270SIM

Field Parameters (pH, Temperature, Conductivity, Turbidity, Water Level, & Product Level) are recorded from all wells sampled

(1) - If a groundwater cleanup level exceedance occurs in first or third quarter in any of these highlighted wells, all (1) wells will be sampled the following quarter. Wells exceeding cleanup levels will continue quarterly monitoring until four consecutive quarters below cleanup level are achieved.

Table 4. Groundwater Performance Monitoring Groundwater Elevations
First Quarter 2024
Site: SeaPort Seattle Terminal (Former ARCO/BP Harbor Island Terminal)

Well	Date	TOC Elevation (ft NAVD88)	Depth to Water (ft below TOC)	Groundwater Elevation (ft NAVD88)
Plant 1				
GM-14S	3/27/2024	11.77	3.6	8.17
GM-15S	3/26/2024	12.32	4.51	7.81
GM-16S	3/27/2024	11.99	3.99	8.00
GM-17S	3/27/2024	12.56	3.86	8.70
GM-24S	3/27/2024	11.11	2.42	8.69
AR-03	3/26/2024	12.49	5.09	7.40
AMW-01	3/26/2024	12.17	6.85	5.32
AMW-02	3/26/2024	15.36	8.39	6.97
AMW-03	3/26/2024	15.29	7.62	7.67
AMW-04	3/26/2024	11.42	7.48	3.94
AMW-05	3/26/2024	11.05	6.12	4.93
MW-1-T9	3/27/2024	12.21	4.82	7.39
MW-2-T9	3/27/2024	12.37	4.68	7.69
MW-3-T9	3/27/2024	11.87	4.51	7.36

Definitions:

ft	Feet
NA	Not available. Well elevations have not been surveyed.
NAVD88	North American Vertical Datum of 1988
TOC	Top of casing

Table 5. Summary of Analytical Results for Groundwater - TPH-G, TPH-D, TPH-O, and Benzene
First Quarter 2024
Site: SeaPort Seattle Terminal (Former ARCO/BP Harbor Island Terminal)

Well	Date	TPH-G NWTPH-Gx (µg/L)	TPH-D NWTPH-Dx (µg/L)	TPH-O NWTPH-Dx (µg/L)	Benzene EPA 8260 (µg/L)
Plant 1					
GM-14S	3/27/2024	420	340	ND	430
GM-15S	3/26/2024	ND	ND	ND	ND
GM-16S	3/27/2024	ND	ND	ND	ND
GM-17S	3/27/2024	ND	ND	ND	ND
GM-24S	3/27/2024	550 J	320	ND	ND
AR-03	3/26/2024	140	330	ND	ND
AMW-01	3/26/2024	ND	ND	ND	ND
AMW-02	3/26/2024	ND	ND	ND	ND
AMW-03	3/26/2024	ND	ND	ND	ND
AMW-04	3/26/2024	ND	ND	ND	ND
AMW-05	3/26/2024	ND	ND	ND	ND
MW-1-T9	3/27/2024	99	ND	ND	ND
MW-2-T9	3/27/2024	56	ND	ND	ND
MW-3-T9	3/27/2024	410	1,400	ND	ND
Cleanup Level		1,000	10,000	10,000	71
Method Reporting Limit		50	250	750	0.5

Notes:

Values in **bold** exceed the cleanup level.

Definitions:

EPA 8260	EPA method of analysis for volatile organic compounds in water.
µg/L	Micrograms per liter.
ND	Constituent not detected above listed method reporting limit.
TPH	Total petroleum hydrocarbons.
TPH-D	Total petroleum hydrocarbons as diesel.
TPH-G	Total petroleum hydrocarbons as gasoline.
TPH-O	Total petroleum hydrocarbons as oil.
NWTPH-Dx	Northwest TPH method for analysis of diesel in water - extended.
NWTPH-Gx	Northwest TPH method for analysis of gasoline in water - extended.
J	Estimated value.
UJ	Not detected at an estimated value.

Table 6. Summary of Free Product Measurement Results for Groundwater
 2024 Monitoring Data
 Site: SeaPort Seattle Terminal (Former ARCO/BP Harbor Island Terminal)

Well	Date	Free Product (feet)
Plant 1		
GM-11S	1/31/2024	Slight Sheen
GM-11S	2/23/2024	None
GM-11S	3/21/2024	None
GM-11S	4/18/2024	None
GM-11S	5/23/2024	None
GM-11S	6/27/2024	Slight Sheen
GM-12S	1/31/2024	None
GM-12S	2/23/2024	None
GM-12S	3/21/2024	None
GM-12S	4/18/2024	None
GM-12S	5/23/2024	None
GM-12S	6/27/2024	None
GM-13S	1/31/2024	None
GM-13S	2/23/2024	None
GM-13S	3/21/2024	None
GM-13S	4/18/2024	None
GM-13S	5/23/2024	None
GM-13S	6/27/2024	None
Cleanup Level		No Sheen

Notes: Values in **bold** exceed the cleanup level.

Table 7. Summary of Data Validation Results
Groundwater Performance Monitoring
First Quarter 2024
Site: SeaPort Seattle Terminal (Former ARCO/BP Harbor Island Terminal)

Sample ID	Constituent	Qualifier	Reason
P1-GWGM-24S-124	Gasoline	J	The RPD for gasoline in the Laboratory Duplicate prepared from this sample exceeds 20%. This sample result is, therefore, qualified as an estimated value (J).

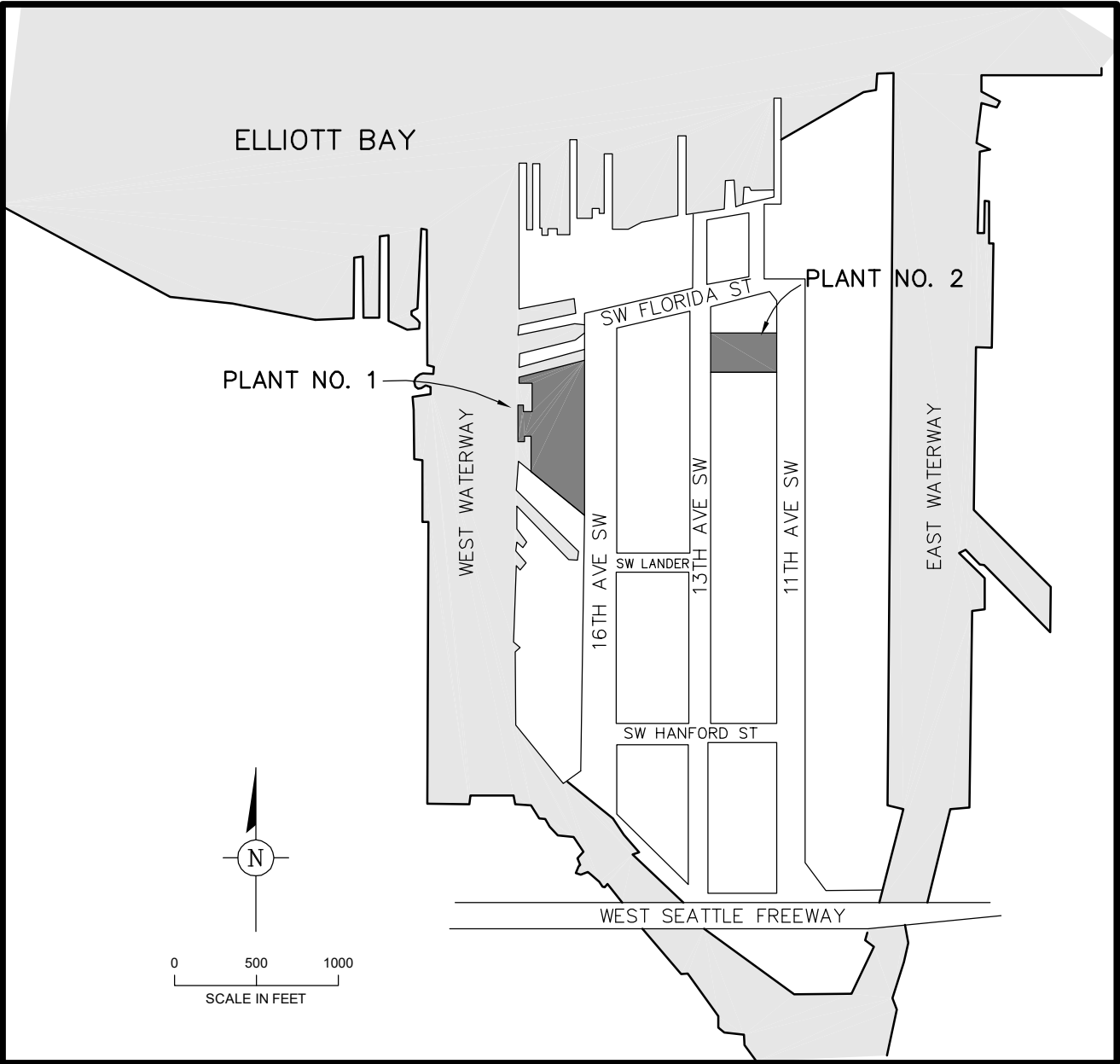
Definitions:
J The associated result is qualified as an estimated value.
RPD Relative Percent Difference

FIGURES

1. Site Location Map
2. Plant 1 First Quarter 2024 Groundwater Monitoring Analytical Results & Contours



AREA PLAN



SITE PLAN

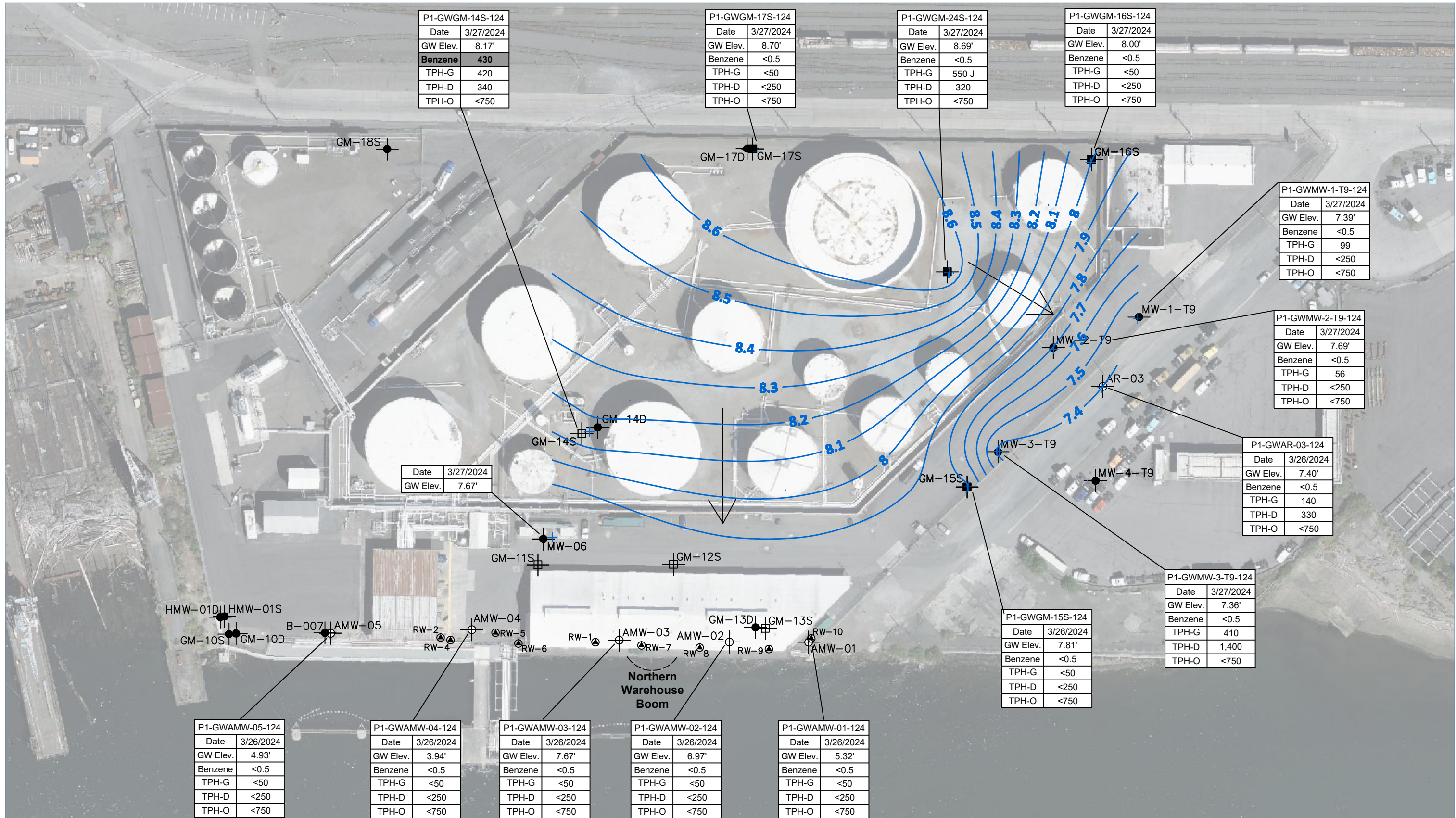


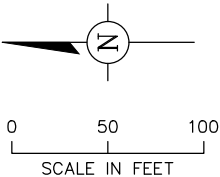
Image © 2022 Microsoft Corporation

LEGEND

- GM-16S Monitoring Well
- AMW-01 Performance/Confirmation Well
- GM-13D Performance Well
- GM-13S Product Performance Well
- Groundwater Flow Direction
- Groundwater Contour (Feet NAVD88)
- RW-5 Recovery Well

Sample ID			CUL
Date	Date Sample Collected		-
GW Elev.	Groundwater Elevation in Feet NAVD88		-
Benzene	Benzene (EPA 8260) in µg/L		71
TPH-G	Total Petroleum Hydrocarbons as Gasoline (NWTPH-GX) in µg/L		1,000
TPH-D	Total Petroleum Hydrocarbons as Diesel (NWTPH-DX) in µg/L		10,000
TPH-O	Total Petroleum Hydrocarbons as Oil (NWTPH-OX) in µg/L		10,000

Notes: **Bold** - Detected concentration exceeds site specific cleanup level
< = Not detected at listed laboratory reporting limit





7518 NE 169th Street
Kenmore, WA 98028

Plant 1 First Quarter 2024
GW Monitoring Analytical Results & Contours

SeaPort Seattle Terminal (Former ARCO/BP Harbor Island Terminal)
1652 Southwest Lander Street
Seattle, WA 98134

FIGURE

2