October 2023
SeaPort Seattle Terminal
(Former ARCO/BP Harbor Island Terminal)
Cleanup Site ID 4426
Consent Decree No. 00-2-05714-8SEA

2023

Third Quarter Progress Report/ Second Quarter Groundwater Performance Monitoring Report

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



October 2023
SeaPort Seattle Terminal
(Former ARCO/BP Harbor Island Terminal)
Cleanup Site ID 4426
Consent Decree No. 00-2-05714-8SEA

2023

Third Quarter Progress Report/ Second Quarter Groundwater Performance Monitoring Report

Erik I. Lottsfeldt, LG

Project Geologist/Project Manager

TechSolve Environmental, Inc.

Like Wenteld

A21

Censed Geologic

ERIK I. LOTTSFELDT

Larry E. Roberts, LG, LHG

Principal, WA Licensed Geologist/Hydrogeologist

TechSolve Environmental, Inc.

Jany & Robert

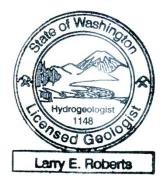




TABLE OF CONTENTS

EX	ECUTIVE SUMMARY	.ES-1
1	INTRODUCTION	1-1
2	REMEDIATION SYSTEM OPERATIONS	2-1
	2.1 Waterfront System Operations	2-1
	2.1.1 Recovery Well Monitoring	2-3
	2.2 Inland System Operations	
	2.3 Containment Boom Monitoring	
3	SUMMARY OF GROUNDWATER PERFORMANCE MONITORING PROGRAM	3-1
4	SUMMARY OF DATA VALIDATION	4-1
5	ADDITIONAL ACTIVITIES	5-1
I		
6	REFERENCES	6-1

<u>TABLES</u>

- 1. Waterfront Groundwater System Petroleum Hydrocarbon Recovery Rates
- 2. Groundwater Performance Monitoring Schedule
- 3. Groundwater Performance Monitoring Groundwater Elevations
- 4. Summary of Analytical Results for Groundwater TPH-G, TPH-D, TPH-O, and Benzene
- 5. Summary of Free Product Measurement Results for Groundwater
- 6. Summary of Data Validation Results

FIGURES

- 1. Site Location Map
- 2. Plant 1 Second Quarter 2023 Groundwater Monitoring Analytical Results & Contours



i

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 SVE soil vapor extraction

TechSolv TechSolv Consulting Group, Inc. (predecessor of TechSolve Environmental, Inc.)

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



EXECUTIVE SUMMARY

This report summarizes the operation of remediation systems during the Third Quarter 2023 (July through September) and the Second Quarter 2023 Groundwater Monitoring Event (April through June) 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 during the third quarter. One monitoring well, GM-14S, showed elevated concentrations of dissolved-phase Indicator Hazardous Substances (IHSs) above cleanup levels (CULs) during the second quarter groundwater performance monitoring. 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 2000b), the Fourth Quarter Progress Report/Third Quarter Groundwater Monitoring Report will be the next report submitted to Ecology. That report will be submitted to Ecology by January 15, 2024.



1 INTRODUCTION

TechSolve Environmental, Inc. (TechSolve) is submitting this report on behalf of TLP Management Services LLC to summarize the Second Quarter 2023 Groundwater Monitoring event and operation and maintenance of the waterfront remediation system during the Third Quarter 2023 (July through September) 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). This progress report satisfies reporting requirements pursuant to Ecology Consent Decree No. 00-2-05714-8SEA (Ecology 2000b).



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 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 and 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 7592-05 for discharge 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 recovery objectives.

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 September 2023) (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 29,782 gallons. The majority of LNAPL recovered by final remediation systems was from enhanced biodegradation, calculated from carbon dioxide concentrations in SVE vapor.

Groundwater/LNAPL recovery system data presented in Table 1 show that influent concentrations of dissolved benzene, diesel, and gasoline in recovered groundwater (i.e., untreated water pumped from recovery wells screened in the shallow groundwater) have decreased over time. During 2023, influent concentrations of dissolved benzene, diesel, and gasoline were all below the surface water cleanup levels (CULs). 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 correspond with the absence of recoverable free-phase LNAPL per the frequent monitoring of 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 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 2023 (Table 1). Average monthly effluent flow rates ranged from 0.51 to 2.20 gallons per minute (GPM) in 2023. 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 remediation systems and wells are conducted to maintain integrity, effective operation, capture, and hydraulic control along the waterfront. Notable activities conducted in the third quarter of 2023 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
- yearly change out and calibration of the sanitary discharge flow meter.



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 voluntarily conducted semi-annually and was conducted in June 2023, as detailed in the Second Quarter 2023 Progress Report (TechSolve 2023b). 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 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 RI/FS). The next round of recovery well sampling is scheduled to be completed in the fourth quarter of 2023, and the results will be presented in the subsequent quarterly progress report to be submitted in January 2024.

The trends in the monitoring results from the waterfront recovery wells and compliance monitoring wells support the conclusion that the cleanup objectives for the Site have been achieved and have been detailed in the Annual Site Reports since 2019 (TechSolve 2020, 2021, 2022c, and 2023a). 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 activities of waterfront temporary piezometers are 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 Section 3.



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. 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 weekly, at a minimum, for boom integrity and for the presence of oil sheens and augmented by checks 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 third quarter 2023. 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. The Southern Warehouse Boom will be reinstalled and maintained if sheens are detected at this location in the future. Waterway sheen monitoring results will continue to be evaluated throughout the remainder of 2023 per Ecology's request (Ecology 2023).



3 SUMMARY OF GROUNDWATER PERFORMANCE MONITORING PROGRAM

The Second Quarter 2023 Groundwater Monitoring Event was conducted in accordance with requirements of the Consent Decree, CAP, and Groundwater Compliance Monitoring and Contingency Program (GWCMCP) (TechSolv 1999). The monitoring also includes revisions requested by Ecology that are included in the EDR and detailed below. The current groundwater monitoring schedule is summarized in Table 3. Plant 1 monitoring well locations are shown on Figure 2. The Second Quarter Groundwater Monitoring event was conducted on June 28, 2023.

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-15S, GM-16S, GM-17S, MW-1-T9, MW-2-T9, and MW-3-T9 were not sampled in the second quarter of 2023. During this quarter, these wells were monitored for water levels only. These wells will next be sampled in the third quarter of 2023.

Well GM-14S was historically used to monitor for sheens on groundwater, as discussed below. As sheens are no longer detected in groundwater at GM-14, quarterly groundwater monitoring for dissolved-phase IHSs was initiated at this well in 2007.

Overall, second quarter 2023 groundwater elevations (Table 3) were lower than elevations measured in the first quarter of 2023. These data indicate that the seasonal groundwater high occurred in late 2022 to early 2023, corresponding with historic trends showing groundwater elevations rising to seasonal highs in the winter and spring and falling to seasonal lows in the summer and autumn.

The water level elevations listed in Table 3 are now shown relative to the North American Vertical Datum of 1988 (NAVD88), whereas elevations listed in previous reports were relative to the older National Geodetic Vertical Datum of 1929 (NGVD29). The NAVD88 elevations listed are approximately 3.3 feet higher than the previously NGVD29 elevations. The change in datum was made following a 2021 survey of wells to the current NAVD88 datum, conducted as part of a 2021 Hydraulic Investigation (TechSolve 2022a).

Second Quarter 2023 Groundwater Monitoring Event samples were submitted to ALS Laboratories of Everett, Washington (Ecology Accreditation #C601) for laboratory analysis of IHSs identified in the CAP. The IHSs include total petroleum hydrocarbons (TPH) as gasoline (TPH-G), TPH as diesel (TPH-D), TPH as oil (TPH-O), and benzene.

Petroleum hydrocarbon monitoring results for the Second Quarter 2023 Groundwater Monitoring Event are included in Table 4 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 concentrations detected in Well GM-14S are similar to concentrations previously



detected and are on a decreasing trend. Further evaluations of data trends will be presented in the 2023 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 5). 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 sheen or measurable LNAPL were detected in Wells GM-11S, GM-12S, and GM-13S in 2023. Historic sheen monitoring data and trend analysis were presented in the 2022 Annual Site Report (TechSolve 2023a). 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 2023, until Ecology concurs that the GWCMCP product 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, limited data were qualified with a UJ qualifier (the associate result is undetected at an approximate quantitation limit) or J qualifier (the associated result is an estimated value).

A summary of data qualified during validation, qualifiers assigned, and reasons for data qualification, are provided in Table 6. All laboratory reports are retained by TechSolve.

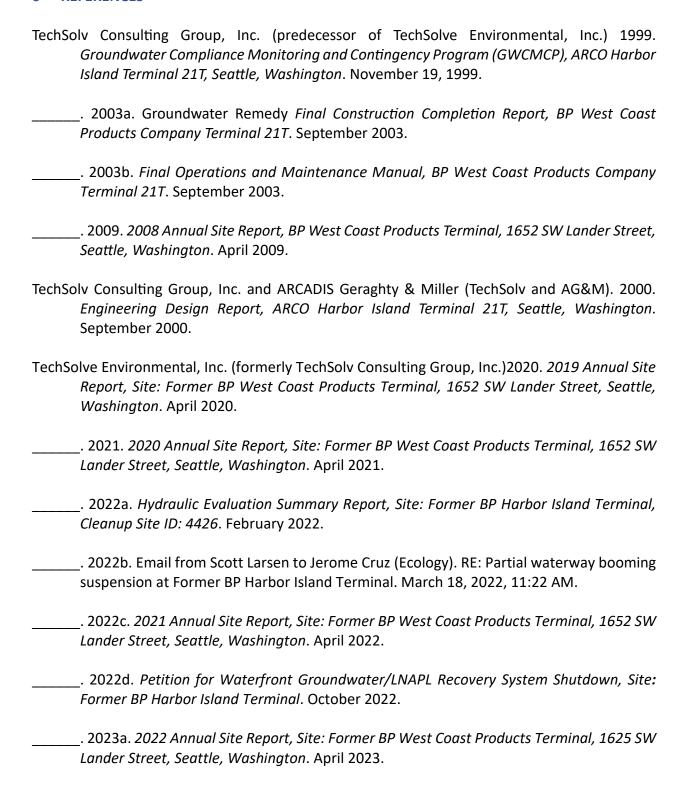


5 ADDITIONAL ACTIVITIES

Eleven temporary piezometers that were installed and sampled as part of the Hydraulic Evaluation (TechSolve 2022a) were resampled in August 2023 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 waterfront active remediation 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 April 2024).



6 REFERENCES





2023b. Second Quarter 2023 Progress Report / First Quarter 2023 Groundwater Monitoring Report, Site: Former BP West Coast Products Terminal, 1652 SW Lander Street, Seattle, Washington. July 2023.
Washington State Department of Ecology (Ecology). 1999. Cleanup Action Plan (CAP), ARCO Terminal 21T, Seattle, Washington. November 19, 1999.
2000. Consent Decree No. 00-2-05714-8SEA. March 24, 2000.
2004a. Annual Site Review Meeting with Roger Nye, Project Manager, Northwest Regional Office. Personal communication to Ralph Moran (BP) and Larry Roberts and Scott Larsen (TechSolv Consulting Group, Inc.). April 14, 2004.
2004b. Letter from Roger K. Nye, Northwest Regional Office, to Ralph Moran (BP). June 8, 2004.
2004c. Email from Roger K. Nye, Northwest Regional Office, to Larry Roberts (TechSolv Consulting Group, Inc.) RE: proposal approval. June 15, 2004.
2023. Verbal discussion between Vance Atkins (Ecology), Larry Roberts (TechSolve Environmental, Inc.), and Doug Hall (TLP Management Services). Onsite terminal walk-through/meeting. July 12, 2023.



TABLES

- 1. Waterfront Groundwater System Petroleum Hydrocarbon Recovery Rates
- 2. Groundwater Performance Monitoring Schedule
- 3. Groundwater Performance Monitoring Groundwater Elevations
- 4. Summary of Analytical Results for Groundwater TPH-G, TPH-D, TPH-O, and Benzene
- 5. Summary of Free Product Measurement Results for Groundwater
- 6. Summary of Data Validation Results



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

GROUNDWATER SYSTEM EFFICIENCIES

			Influent	Effluent	%	Influent	Effluent	%	Influent	Effluent	%	Influent	Effluent	%	Influent	Effluent	%	Influent	Effluent	%	Influent	Effluent	%
	SAMPLE DATE	UNITS	Benzene	Benzene	Reduction	Diesel	Diesel	Reduction	Ethylbenzene	Ethylbenzene	Reduction	Gasoline	Gasoline	Reduction	Oil	Oil	Reduction	Toluene	Toluene	Reduction	Xylenes	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	8.0	77%	485.1	5.2	96%
	2007 Averages	μg/L	8.8	1.5	60%	1,223	906	NA	6.6	8.0	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	8.0	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 95	50	NA NA		750	NA	1.0	1.0 1.0	NA	3.3	3.0	NA
	2022 Averages	μg/L	1.0	0.5	NA 700/		378	NA	1.0	1.0	NA	- 00	50	107		750	NA	1.0	1.0	NA	3.0	3.0	NA NA
	1/26/2023	μg/L	2.4	0.5	79%		470	NA	1.0	1.0	NA	120 89	50	58% 44%		750	NA	1.0	1.0	NA	3.0	3.0	NA NA
	2/23/2023 3/23/2023	μg/L	1.2 0.7	0.5 0.5	58% 29%		450 350	NA NA	1.0 1.0	1.0 1.0	NA NA	50	50 50	44% NA		750 750	NA NA	1.0 1.0	1.0 1.0	NA NA	3.0 3.0	3.0 3.0	NA NA
	4/20/2023	μg/L	2.7	0.5	29% 81%		330	NA NA	1.0	1.0	NA NA	130	50 50	62%		750 750	NA NA	1.0	1.0	NA NA	3.0	3.0	NA NA
	5/25/2023	μg/L μg/L	0.5	0.5	NA		520	NA NA	1.0	1.0	NA NA	50	50	NA		750	NA NA	1.0	1.0	NA NA	3.0	3.0	NA NA
	6/22/2023	μg/L	0.6	0.5	15%		310	NA	1.0	1.0	NA NA	50	50	NA		750	NΔ	1.0	1.0	NA	3.0	3.0	NA NA
	7/20/2023	μg/L	0.5	0.5	NA		300	NA	1.0	1.0	NA NA	66	50	24%		750	NA NA	1.0	1.0	NA	3.0	3.0	NΔ
	8/31/2023	μg/L	0.5	0.5	NA		250	NA.	1.0	1.0	NA	61	50	18%		750	NA.	1.0	1.0	NA	3.0	3.0	NA
	9/21/2023	μg/L	0.5	0.5	NA		1.000	NA.	1.0	1.0	NA	50	50	NA		750	NA.	1.0	1.0	NA	3.0	3.0	NA
	2023 Averages	ua/L	1.1	0.5	NA		442	NA	1.0	1.0	NA	74	50	NA		750	NA	1.0	1.0	NA	3.0	3.0	NA
SI	URFACE WATER CLEAN		71 µg/L			10,000 μg/L	-		NA	•		1,000 µg/L			10,000 μg/L			NA			NA		
	KCDNR DISCHA	RGE LIMITS		70 μg/L			100,000 μg/L			1,700 µg/L			NA		1	100,000 μg/L			1,400 µg/L			NA	

METRO DISCHARGE DATA											
Observation Date	Days since last monitoring reading	Average flow (GPM)	Total Flow Between Observation dates (gallons)	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
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
January-23	35	2.20	110,660	0.0018	0.14	0.36	0.69	0.0009	0.0009	0.0028	0.16
February-23	28	1.11	44,820	0.0007	0.04	0.17	0.28	0.0004	0.0004	0.0011	0.07
March-23	28	0.85	34,270	0.0003	0.02	0.11	0.21	0.0003	0.0003	0.0009	0.05
April-23	28	0.95	38,420	0.0005	0.03	0.11	0.24	0.0003	0.0003	0.0010	0.05
May-23	35	0.83	41,630	0.0006	0.03	0.15	0.26	0.0003	0.0003	0.0010	0.06
June-23	28	0.72	29,060	0.0001	0.01	0.10	0.18	0.0002	0.0002	0.0007	0.04
July-23	28	0.54	21,920	0.0001	0.01	0.06	0.14	0.0002	0.0002	0.0005	0.03
August-23	42	0.53	31,780	0.0001	0.02	0.07	0.20	0.0003	0.0003	0.0008	0.04
September-23	21	0.51	15,530	0.0001	0.01	0.08	0.10	0.0001	0.0001	0.0004	0.03
2023 Totals and Averages	273	0.92	368,090	0.004	0.304	1.214	2.304	0.003	0.003	0.009	0.53
_	·	TOTALS:	33,409,305 gal	13.4	961.9	1660.2	180.2	34.8	14.8	101.3	
	Maximum permitted GPM:	17.5	Gallons Gas, Diesel,	& Oil Recovered:	156.4	237.8	23.6		Total Gallon	s Recovered:	418.32

Oil Water Separator Data					
Observation Date	Monthly LNAPL Recovery (gal)				
February-03	19.6				
April-03	6.9				
May-03	2.5				
July-03	2				
December-03	20				
January-04	25				
June-04	35				
August-04	50				
September-04	8				
November-04	10				
December-04	3.5				
January-05	0				
February-05	35				
July-05	110				
February-06	5				
March-06	2				
December-06	30				
March-08	30				
Total Gallons LNAPL Rec	covered: 395				

TOTAL PETROLEUM RECOVERY	
Total lbs. Dissolved Gas, Diesel, and Oil Recovered in Groundwater (2002-Present)	2,802 lb
Total Gallons Dissolved Gas, Diesel, and Oil Recovered in Groundwater (2002-Present)*	418 ga
Total Gallons LNAPL Recovered by Final Recovery System (2002-Present)	395 ga
Total Gallons LNAPL Recovered by Interim Recovery System (1992-2002)	9,312 ga
Total Gallons of TPH Vapor Recovered by Final SVE System (2003-2008)**	2,334 ga
Total Gallons of TPH Vapor Recovered by Interim SVE System (1996-2002)**	1,248 ga
Total Gallons TPH Recovered from Final SVE System due to Biodegradation (2003-2008)***	11,411 ga
Total Gallons TPH Recovered from Interim SVE System due to Biodegradation (1996-2002)***	4,664 ga
Total Gallons Recovered by Final Recovery Systems (2002-Present)	14,559 ga
Total Gallons Recovered by Interim Recovery Systems (1992-2002)	15,223 ga
Total Gallons of Potroloum Pomoved (1992 Present)	29 782

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)

TPH - Total petroleum hydrocarbons μg/L - micrograms per liter

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(3.785l/gal)=ug/gal, (ug/gal)x(ug/(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

1.583 x 10³ is a constant and is derived as follows: 10⁶ ppmv x 60min/1hr x 1 ib. 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.

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

Table 2. Groundwater Performance Monitoring Schedule
Site: Seaport Seattle Terminal (Former ARCO/BP Harbor Island Terminal)

Analyses Conducted by Quarter

			ucted by Quarter	
Well	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Plant 1				
	Benzene, TPH-G,		Benzene, TPH-G,	
MW-1-T9	TPH-D, TPH-O	(1)	TPH-D, TPH-O	(1)
	Benzene, TPH-G,		Benzene, TPH-G,	_
MW-2-T9	TPH-D, TPH-O	(1)	TPH-D, TPH-O	(1)
	Benzene, TPH-G,		Benzene, TPH-G,	_
MW-3-T9	TPH-D, TPH-O	(1)	TPH-D, TPH-O	(1)
	Benzene, TPH-G,	Benzene, TPH-G,	Benzene, TPH-G,	Benzene, TPH-G,
GM-14S	TPH-D, TPH-O	TPH-D, TPH-O	TPH-D, TPH-O	TPH-D, TPH-O
	Benzene, TPH-G,		Benzene, TPH-G,	
GM-15S	TPH-D, TPH-O	(1)	TPH-D, TPH-O	(1)
	Benzene, TPH-G,		Benzene, TPH-G,	_
GM-16S	TPH-D, TPH-O		TPH-D, TPH-O	
	Benzene, TPH-G,		Benzene, TPH-G,	_
GM-17S	TPH-D, TPH-O		TPH-D, TPH-O	
	Benzene, TPH-G,	Benzene, TPH-G,	Benzene, TPH-G,	Benzene, TPH-G,
GM-24S	TPH-D, TPH-O	TPH-D, TPH-O	TPH-D, TPH-O	TPH-D, TPH-O
	Benzene, TPH-G,		Benzene, TPH-G,	_
AR-03	TPH-D, TPH-O	(1)	TPH-D, TPH-O	(1)
				Benzene, TPH-G,
	Benzene, TPH-G,	Benzene, TPH-G,	Benzene, TPH-G,	TPH-D, TPH-O,
AMW-01	TPH-D, TPH-O	TPH-D, TPH-O	TPH-D, TPH-O	cPAHs
				Benzene, TPH-G,
	Benzene, TPH-G,	Benzene, TPH-G,	Benzene, TPH-G,	TPH-D, TPH-O,
AMW-02	TPH-D, TPH-O	TPH-D, TPH-O	TPH-D, TPH-O	cPAHs
				Benzene, TPH-G,
	Benzene, TPH-G,	Benzene, TPH-G,	Benzene, TPH-G,	TPH-D, TPH-O,
AMW-03	TPH-D, TPH-O	TPH-D, TPH-O	TPH-D, TPH-O	cPAHs
				Benzene, TPH-G,
	Benzene, TPH-G,	Benzene, TPH-G,	Benzene, TPH-G,	TPH-D, TPH-O,
AMW-04	TPH-D, TPH-O	TPH-D, TPH-O	TPH-D, TPH-O	cPAHs
				Benzene, TPH-G,
	Benzene, TPH-G,	Benzene, TPH-G,	Benzene, TPH-G,	TPH-D, TPH-O,
AMW-05	TPH-D, TPH-O	TPH-D, TPH-O	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 3. Groundwater Performance Monitoring Groundwater Elevations
Second Quarter 2023
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	6/28/2023	11.77	4.59	7.18
GM-16S	6/28/2023	11.99	4.96	7.03
GM-17S	6/28/2023	12.56	4.91	7.65
GM-24S	6/28/2023	11.11	3.69	7.42
AMW-01	6/28/2023	12.17	9.39	2.78
AMW-02	6/28/2023	15.36	13.23	2.13
AMW-03	6/28/2023	15.29	13.06	2.23
AMW-04	6/28/2023	11.42	7.31	4.11
AMW-05	6/28/2023	11.05	7.24	3.81

Definitions:

ft Feet

NAVD88 North American Vertical Datum of 1988

TOC Top of casing

Table 4. Summary of Analytical Results for Groundwater - TPH-G, TPH-D, TPH-O, and Benzene Second Quarter 2023

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	6/28/2023	970	2,000	ND	700
GM-24S	6/28/2023	190 J	ND UJ	ND	ND
AMW-01	6/28/2023	ND	ND	ND	ND
AMW-02	6/28/2023	ND	ND	760	6.9 J
AMW-03	6/28/2023	ND	ND	ND	ND
AMW-04	6/28/2023	ND	ND	ND	ND
AMW-05	6/28/2023	ND	ND	ND	ND
Cleanup Level		1,000	10,000	10,000	71
Method Reporti	ng Limit	50	250	750	0.5

Notes:

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

Definitions:

Deminions.					
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 5. Summary of Free Product Measurement Results for Groundwater 2023 Monitoring Data
Site: Seaport Seattle Terminal (Former ARCO/BP Harbor Island Terminal)

Well	Date	Free Product (feet)
Plant 1		
GM-11S	1/26/2023	None
GM-11S	2/23/2023	None
GM-11S	3/23/2023	None
GM-11S	4/20/2023	None
GM-11S	5/25/2023	None
GM-11S	6/22/2023	None
GM-11S	7/20/2023	None
GM-11S	8/31/2023	None
GM-11S	9/21/2023	None
GM-12S	1/26/2023	None
GM-12S	2/23/2023	None
GM-12S	3/23/2023	None
GM-12S	4/20/2023	None
GM-12S	5/25/2023	None
GM-12S	6/22/2023	None
GM-12S	7/20/2023	None
GM-12S	8/31/2023	None
GM-12S	9/21/2023	None
GM-13S	1/26/2023	None
GM-13S	2/23/2023	None
GM-13S	3/23/2023	None
GM-13S	4/20/2023	None
GM-13S	5/25/2023	None
GM-13S	6/22/2023	None
GM-13S	7/20/2023	None
GM-13S	8/31/2023	None
GM-13S	9/21/2023	None
Cleanup Level		No Sheen

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

Table 6. Summary of Data Validation Results

Groundwater Performance Monitoring

Second Quarter 2023

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

Sample ID	Constituent	Qualifier	Reason
P1-GWAMW-02-223	Benzene	J	Benzene was detected in the Rinsate-1-223 at a concentration of 0.71 µg/L. Sample P1-GWAMW-02-223 contained a benzene concentration of 6.9 µg/L. This result is qualified as an estimated value (J) and may be biased high. In other samples, the benzene results are not qualified as benzene was either undetected or was detected at a much higher concentration and, therefore, unlikely to have been affected by the detection in the Rinsate sample.
P1-GWMW-24S-223 P1-GWMW-224S-223	Gasoline	J	The relative percent difference (RPD) for this Field Duplicate pair exceeds the control limit. These results are, therefore, qualified as estimated values (J).
P1-GWMW-24S-223	Gasoline	J	The RPD for the Matrix Spike/Matrix Spike Duplicate prepared from this sample exceeds the control limit. This result is, therefore, qualified as an estimated value (J).
P1-GWMW-24S-223	Diesel	UJ	The RPD for the Laboratory Duplicate prepared from this sample exceeds the control limit. Therefore, this sample result is qualified as undetected at an estimated reporting limit (UJ).

Definitions:

- The analyte was not detected at or above the quantitation limit. U
- J
- The associated value is approximate.

 The analyte was not detected at or above the quantitation limit, which is approximate. UJ
- R The sample results are unusable. The analyte may or may not be present.

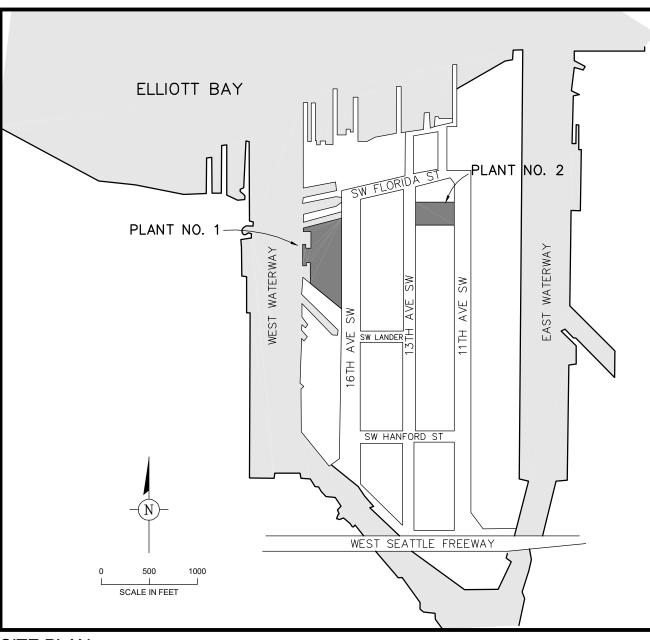
FIGURES

- 1. Site Location Map
- 2. Plant 1 Second Quarter 2023 Groundwater Monitoring Analytical Results & Contours





AREA PLAN



SITE PLAN



Site Location Map

