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9 September 2022
File No. 0202561-000

City of Tacoma
Public Works Department, Engineering Division
747 Market Street, Room 544
Tacoma, WA 98402

Attention: Darius Thompson
Project Manager

Subject: Thea Foss Waterway Esplanade
Groundwater Monitoring Results, June 2022

Dear Mr. Thompson:

This letter transmits the results of the June 2022 groundwater monitoring event conducted for the Thea Foss Waterway Esplanade site (Figure 1). The sampling was performed in accordance with our proposal dated 8 January 2021, and involved collecting and analyzing groundwater samples from the following monitoring wells (Figure 2):

- MW-2 (MW-09-2);
- MW-5;
- P3-MW-01R;
- P3-MW-02;
- P3-MW-03; and
- Landau Well.

Samples were collected using low-flow techniques and were analyzed for dissolved arsenic, copper, lead, nickel, and zinc by the City of Tacoma Environmental Services Laboratory using Method 6020B. Samples from the Landau Well were also analyzed for gasoline using method NWTPH-Gx, diesel and heavy oil using method NWTPH-Dx, and benzene, toluene, ethylbenzene, and xylenes (BTEX) using method 8260D. All wells were sampled within approximately 6 hours of low tide in the adjacent Thea Foss Waterway, which occurred at 9:04 AM PST.

Table 1 presents the water levels measured in each well at the specified date and time in the table. Haley & Aldrich's field groundwater sampling data forms are included as Appendix A. The laboratory report, along with our data usability summary report, is included in Appendix B.

Table 2 summarizes the results of the chemical analyses and compares them to groundwater- and surface water-based cleanup levels. The groundwater sample collected from P3-MW-01R exceeded the

Model Toxics Control Act (MTCA) surface water standards for marine waters, aquatic life, chronic for copper (3.1 µg/L) with a value of 3.82 µg/L and exceeded the MTCA Method B groundwater cleanup level for drinking water for arsenic (0.058 µg/L) with a value of 1.55 µg/L, though this value is still below the MTCA Method A groundwater cleanup level (5 µg/L). All other dissolved metals results were either non-detect or below regulatory levels.

Table 3 summarizes the historical results of the chemical analyses and compares them to groundwater- and surface water-based cleanup levels.

A petroleum-like odor was observed in the Landau Well, so samples from that well were analyzed for gasoline range organics (GRO) using method NWTPH-Gx, diesel range organics (DRO) and heavy oil range organics (ORO) using method NWTPH-Dx, and benzene, toluene, ethylbenzene, and xylenes (BTEX) using method 8260D. Results were all non-detect. We recommend no further testing for GRO, DRO, ORO, or BTEX at this time.

Please note that surface monuments in several of the monitoring wells are missing bolts or are damaged (see details in groundwater sampling field forms included in Appendix A). We recommend that these well monuments be repaired prior to or during the next sampling event, if possible.

We trust that this report meets your needs. Please contact us with any questions or if you would like to discuss further.

Sincerely yours,
HALEY & ALDRICH, INC.

Becca Dozier
Hydrogeologist

Mark Dagel, LHG
Program Manager

Attachments:
Table 1 – Water-Level Measurements
Table 2 – Analytical Results
Table 3 – Historical Results
Figure 1 – Vicinity Map
Figure 2 – Well Locations
Appendix A – Groundwater Sampling Field Forms
Appendix B – Data Quality Review and Laboratory Data Report

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TABLES

TABLE 1
WATER-LEVEL MEASUREMENTS
THEA FOSS WATERWAY ESPLANADE
TACOMA, WASHINGTON

Well	Time	Depth to Water (feet)
MW-2	1:51 PM	11.86
MW-5	12:35 PM	9.67
P3-MW-01R	2:48 PM	8.69
P3-MW-02	11:25 AM	5.99
P3-MW-03	3:23 PM	9.82
Landau Well	10:01 AM	16.29

Notes:
Measurements taken on 24 June 2022.
Depth to water measured from top of PVC well casings.
All times are in Pacific Standard Time.

TABLE 2
ANALYTICAL RESULTS
THEA FOSS WATERWAY ESPLANDE
TACOMA, WASHINGTON

	Monitoring Well																								Regulatory Levels			
																									Groundwater Cleanup Levels, Cleanup Levels and Risk Calculation (CLARC)		Surface Water Standards for Marine Waters, Chapter 173-201A WAC	
Results in µg/L	MW-2				MW-5				P3-MW-01R				P3-MW-02				P3-MW-03				Landau Well				Method A	Method B, Drinking Water	Aquatic Life, Chronic	Human Health
Sampling Date	4/9/2019	1/27/2020	3/31/2021	6/24/2022	4/9/2019	1/27/2020	3/31/2021	6/24/2022	4/9/2019	1/27/2020	3/31/2021	6/24/2022	4/9/2019	1/27/2020	3/31/2021	6/24/2022	4/9/2019	1/27/2020	3/31/2021	6/24/2022	4/9/2019	1/27/2020	3/31/2021	6/24/2022				
Depth to Water (feet)	11.81	10.72	11.9	11.86	9.46	8.64	9.85	9.67	8.55	7.12	8.52	8.69	5.43	5.43	5.89	5.99	8.73	7.94	9.07	9.82	12.03	11.98	12.35	16.29				
Dissolved Metals																												
Arsenic	*1.23*	0.5 U	2.5 U	1 U	*1.03*	*0.615*	2.5 U	1 U	*1.58*	*1.56*	2.5 U	*1.55*	*2.52*	*4.33*	2.5 U	1 U	***10.8***	*1.76*	***6.2***	1 U	***5.73***	*0.68*	*2.63*	5 U	5 [a]	0.058	36	10
Copper	0.318 T	0.5 U	2.5 U	1 U	2.41	0.5 U	2.5 U	1 U	3.09	1.51	2.65	3.82	0.249 T	0.5 U	2.5 U	1 U	4.97	1.6	2.5 U	1 U	0.529	0.5 U	2.5 U	5 U	-	640 [b]	3.1	-
Lead	0.5 U	0.5 U	2.5 U	1 U	0.5 U	0.5 U	2.5 U	1 U	0.0061 U	0.5 U	2.5 U	1 U	0.169 T	0.5 U	2.5 U	1 U	0.5 U	0.5 U	2.5 U	1 U	0.0061 U	0.5 U	2.5 U	5 U	15	-	8.1	-
Nickel	0.965	0.566	2.5 U	1 U	0.845	0.538	2.5 U	1 U	1.11	0.829	2.5 U	1.22	0.411 T	0.5 U	2.5 U	1 U	1.53	0.544	2.5 U	4.39	2.83	0.595	2.5 U	5 U	-	-	8.2	190
Zinc	17.6	1.78	2.5 U	2.01	3.25	0.58	2.5 U	2.83 J	2.77	1.26	4.45	4.42	1.85	0.5 U	2.5 U	1.21	2.07	0.5	9.01	3.36	2.41	0.81	2.62	5 U	-	4800 [b]	81	2900
NWTPH-Dx																												
Diesel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100 U	100 U	500	-	50 [d,e]	-
Heavy Oil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	190 U	200 U	500	-	-	-
NWTPH-Gx																												
Gasoline	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	250 U	800 / 1000 [c]	-	1700 [d]	-
Volatile Organic Compounds																												
Benzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.5 U	5	0.8	23 [d]	1.6
Ethylbenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.5 U	700	800 [b]	21 [d]	270
Toluene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.5 U	1000	640 [b]	102 [d]	410
Xylenes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5 U	1000	1600 [b]	106 [d]	-

Notes:

Analyses performed by City of Tacoma Environmental Services Laboratory using method 6020B for dissolved metals, method NWTPH-Gx for gasoline, method NWTPH-Dx for diesel and heavy oil-range hydrocarbons, and method 8260D for benzene, toluene, ethylbenzene, and xylenes (BTEX).

U = Not detected at detection limit indicated.

T = Value is between the MDL and RL.

Monitoring well values represent dissolved metals concentrations (laboratory filtered).

All concentrations in µg/L.

***Bolded** values indicate concentration exceeds Method A groundwater cleanup level.*

Italicized values indicate concentration exceeds Method B groundwater cleanup level.

Shaded values indicate concentration exceeds surface water standard.

- = not applicable or no results

[a] *Arsenic cleanup level based on background groundwater concentrations for state of Washington.*

[b] *Groundwater Method B Non-cancer cleanup level.*

[c] *800 µg/L when benzene is present in groundwater; 1000 µg/L when benzene is not detected.*

[d] *Aquatic life protective values*

[e] *Unweathered*

TABLE 3
HISTORICAL RESULTS
THEA FOSS WATERWAY ESPLANADE
TACOMA, WASHINGTON

Well ID	Regulatory Level	MW-16							MW-30						
Sampling Date		8/5/2010	12/29/2010	7/26/2011	3/1/2012	10/15/2013	4/17/2014	10/23/2014	8/5/2010	12/29/2010	7/26/2011	3/1/2012	10/15/2013	4/17/2014	10/23/2014
Depth to Water in Feet[a]		15.21	13.30	15.15	14.3	14.17	13.68	13.55	10.51	7.70	9.99	9.14	10.55	8.51	8.60
TPH in µg/L															
Diesel	500[c]	80 U	100 U	70 U	70 U	100 U	100 U	30 UJ	80 U	100 T	70 T	70 U	100 U	100 U	50 J
Heavy oil	500[c]	210 U	100 U	40 U	50 T	200 U	200 U	50 UJ	210 U	100 U	40 U	40 U	200 U	200 U	50 UJ
Gasoline	800[c]	35 T	50 U	70	10 U	50 U	50 U	21.9 J	87	50 U	158	29.7	114	143	124 J
BTEX in µg/L															
Benzene	71[d]	0.2 U	1 U	0.20	1.0 U	1.0 U	0.2 U	0.2 U	1.6	1.04	9.40	9.4	12	20	15
Toluene	200,000[d]	0.2 U	1 U	0.20	1.0 U	1.0 U	0.2 U	0.2 U	0.2 U	1 U	0.20 T	0.20 U	1.0 U	0.2 U	0.2 U
Ethylbenzene	29,000[d]	0.2 U	1 U	0.30 T	0.2 U	1.0 U	0.2 U	0.2 U	0.2 U	1 U	0.50 T	0.20 U	1.0 U	0.2 JT	0.2 U
Total xylene	1,600[e]	0.6 U	2 U	0.70 T	0.6 U	2.0 U	0.4 U	0.4 U	0.6 U	2 U	1.00 T	0.60 U	0.7 T	0.9 JT	1.0 T
cPAHs in µg/L															
Benzo(a)anthracene	-	0.107	0.072	0.005 U	0.005 U	0.007 JT	0.010 UJ	0.005 U	0.048	0.006 U	0.005 U	0.005	0.010 UJ	0.010 UJ	0.005 UJ
Benzo(a)pyrene	-	0.117	0.078	0.009 U	0.009 U	0.01 UJ	0.010 UJ	0.005 U	0.052	0.004 U	0.009 U	0.009	0.010 UJ	0.010 UJ	0.005 UJ
Benzo(b,k)fluoranthenes	-	0.168	0.119	0.012 U	0.012 U	0.02 UJ	0.020 UJ	0.012 U	0.094	0.007 U	0.012 U	0.012	0.020 UJ	0.020 UJ	0.012 UJ
Chrysene	-	0.101	0.079	0.003 U	0.003 U	0.01 UJ	0.010 UJ	0.006 U	0.049	0.005 U	0.003 U	0.003	0.010 UJ	0.010 UJ	0.006 UJ
Dibenz(a,h)anthracene	-	0.014	0.027	0.005 U	0.007 T	0.01 UJ	0.010 UJ	0.004 U	0.009 U	0.008 T	0.005 U	0.005	0.010 UJ	0.010 UJ	0.004 UJ
Indeno(1,2,3-cd)pyrene	-	0.072	0.055	0.006 U	0.007 T	0.01 UJ	0.010 UJ	0.003 U	0.039	0.006 T	0.006 U	0.006 T	0.010 UJ	0.010 UJ	0.003 UJ
Total cPAHs[b]	0.031[b,d]	**0.154**	**0.106**	0.006 U	0.007	0.008 J	0.008 UJ	0.004 U	**0.071**	0.004	0.006 U	0.012 J	0.008 UJ	0.008 UJ	0.004 UJ
Dissolved Metals in µg/L															
Arsenic	0.14[d]	**6.55**	**9.3**	**5.67**	**7.44**	**6.44**	**9.56**	**6.16**	**8.05**	**21.4**	**17.9**	**19.4**	**9.96**	**10.4**	**10.6**
Copper	3.1[f]	0.09 T	1.05 T	0.758	0.249	0.038 U	0.038 U	0.995	0.12 T	0.4 T	0.038 U	0.108 T	0.044 T	0.038 U	0.357
Lead	8.1[f]	0.028 U	0.6 T	0.413	0.078 T	0.2 U	0.026 U	0.156 J	0.06 T	0.15 T	0.067 T	0.078 T	0.2 U	0.102 JT	0.026 U
Nickel	8.2[f]	4.89	0.9 T	1.56	0.685	0.261	0.274	1.11	3.72	0.8 T	0.975	1.27	0.406	0.396	0.408 U
Zinc	81[f]	16	4.3	3.06	0.688	0.79 U	0.66	2.17	15.4	2 T	0.983	1.93	0.898 U	1.97	1.05

TABLE 3
HISTORICAL RESULTS
THEA FOSS WATERWAY E
TACOMA, WASHINGTON

Well ID	MW-9			P4-MW02							P10-MW03R				P10-MW03R				
Sampling Date	10/15/2013	4/17/2014	10/23/2014	8/5/2010	12/30/2010	7/26/2011	2/29/2012	10/15/2013	4/17/2014	10/23/2014	10/14/1997	1/20/1998	8/10/2010	12/29/2010	7/29/2011	3/1/2012	10/15/2013	4/17/2014	10/23/2014
Depth to Water in Feet[a]	13.83	14.62	14.45	8.54	9.10	9.61	9.49	9.51	9.65	9.27	-	-	7.93	6.10	8.02	7.37	8.18	7.52	7.05
TPH in µg/L																			
Diesel	**1300**	**6400**	**4400** J	260	200	90 T	280	100 U	100 U	40 J	250 U	250 U	80 U	100 J	70	70 U	100 U	100 U	30 UJ
Heavy oil	410	**3400**	**2000** J	210 U	200 T	40 U	360	200 U	200 U	50 UJ	500 U	500 U	210 U	200 T	60 T	40 U	200 U	200 U	50 UJ
Gasoline	**1560**	**1930**	634	160	50 U	89.7	31.2	447	76.7 U	79.2	100 U	100 U	46 T	50 U	60.1	10 U	50 U	50 U	24.1 J
BTEX in µg/L																			
Benzene	**120**	**220**	**80**	3.2	2.32	4.9	2.70	3.8	3.5	3.6	0.5 U	0.5 U	2.0 U	1 U	0.2 U	0.2 U	1.0 U	0.2 U	0.2 U
Toluene	2.4	2.5 J	1.4 T	0.6 T	1 U	0.4 T	0.20 U	0.2 T	0.3 JT	0.3 T	0.5 U	0.5 U	2.0 U	1 U	0.2 U	0.2 U	1.0 U	0.2 U	0.2 U
Ethylbenzene	29	36	9.8	1.3	1 U	0.6 T	0.30 T	0.3 T	0.3 JT	0.3 T	0.5 U	0.5 U	2.0 U	1 U	0.2 U	0.2 U	1.0 U	0.2 U	0.2 U
Total xylene	16.2	12.2 J	5.3 T	1.7 T	2 U	1.3 T	0.60 T	1.2 T	1.7 JT	1.5 T	0.5 U	0.5 U	6.0 U	2 U	0.6 U	0.6 U	2.0 U	0.4 U	0.4 U
cPAHs in µg/L																			
Benzo(a)anthracene	10.200 J	2.34 J	7.56 J	0.454	0.404	0.067	0.236	0.198 J	0.0630 J	0.1420	1.000 U	0.015	0.102	0.035	0.040	0.014	0.128 J	0.015 J	0.032 J
Benzo(a)pyrene	2.680 J	26.3 J	1.79 J	0.371	0.357	0.016	0.199	0.048 J	0.0270 J	0.0660	1.000 U	0.010 U	0.073	0.029	0.030	0.010	0.054 J	0.010 UJ	0.007 T
Benzo(b,k)fluoranthenes	6.030 J	6.96 J	3.54 J	0.490	0.521	0.024	0.265	0.091 J	0.0380 J	0.0950	1.000 U	0.010 U	0.098	0.035	0.044	0.012 T	0.192 J	0.020 UJ	0.015 T
Chrysene	10.300 J	52.9 J	6.2 J	0.385	0.430	0.055	0.239	0.177 J	0.0580 J	0.1330	1.000 U	0.012	0.120	0.046	0.049	0.013	0.153 J	0.012 J	0.025 J
Dibenz(a,h)anthracene	0.276 J	101 J	0.204 J	0.030	0.050	0.005 U	0.020	0.005 JT	0.0100 UJ	0.0040 U	1.000 U	0.010 U	0.009 U	0.006	0.005 T	0.005	0.086 J	0.010 UJ	0.004 UJ
Indeno(1,2,3-cd)pyrene	0.689 J	112 J	0.506 J	0.145	0.158	0.006 U	0.092	0.012 J	0.0100 J	0.0260	1.000 U	0.010 U	0.032	0.013 T	0.015	0.006 T	0.083 J	0.010 UJ	0.003 UJ
Total cPAHs[b]	**4.503** J	**49.059** J	**3.033** J	**0.487**	**0.475**	0.026	**0.263**	**0.080** J	**0.039** J	**0.094**	**0.705** U	0.008	**0.098**	**0.038** J	**0.041** J	0.014 J	**0.104** J	0.009 J	0.012 J
Dissolved Metals in µg/L																			
Arsenic	5 U	**2.06**	**2.4**	**2.61**	**0.95** T	**0.836**	**0.843** T	5 U	**0.319**	**0.517**	1.4 U	1.3 U	**0.73**	**0.3** T	**0.374**	**0.316** J	5 U	**0.276**	**0.278**
Copper	0.2 U	0.038 U	0.225	0.14 T	0.6 T	0.038 U	1.69	0.041 T	0.038 U	0.356	3.9 U	4.5 U	1.37	0.5 T	0.058 T	1.54	0.2 U	0.2 U	0.266
Lead	0.2 U	0.026 U	0.026 U	0.05 JT	3.5	0.026 U	0.401	0.2 U	0.026 U	0.026 U	4 U	1.2 U	0.028 U	0.5 T	0.165 T	0.286	0.2 U	0.026 U	0.026 U
Nickel	0.642	0.316	0.368 UJ	6.81	0.4 T	0.886	2.82	0.08 J	0.101 JT	0.2 U	0.4 U	0.6 U	8.11	0.75 T	2.67	**26.4**	0.446	0.457	0.379 UJ
Zinc	0.695 U	5.4	0.98	20.5	2.75	0.239	4.19	0.333 U	2.38	2.07	1.9 U	1.4 U	68.5	1.8 T	0.965	10	0.541 U	2.0	0.84

TABLE 3
HISTORICAL RESULTS
THEA FOSS WATERWAY E
TACOMA, WASHINGTON

Well ID	P10-MW04								R21-MW01	R21-MW02			MW-2			MW-5		
Sampling Date	10/14/1997	1/20/1998	8/10/2010	12/29/2010	2/29/2012	10/15/2013	4/17/2014	10/23/2014	10/23/2014	10/15/2013	4/17/2014	10/23/2014	10/15/2013	4/17/2014	10/23/2014[g]	10/15/2013	4/17/2014	10/23/2014
Depth to Water in Feet[a]	-	-	10.12	8.10	10.34	10.38	9.74	9.48	8.9	12.02	10.04	11.59	11.9	11.53	-	9.8	9.44	9.01
TPH in µg/L																		
Diesel	250 U	250 U	80 U	300	70	100 U	100 U	30 UJ	30 UJ	100 U	100 U	30 UJ	100 U	100 U	-	40 T	100 U	30 UJ
Heavy oil	500 U	500 U	210 U	**1,300**	40	70 T	200 U	50 J	50 UJ	200 U	200 U	50 UJ	200 U	200 U	-	200 U	200 U	50 UJ
Gasoline	100 U	100 U	18 T	50 U	151	50 U	50 U	16.7 J	18.3 J	50 U	50 U	19.8 J	50 U	50 U	-	50 U	50 U	24.7 J
BTEX in µg/L																		
Benzene	0.5 U	0.5 U	0.2 U	1 U	2.5	1.0 U	0.2 U	0.2 U	0.2 U	1.0 U	0.2 U	0.2 U	1.0 U	0.2 U	-	1.0 U	0.2 U	0.2 U
Toluene	0.5 U	0.5 U	0.2 U	1 U	14	1.0 U	0.2 U	0.2 U	0.2 U	1.0 U	0.2 U	0.2 U	1.0 U	0.2 U	-	1.0 U	0.2 U	0.2 U
Ethylbenzene	0.5 U	0.5 U	0.2 U	1 U	2.8	1.0 U	0.2 U	0.2 U	0.2 U	1.0 U	0.2 U	2.0 U	1.0 U	0.2 U	-	1.0 U	0.2 U	0.2 U
Total xylene	0.5 U	0.5 U	0.6 U	2 U	13.9	2.0 U	0.4 U	0.4 U	0.4 U	2.0 U	0.4 U	0.4 U	2.0 U	0.4 U	-	2.0 U	0.4 U	0.4 U
cPAHs in µg/L																		
Benzo(a)anthracene	1.000 U	0.035	0.015	1.010 J	0.005	0.115 J	0.010 UJ	0.013	0.015	0.079 J	0.010 UJ	0.005 UJ	0.026 J	0.010 UJ	-	0.036 J	0.010 UJ	0.014 J
Benzo(a)pyrene	1.000 U	0.010 U	0.014	1.130 J	0.009	0.072 J	0.010 UJ	0.005 U	0.005 U	0.049 J	0.010 UJ	0.005 UJ	0.009 JT	0.010 UJ	-	0.010 UJ	0.010 UJ	0.005 UJ
Benzo(b,k)fluoranthenes	1.000 U	0.010 U	0.020	1.710 J	0.012	0.119 J	0.020 UJ	0.012 U	0.012 U	0.075 J	0.020 UJ	0.012 UJ	0.017 JT	0.020 UJ	-	0.020 UJ	0.020 UJ	0.012 UJ
Chrysene	1.000 U	0.022	0.140	1.230 J	0.007 T	0.120 J	0.010 UJ	0.008 T	0.010	0.077 J	0.010 UJ	0.006 UJ	0.018 J	0.010 UJ	-	0.026 J	0.010 UJ	0.010 J
Dibenz(a,h)anthracene	1.000 U	0.010 U	0.009 U	0.207 J	0.005	0.014 J	0.010 UJ	0.004 U	0.004 U	0.010 J	0.010 UJ	0.004 UJ	0.010 UJ	0.010 UJ	-	0.010 UJ	0.010 UJ	0.004 UJ
Indeno(1,2,3-cd)pyrene	1.000 U	0.010 U	0.009 T	0.683 J	0.006 T	0.043 J	0.010 UJ	0.003 U	0.003 U	0.025 J	0.010 UJ	0.003 UJ	0.006 JT	0.010 UJ	-	0.010 UJ	0.010 UJ	0.003 UJ
Total cPAHs[b]	**0.705** U	0.010	0.020 J	**1.503** J	0.012 J	**0.102** J	0.008 UJ	0.005 J	0.005	**0.069** J	0.008 UJ	0.004 UJ	0.015 J	0.008 UJ	-	0.011 J	0.008 UJ	0.005 J
Dissolved Metals in µg/L																		
Arsenic	**5.5**	1.3 U	**3.2**	**1.25** T	**2.71** T	5 U	**0.42**	**1.46**	**2.81**	25 U	**1.06**	**1.07**	5 U	**0.441**	-	5 U	**0.584**	**3.43**
Copper	3.9 U	9.2 U	0.079 U	0.095 T	0.183 T	0.2 U	0.2 U	0.417	0.307	0.316 T	0.905	0.854 J	0.2 U	0.2 U	-	0.2 U	0.2 U	0.71
Lead	9.4 U	2.3 U	0.15 T	7	0.153 T	0.294 U	0.306	0.407	0.223	1 U	0.052 U	0.13 U	0.2 U	0.026 U	-	0.2 U	0.026 U	0.138 J
Nickel	0.4 U	0.6 U	7.17	1.9 T	6.21	0.798	0.795	2.24	0.270 UJ	0.988 T	0.976	1.830 UJ	0.202	0.162 JT	-	0.134 T	0.403	1.49
Zinc	1.9 U	1.8 U	3.22	6.3	0.756	0.594 U	2.52	76.4	1.83	2.26 U	3.42	3.39	0.66 U	1.99	-	0.852 U	3.86	77.9

TABLE 3
HISTORICAL RESULTS
THEA FOSS WATERWAY E
TACOMA, WASHINGTON

Well ID	MW7-1A			P3-MW01R		P3-MW01R	P3-MW2			P3-MW03			Landau Well		
Sampling Date	10/15/2013	4/17/2014	10/23/2014	10/15/2013	4/17/2014	10/23/2014	10/15/2013	4/17/2014	10/23/2014	10/15/2013	4/17/2014	10/23/2014	10/15/2013	4/17/2014	10/23/2014
Depth to Water in Feet[a]	4.74	4.69	2.91	8.09	8.19	8.00	6.03	6.05	5.30	9.06	9.11	8.53	12.72	12.38	11.20
TPH in µg/L															
Diesel	40 T	100 U	30 UJ	50 U	100 U	30 UJ	30 T	100 U	30 UJ	30 T	100 U	30 UJ	80 T	100 U	70 J
Heavy oil	200 U	200 U	50 UJ	100 U	200 U	50 UJ	200 U	200 U	50 UJ	200 U	200 U	50 UJ	200 U	200 U	50 UJ
Gasoline	50 U	50 U	16.7 J	50 U	50 U	16.5 J	50 U	50 U	15.9 J	50 U	50 U	16.2 J	252	213	224 J
BTEX in µg/L															
Benzene	1.0 U	0.2 U	0.2 U	1.0 U	0.2 U	0.2 U	1.0 U	0.2 U	0.2 U	1.0 U	0.2 U	0.2 U	0.7 T	0.3 JT	0.5 T
Toluene	1.0 U	0.2 U	0.2 U	1.0 U	0.2 U	0.2 U	1.0 U	0.2 U	0.2 U	1.0 U	0.2 U	0.2 U	1.0	0.8 JT	1.2
Ethylbenzene	1.0 U	0.2 U	0.2 U	1.0 U	0.2 U	0.2 U	1.0 U	0.2 U	0.2 U	1.0 U	0.2 U	0.2 U	0.2 T	0.2 U	0.2 U
Total xylene	2.0 U	0.4 U	0.4 U	2.0 U	0.4 U	0.4 U	2.0 U	0.4 U	0.4 U	2.0 U	0.4 U	0.4 U	1.5 T	1.5 JT	1.7 T
cPAHs in µg/L															
Benzo(a)anthracene	0.043 J	0.020 J	0.071 J	0.030 J	0.010 UJ	0.005 UJ	0.019 J	0.010 UJ	0.005 UJ	0.024 J	0.010 UJ	0.005 U	0.022 J	0.010 UJ	0.005 U
Benzo(a)pyrene	0.023 J	0.023 J	0.084 J	0.008 JT	0.010 UJ	0.005 UJ	0.010 UJ	0.010 UJ	0.005 UJ	0.010 UJ	0.010 UJ	0.005 U	0.007 JT	0.010 UJ	0.005 U
Benzo(b,k)fluoranthenes	0.060 J	0.060 J	0.242 J	0.018 JT	0.020 UJ	0.012 UJ	0.020 UJ	0.020 UJ	0.012 UJ	0.020 UJ	0.020 UJ	0.012 U	0.017 JT	0.020 UJ	0.012 U
Chrysene	0.040 J	0.024 J	0.087 J	0.024 J	0.010 UJ	0.006 UJ	0.017 J	0.010 UJ	0.006 UJ	0.018 J	0.010 UJ	0.006 U	0.020 J	0.010 UJ	0.006 U
Dibenz(a,h)anthracene	0.005 JT	0.010 UJ	0.004 UJ	0.010 UJ	0.010 UJ	0.004 UJ	0.010 UJ	0.010 UJ	0.004 UJ	0.010 UJ	0.010 UJ	0.004 U	0.010 UJ	0.010 UJ	0.004 U
Indeno(1,2,3-cd)pyrene	0.021 J	0.021 J	0.079 J	0.005 JT	0.010 UJ	0.003 UJ	0.010 UJ	0.010 UJ	0.003 UJ	0.010 UJ	0.010 UJ	0.003 U	0.006 JT	0.010 UJ	0.003 U
Total cPAHs[b]	**0.036** J	**0.034** J	**0.124** J	0.014 J	0.008 UJ	0.004 UJ	0.009 J	0.008 UJ	0.004 UJ	0.010 J	0.008 UJ	0.004 U	0.012 J	0.008 UJ	0.004 U
Dissolved Metals in µg/L															
Arsenic	**6.06**	**3.57**	**0.93**	5 U	**1.66**	**1.62**	5 U	**1.93**	**3.79**	5 U	**1.43**	**3.09**	5 U	**0.686**	**0.902**
Copper	0.346	0.648	**4.06**	2.33	2.74	2.44	0.2 U	0.038 U	0.772	1.04	1.24	1.37	0.2 U	0.038 U	0.265
Lead	0.2 U	0.089 JT	0.469	0.2 U	0.026 U	0.161 J	0.2 U	0.026 U	0.0662 J	0.2 U	0.026 U	0.026 U	0.2 U	0.026 U	0.026 U
Nickel	0.556	0.791	0.377 UJ	1.16	0.788	1.29	0.125 T	0.191	0.2 U	0.591	0.483	1.12	0.36	0.314	0.52 UJ
Zinc	1.38 U	3.48	1.77	2.35 U	3.42	5.25	0.514 U	2.71	2.03	0.873 U	2.47	1.22	9.72	2.5	0.99

Notes:
Regulatory level = Consent Decree cleanup levels, which reflect the MCTA Amendments of February 2001.
*Values in **BOLD** indicate detected concentrations exceed Consent Decree cleanup levels.*
U = Not detected at the specified reporting limit.
T/JT = Estimated value between the method detection limit (MDL) and the reporting limit (RL).
J = Estimated value.
- = not applicable or no results
a. Depth to water measurements were collected from top of casing.
b. Total cPAHs calculated using the toxicity equivalency methodology (TEM) in WAC 173-340-708(8). Half detection limit was used for non-detects.
c. Cleanup standard based on MTCA Method A Groundwater Cleanup Level
d. Cleanup standard based on Federal National Toxics Rule Criteria (40 CFR 131) for human consumption of aquatic organisms.
e. Cleanup standard based on Method B Groundwater Cleanup Level.
f. Cleanup standard based on WAC 173-201A Marine Water Chronic.
g. Not sampled because the monument was flooded/under water.

FIGURES

HALEY ALDRICH

THEA FOSS WATERWAY ESPLANADE
TACOMA, WASHINGTON

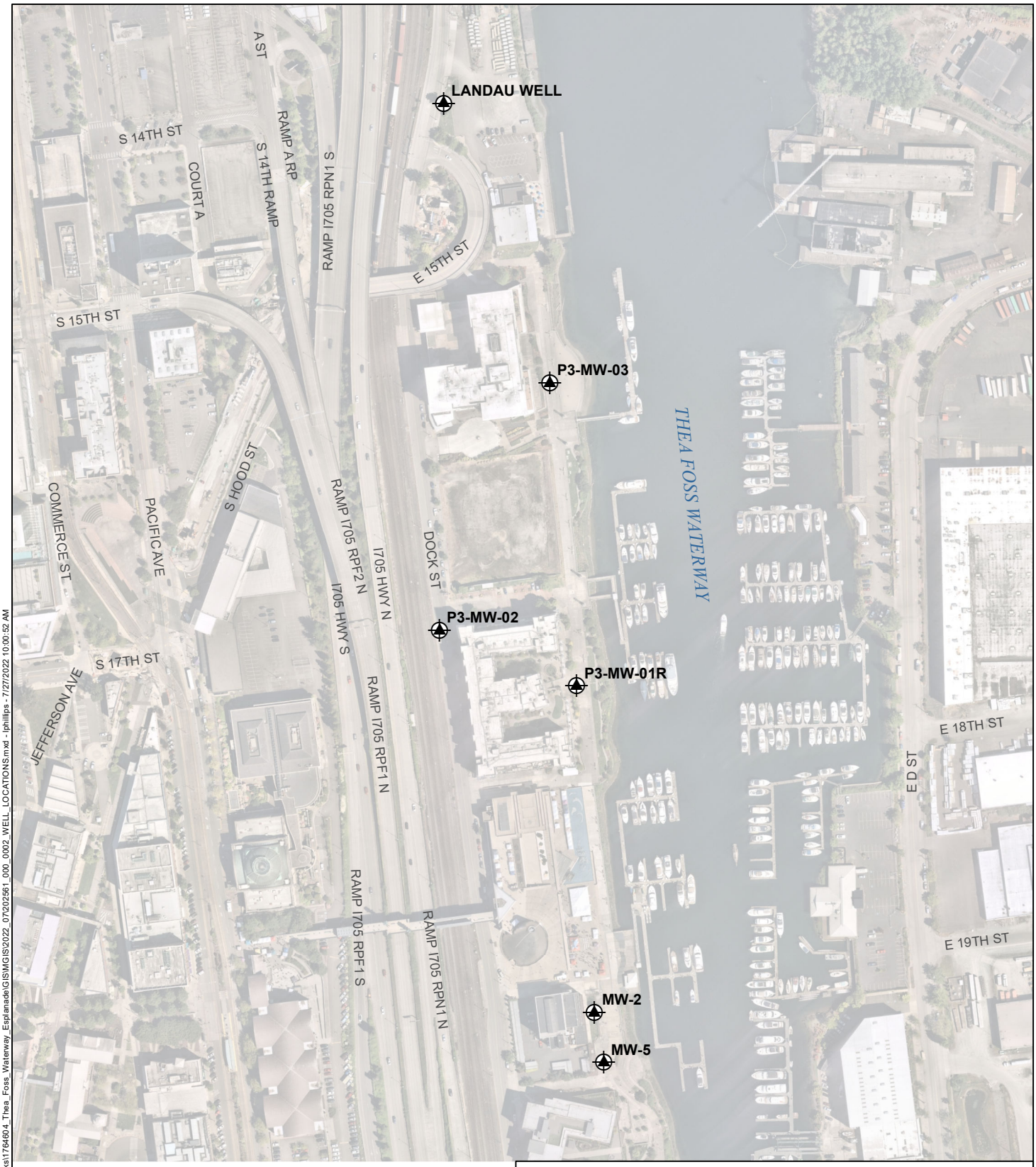
VICINITY MAP

MAP SOURCE: ESRI
SITE COORDINATES: 47°14'53"N, 122°25'57"W

APPROXIMATE SCALE: 1 IN = 2000 FT
JULY 2022

FIGURE 1

GIS: \\haleyaldrich.com\share\sea_projects\Notebooks\176460.4_Thea_Foss_Waterway_Esplanade\GIS\MXD\GIS\2022_0720\2561_000_0001_VICINITY_MAP.mxd - lphillips - 7/27/2022 10:22:01 AM



LEGEND

MONITORING WELL

N

0 150 300

SCALE IN FEET

NOTES
1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. AERIAL IMAGERY SOURCE: NEARMAP, 22 MAY 2022

HALEY ALDRICH

THEA FOSS WATERWAY ESPLANADE
TACOMA, WASHINGTON

WELL LOCATIONS

JULY 2022

FIGURE 2

GIS: \\haleyaldrich.com\share\sea_projects\Notebooks\176460-4_Thea_Foss_Waterway_Esplanade\GIS\MGIS\2022_07202561_000_0002_WELL_LOCATIONS.mxd - lphillips - 7/27/2022 10:00:52 AM

APPENDIX A
Groundwater Sampling Field Forms

Groundwater Sampling Data - Well I.D. MW-2

Project	Thea Foss Waterway Esplanade	Date/Time Sampled	6/24/2022 1351
Job No.	0202561-000	Tidally Influenced	Yes [X] No [ ]
Project Manager	M. Dagel	Well Depth in Feet	~25.66
Field Reps.	B. Dozier & Z. McIntire	Screened Interval in Feet	

1) Purging Data/Field Measurements: *All Measurements Relative to Top of Casing (TOC)*

Well Depth	~25.66	Casing Volume in Gallons	2.25
Depth of Sediment (DTS) in Feet	25.66	[2" diameter = x 0.163 gal/ft]	
Depth of Water (DTW) in Feet	11.86	Purge Volume in Gallons	6.75
(DTS - DTW)	~~BD~~ 13.82	Actual Purge in Gallons	2.5

Time	No. of Gallons Purged	pH	Temp in °C	Conduct in mS/cm	Diss Oxygen in mg/L	Turbidity in NTU	ORP in mV	Comments: Quality, Recovery Color, Odor, Sheen, Accumulated Silt/Sand
1319	0.5	6.67	16.2	0.907	0.12	6.86	-35.6	Sulfur-like odor, clear, NS, no sediment
1327	1.0	6.52	16.2	0.778	0.08	9.88	-60.4	Slight sulfur-like odor, clear, NS, no sediment
1335	1.5	6.41	16.3	0.706	0.09	22.14	-62.2	Slight sulfur-like odor, clear, NS, minor suspended sediments
1343	2.0	6.36	16.4	0.759	0.03	10.94	-61.2	Slight sulfur-like odor, clear, NS, minor suspended sediments
1351	2.5	6.35	16.4	0.805	-0.01	7.14	-70.6	Slight sulfur-like odor, clear, NS, minor sediments
SMPL								

Comments

	Method	Purging Rate in GPM	Depth of Equipment in Feet
Purge	Peristaltic	0.08	~20
Sample	Peristaltic	"	"

Bails dry? Yes [ ] No [X]

At no. of Casing Volumes

Purge Water Disposal Method/Volume drum on site

2) Sampling Data

Bottle Type	No of Containers	Analyses	Perserv.	Filter
125 mL poly	1	Diss As, Cu, Pb, Ni, Zn	N	Lab Filtered

Total Number of Bottles 1

Duplicate Sample I.D.

Field Blank I.D.

Rinseate Sample I.D.

3) Field Equipment

Type/Brand/Serial No./Material/Units

Pump Type/Tubing Type	peristaltic	Temp/pH/E.C./D.O	YSI DSS
Bailer Type		Water Level Probe	waterline
Filter Type		Other	

4) Well Conditions

OK [X] Not OK [ ] Explain

Groundwater Sampling Data - Well I.D. MW-5

Project	Thea Foss Waterway Esplanade	Date/Time Sampled	6/24/2022 1235
Job No.	0202561-000	Tidally Influenced	Yes [X] No [ ]
Project Manager	M. Dagel	Well Depth in Feet	~20.67
Field Reps.	B. Dozier & Z. McIntire	Screened Interval in Feet	—

1) Purging Data/Field Measurements: *All Measurements Relative to Top of Casing (TOC)*

Well Depth	~20.67	Casing Volume in Gallons	1.79
Depth of Sediment (DTS) in Feet	20.67	[2" diameter = x 0.163 gal/ft]	
Depth of Water (DTW) in Feet	9.67	Purge Volume in Gallons	5.38
(DTS - DTW)	11.00	Actual Purge in Gallons	2.0

Time	No. of Gallons Purged	pH	Temp in °C	Conduct in mS/cm	Diss Oxygen in mg/L	Turbidity in NTU	ORP in mV	Comments: Quality, Recovery Color, Odor, Sheen, Accumulated Silt/Sand
1214	.5	6.44	15.6	~~0.631~~	0.06	14.91	-12.8	NS Sulfur-like odor, initially turbid, but cleared quickly
—	—	—	—	0.522	—	—	—	—
1220	1.0	6.38	15.6	0.558	-0.01	16.04	-24.2	*Sulfur-like odor, NS, clear, variable density grey solid
1228	1.5	6.34	15.7	0.578	-0.04	11.90	-33.9	Sulfur-like odor, NS, Clear *
1235	2	6.34	15.7	0.595	-0.06	9.62	-40.0	Sulfur-like odor, NS, Clear *

BD SMPL 1@1236

Comments

	Method	Purging Rate in GPM	Depth of Equipment in Feet
Purge	Peristaltic	~0.09	~15'
Sample	Peristaltic	"	"

Bails dry? Yes [ ] No [X]

At no. of Casing Volumes —

Purge Water Disposal Method/Volume drum onsite

2) Sampling Data

Bottle Type	No of Containers	Analyses	Perserv.	Filter
125 mL poly	2	Diss As, Cu, Pb, Ni, Zn	N	Lab Filtered

Total Number of Bottles 2

Duplicate Sample I.D. Dup 1 @1236

Field Blank I.D. —

Rinseate Sample I.D. —

3) Field Equipment

Type/Brand/Serial No./Material/Units

Pump Type/Tubing Type	peristaltic	Temp/pH/E.C./D.O	YSI DSS
Bailer Type	—	Water Level Probe	waterline
Filter Type	—	Other	—

4) Well Conditions

OK [X] Not OK [ ] Explain seal is warped

* Variable density, grey solid (maybe organic)

Groundwater Sampling Data - Well I.D. P3-MW-01R

Project	Thea Foss Waterway Esplanade	Date/Time Sampled	6/24/2022 1448
Job No.	0202561-000	Tidally Influenced	Yes [X] No [ ]
Project Manager	M. Dagel	Well Depth in Feet	~10.64
Field Reps.	B. Dozier & Z. McIntire	Screened Interval in Feet	

1) Purging Data/Field Measurements: *All Measurements Relative to Top of Casing (TOC)*

Well Depth	~10.64	Casing Volume in Gallons	0.32
Depth of Sediment (DTS) in Feet	10.64	[2" diameter = x 0.163 gal/ft]	
Depth of Water (DTW) in Feet	8.69	Purge Volume in Gallons	~~1.32~~ BD 0.95
(DTS - DTW)	1.95	Actual Purge in Gallons	1.0

Time	No. of Gallons Purged	pH	Temp in °C	Conduct in mS/cm	Diss Oxygen in mg/L	Turbidity in NTU	ORP in mV	Comments: Quality, Recovery Color, Odor, Sheen, Accumulated Silt/Sand
1423	0.25	6.96	15.6	0.770	2.76	2.84	16.0	clear, NO, NS
1427	0.5	6.84	15.8	0.766	2.66	2.53	18.3	clear, NO, NS
~~1441~~ SAMPL	~~1.0~~	~~6.75~~	~~16.0~~	~~0.765~~	~~2.69~~	~~BD~~		
1446 BD SAMPL	1.0	6.76	16.2	0.765	2.62	2.68	43.7	clear, NO, NS

Comments

	Method	Purging Rate in GPM	Depth of Equipment in Feet
Purge	Peristaltic	~0.05	~9
Sample	Peristaltic	"	"

Bails dry? Yes [ ] No [X]

At no. of Casing Volumes —

Purge Water Disposal Method/Volume drum on site

2) Sampling Data

Bottle Type	No of Containers	Analyses	Perserv.	Filter
125 mL poly	2 ~~XBD~~	Diss As, Cu, Pb, Ni, Zn	N	Lab Filtered

Total Number of Bottles ~~XBD~~ 2

Duplicate Sample I.D. ~~—~~ Dup2

Field Blank I.D. — 4/1449

Rinseate Sample I.D. —

3) Field Equipment

Pump Type/Tubing Type	peristaltic	Temp/pH/E.C./D.O	YSI DSS
Bailer Type	—	Water Level Probe	Waterline
Filter Type	—	Other	

4) Well Conditions

OK [ ] Not OK [X] Explain Missing 3 bolts, monument flooded

Groundwater Sampling Data - Well I.D. P3-MW-02 well in road (S-bound side of Dock St)

Project	Thea Foss Waterway Esplanade	Date/Time Sampled	6/24/2022 1125
Job No.	0202561-000	Tidally Influenced	Yes [X] No [ ]
Project Manager	M. Dagel	Well Depth in Feet	~14.16
Field Reps.	B. Dozier & Z. McIntire	Screened Interval in Feet	

1) Purging Data/Field Measurements: *All Measurements Relative to Top of Casing (TOC)*

Well Depth	~14.16	Casing Volume in Gallons	1.33
Depth of Sediment (DTS) in Feet	14.16	[2" diameter = x 0.163 gal/ft]	
Depth of Water (DTW) in Feet	5.99	Purge Volume in Gallons	3.99
(DTS - DTW)	8.17	Actual Purge in Gallons	2.0

Time	No. of Gallons Purged	pH	Temp in °C	Conduct in mS/cm	Diss Oxygen in mg/L	Turbidity in NTU	ORP in mV	Comments: Quality, Recovery Color, Odor, Sheen, Accumulated Silt/Sand
1102	0.5	7.51	14.5	0.316	0.12	13.47	-74.3	initially turbid, NO, NS
1110	1	7.16	14.5	0.304	0.01	17.77	-99.9	NO, NS, clear
1116	1.5	6.96	14.5	0.301	-0.03	16.06	-105.5	NO, NS, clear
sample 1125	2.0	6.84	14.4	0.296	-0.06	16.76	-106.4	NO, NS, clear
BD SMPL								

Comments

	Method	Purging Rate in GPM	Depth of Equipment in Feet
Purge	Peristaltic	0.09	~11.5
Sample	Peristaltic	"	"

Bails dry? Yes [ ] No [X]

At no. of Casing Volumes —

Purge Water Disposal Method/Volume drums onsite

2) Sampling Data

Bottle Type	No of Containers	Analyses	Perserv.	Filter
125 mL poly	1	Diss As, Cu, Pb, Ni, Zn	N	Lab Filtered

Total Number of Bottles 1

Duplicate Sample I.D. —

Field Blank I.D. —

Rinseate Sample I.D. —

3) Field Equipment

Type/Brand/Serial No./Material/Units

Pump Type/Tubing Type	peristaltic	Temp/pH/E.C./D.O	YSI DSS
Bailer Type	—	Water Level Probe	waterline
Filter Type	—	Other	

4) Well Conditions

OK [ ] Not OK [X] Explain lid missing 2 bolts

Measure DTW from north side of casing

Groundwater Sampling Data - Well I.D. P3-MW-03

Project	Thea Foss Waterway Esplanade	Date/Time Sampled	6/24/2022 1523
Job No.	0202561-000	Tidally Influenced	Yes [X] No [ ]
Project Manager	M. Dagel	Well Depth in Feet	~10.46
Field Reps.	B. Dozier & Z. McIntire	Screened Interval in Feet	

1) Purging Data/Field Measurements: *All Measurements Relative to Top of Casing (TOC)*

Well Depth	~10.46	Casing Volume in Gallons	~~0.64 BD~~ 0.1
Depth of Sediment (DTS) in Feet	10.46	[2" diameter = x 0.163 gal/ft]	
Depth of Water (DTW) in Feet	9.82	Purge Volume in Gallons	0.31
(DTS - DTW)	~~10.46 BD~~ 0.64	Actual Purge in Gallons	~~0. BD~~

Time	No. of Gallons Purged	pH	Temp in °C	Conduct in mS/cm	Diss Oxygen in mg/L	Turbidity in NTU	ORP in mV	Comments: Quality, Recovery Color, Odor, Sheen, Accumulated Silt/Sand
1512	0.1	6.93	17.7	6.116	0.86	6.06	110.7	initially clear, NO, NS
1517	0.5	6.60	17.2	5.719	0.20	3.46	99.6	clear, NO, NS
1523	0.75	6.52	17.1	5.658	0.09	4.54	91.1	clear, NO, NS

~~BD~~ SHR

Comments

	Method	Purging Rate in GPM	Depth of Equipment in Feet
Purge	Peristaltic		~10.2
Sample	Peristaltic	21	21

Bails dry? Yes [ ] No [ ]

At no. of Casing Volumes

Purge Water Disposal Method/Volume drum onsite

2) Sampling Data

Bottle Type	No of Containers	Analyses	Perserv.	Filter
125 mL poly	1	Diss As, Cu, Pb, Ni, Zn	N	Lab Filtered

Total Number of Bottles 1

Duplicate Sample I.D. —

Field Blank I.D. —

Rinseate Sample I.D. —

3) Field Equipment

Type/Brand/Serial No./Material/Units

Pump Type/Tubing Type	peristaltic	Temp/pH/E.C./D.O	YSI DSS
Bailer Type	—	Water Level Probe	waterline
Filter Type	—	Other	

4) Well Conditions

OK [X] Not OK [ ] Explain

Groundwater Sampling Data - Well I.D.

Landau Well (well in road, N-bound Dock st)

Project	Thea Foss Waterway Esplanade	Date/Time Sampled	6/24/2022 1001
Job No.	0202561-000	Tidally Influenced	Yes [X] No [ ]
Project Manager	M. Dagel	Well Depth in Feet	~30.16'
Field Reps.	B. Dozier & Z. McIntire	Screened Interval in Feet	

1) Purging Data/Field Measurements: *All Measurements Relative to Top of Casing (TOC)*

Well Depth	~30.16	Casing Volume in Gallons	2.26
Depth of Sediment (DTS) in Feet	30.16	[2" diameter = x 0.163 gal/ft]	
Depth of Water (DTW) in Feet	16.29	Purge Volume in Gallons	6.78
(DTS - DTW)	13.87	Actual Purge in Gallons	2.5

Time	No. of Gallons Purged	pH	Temp in °C	~~mS/cm~~ Conduct in mS/cm	Diss Oxygen in mg/L	Turbidity in NTU	ORP in mV	Comments: Quality, Recovery Color, Odor, Sheen, Accumulated Silt/Sand
0428	0.5	6.76	14.7	~~31.666~~ 27.689	~~1.22~~ 0.056	18.17	-121.5	strong petro-like odor, NS, clear
0934	1.0	6.76	14.7	27.914	0.07	23.03	-130.9	petro-like odor, NS, clear
0943	1.5	6.80	14.7	27.987	0.02	32.76	-141.1	petro-like odor, NS, clear
0951	2.0	6.82	14.9	28.143	0.01	24.40	-145.9	slight petro-like odor, NS, clear
SMPL 1001	2.5	6.84	14.8	28.190	-0.01	11.33	-150.4	slight petro-like odor, NS, clear

Comments

	Method	Purging Rate in GPM	Depth of Equipment in Feet
Purge	Peristaltic	~0.06	25'
Sample	Peristaltic	"	"

Bails dry? Yes [ ] No [X]

At no. of Casing Volumes —

Purge Water Disposal Method/Volume drums onsite

2) Sampling Data

Bottle Type	No of Containers	Analyses	Perserv.	Filter
125 mL poly	1	Diss As, Cu, Pb, Ni, Zn	N	Lab Filtered
1L amber	2		N	—
VOA	6		Y	—

Total Number of Bottles 8

Duplicate Sample I.D. —

Field Blank I.D. —

Rinseate Sample I.D. —

3) Field Equipment

Type/Brand/Serial No./Material/Units

Pump Type/Tubing Type	peristaltic	Temp/pH/E.C./D.O	YSI DSS
Bailer Type	—	Water Level Probe	water line
Filter Type	—	Other	—

4) Well Conditions

OK [ ] Not OK [X] Explain missing 3 bolts, lid two corners are cracked

measured DTW from north side of well

APPENDIX B
Data Quality Review and Laboratory Data Report

Haley & Aldrich, Inc.
600 South Meyer Ave
Suite 100
Tucson, AZ 85701
520.289.8621

Data Usability Summary Report

Project Name: Foss Upland Esplanade

Project Description: Groundwater Samples

Sample Date(s): 24 June 2022

Analytical Laboratory: City of Tacoma – Environmental Services Lab

Validation Performed by: Santa McKenna

Validation Reviewed by: Katherine Miller

Validation Date: 25 July 2022

Haley & Aldrich, Inc. prepared this Data Usability Summary Report (DUSR) to summarize the review and validation of the analytical results for Sample Delivery Group (SDG) listed. This DUSR is organized into the following sections:

1. **Sample Delivery Group Number 2206055**
2. **Explanations**
3. **Glossary**
4. **Abbreviations**
5. **Qualifiers**

References

This data validation and usability assessment was performed per the guidance and requirements established by the United States Environmental Protection Agency (USEPA) using the following reference materials:

- National Functional Guidelines (NFG) for Inorganic Data Review.
- National Functional Guidelines (NFG) for Organic Data Review.
- Analysis of Volatile Organic Compounds (VOCs) in Air Contained in Canisters by Method TO-15.
- The project-specific Quality Assurance Project Plan (QAPP), herein referred to as the specified limits (see references section). Written in 1997, the QAPP referenced the NFG written at the time. Data in this report has been reviewed against the most recent NFG.

Data reported in this sampling event were reported to the practical quantitation limit (PQL).

Sample data were qualified in accordance with the laboratory's standard operating procedures (SOP). The results presented in each laboratory report were found to be compliant with the data quality objectives for the project and therefore usable; any exceptions are noted in the following pages.

1. Sample Delivery Group Number 2206055

1.1 SAMPLE MANAGEMENT

This DUSR summarizes the review of SDG number 2206055, dated 14 July 2022. Samples were collected, preserved, and shipped following standard chain of custody (COC) protocol. Samples were also received appropriately, identified correctly, and analyzed according to the COC.

Analyses were performed on the following samples:

Sample ID	Sample Type	Lab ID	Sample Date	Matrix	Methods
MW-5 HC#7	N	2206055-01	6/24/2022	Groundwater	A
MW-2 HC#7	N	2206055-02	6/24/2022	Groundwater	A
P3-MW-01R HC#7	N	2206055-03	6/24/2022	Groundwater	A
P3-MW-02 HC#7	N	2206055-04	6/24/2022	Groundwater	A
P3-MW-03 HC#7	N	2206055-05	6/24/2022	Groundwater	A
Landau Well HC#7	N	2206055-06	6/24/2022	Groundwater	A, B, C, D
DUP1-MW-5 HC#7	FD	2206055-07	6/24/2022	Groundwater	A
DUP2-P3-MW-01R HC#7	FD	2206055-08	6/24/2022	Groundwater	A
IA-15-1-G	TB	2206055-09	6/24/2022	Water Quality	B

Method Holding Times			
A.	USEPA 6020B	Dissolved Metals	7 days unpreserved; 14 days preserved
B.	USEPA 82690B	VOCs	7 days unpreserved; 14 days preserved
C.	NWTPH-DX	Total Extractable Hydrocarbons Diesel	7 days unpreserved; 14 days preserved
D.	NWTPH-GX	Total Extractable Hydrocarbons Gasoline	7 days unpreserved; 14 days preserved

 # days/# days notation indicates the holding time is # days for extraction and then an additional # days for analysis.

1.2 HOLDING TIMES/PRESERVATION

The samples arrived at the laboratory at the proper temperature and were prepared and analyzed within the holding time and preservation criteria specified per method protocol.

1.3 REPORTING LIMITS AND SAMPLE DILUTIONS

The PQLs for the samples within this SDG met or were below the minimum requirements specified by the project specific QAPP with the following exceptions:

Sample ID	Lab ID	Analyte/ Method	Issue/Explanation
Landau Well HC#7	2206055-06	Dissolved copper	PQL above minimum requirements specified by QAPP (5.0 vs 3.1 ug/L)

1.4 SURROGATE RECOVERY COMPLIANCE

Refer to section E 1.2. The percent recovery (%R) for each surrogate compound added to each project sample were determined to be within the laboratory specified quality control (QC) limits.

1.5 LABORATORY CONTROL SAMPLES

Refer to section E 1.3. Compounds associated with the laboratory control samples (LCS) analyses exhibited recoveries and relative percent differences (RPDs) within the specified limits.

1.6 MATRIX SPIKE SAMPLES

Refer to section E 1.4. No client samples were used for matrix spike/matrix spike duplicate (MS/MSD).

1.7 BLANK SAMPLE ANALYSIS

Refer to section E 1.5. Method blank samples had no detections, indicating that no contamination from laboratory activities occurred.

The analysis of the blank samples for trip blank was free of target compounds.

1.8 DUPLICATE SAMPLE ANALYSIS

Refer to section E 1.6. No client samples were used for laboratory duplicate analysis.

The following sample(s) were used for field duplicate analysis. The RPD comparison for detections in either the parent or duplicate sample(s) is shown below. RPDs were all below 35 percent for water (or the absolute difference rule was satisfied if detects were less than 5 times the RL). Any exceptions are noted below and qualified.

Primary Sample ID	Duplicate Sample ID	Method(s)
MW-5 HC#7	DUP1-MW-5 HC#7	USEPA6020B
P3-MW-01R HC#7	DUP2-P3-MW-01R HC#7	USEPA 6020B

Field Duplicate RPD Calculations:

Method(s): USEPA 6020B				
Analyte (µg/L)	Primary Sample ID	Duplicate Sample ID	% RPD	Qualification
	MW-5 HC#7	DUP1-MW-5 HC#7		
Zinc	2.83	1.0 U	NA	J/UJ, Abs Diff > RL

1.9 PRECISION AND ACCURACY

Refer to section E 1.7. Where required by the method, some measurement of analytical accuracy and precision was reported for each method with the site samples.

1.10 SYSTEM PERFORMANCE AND OVERALL ASSESSMENT

The results presented in this report were found to comply with the data quality objectives for the project and the guidelines specified by the analytical method. Based on the review of this report, the data are useable and acceptable as no data was rejected. The qualifiers applied to this data set are summarized in the table below.

Sample ID	Analyte	Reported Result	Validated Result	Reason for Qualifier
MW-5 HC#7	Dissolved zinc	2.83	2.83 J	Field duplicate calculations
DUP1-MW-5 HC#7	Dissolved zinc	1.0 U	1.0 UJ	Field duplicate calculations

2. Explanations

The following explanations include more detailed information regarding each of the sections in the DUSR above. Not all sections in the Explanations are represented:

- E 1.2 Surrogate Recovery Compliance
  - Surrogates, also known as system monitoring compounds, are compounds added to each sample prior to sample preparation to determining the efficiency of the extraction procedure by evaluating the percent recovery (%R) of the compounds.
- E 1.3 Laboratory Control Samples
  - The laboratory control sample/laboratory control sample duplicate (LCS/LCSD) analyses are used to assess the precision and accuracy of the analytical method independent of matrix interferences.
- E 1.4 Matrix Spike Samples
  - Matrix spike/matrix spike duplicate (MS/MSD) data are used to assess the precision and accuracy of the analytical method and evaluate the effects of the sample matrix on the sample preparation procedures and measurement methodologies.
  - For inorganic methods, when a matrix spike recovery falls outside of the control limits and the sample result is less than four times the spike added, a post digestion spike (PDS) is performed.
- E 1.5 Blank Sample Analysis
  - Method blanks are prepared by the analytical laboratory and analyzed concurrently with the project samples to assess possible laboratory contamination.
  - Field blanks are prepared to identify contamination that may have been introduced during field activity. Equipment blanks are prepared to identify contamination that may have been introduced while decontaminating sampling equipment. Trip blanks are prepared when volatile analysis is requested to identify contamination that may have been introduced during transport.
- E 1.6 Laboratory and Field Duplicate Sample Analysis
  - The laboratory duplicate sample analysis is used by the laboratory at the time of the analysis to demonstrate acceptable method precision. The RPD or absolute difference was evaluated for each duplicate sample pair to monitor the reproducibility of the data.
  - The field duplicate sample analysis is used to assess the precision of the field sampling procedures and analytical method. The relative percent difference (RPD) or absolute difference was evaluated for each duplicate sample pair to monitor the reproducibility of the data.
- E 1.7 Precision and Accuracy
  - Precision measures the reproducibility of repetitive measurements. In a laboratory environment, this will be measured by determining the relative percent difference (%RPD) found between a primary and a duplicate sample. This can be an LCS/LCSD pair, a MS/MSD pair, a laboratory duplicate performed on a site sample, or a field duplicate collected and analyzed concurrently with a site sample.

- Accuracy is a statistical measurement of the correctness of a measured value and includes components of random error (variability caused by imprecision) and systematic error. In a laboratory environment, this will be measured by determining the percent recovery (%Rec) of certain spiked compounds. This can be assessed using LCS, BS, MS, and/or surrogate recoveries.

3. Glossary

Not all of the following symbols, acronyms, or qualifiers occur in this document.

- Sample Types:
  - EB Equipment Blank Sample
  - FB Field Blank Sample
  - FD Field Duplicate Sample
  - N Primary Sample
  - TB Trip Blank Sample
- Units:
  - µg/kg microgram per kilogram
  - µg/L microgram per liter
  - µg/m3 microgram per cubic meter
  - mg/kg milligram per kilogram
  - mg/L milligram per liter
  - ppb v/v parts per billion volume/volume
  - pCi/L picocuries per liter
  - pg/g picograms per gram
- Matrices:
  - AA Ambient Air
  - GS Soil Gas
  - GW/WG Groundwater
  - QW Water Quality
  - IA Indoor Air
  - SE Sediment
  - SO Soil
  - WQ Water Quality control matrix
  - WS Surface Water
- Table Footnotes:
  - NA Not applicable
  - ND Non-detect
  - NR Not reported
- Common Symbols:
  - % percent
  - < less than
  - ≤ less than or equal to
  - > greater than
  - ≥ greater than or equal to
  - = equal
  - °C degrees Celsius
  - ± plus or minus
  - ~ approximately
  - x times (multiplier)

4. Abbreviations

%D	Percent Difference
%R	Percent Recovery
%RSD	Percent Relative Standard Deviation
%v/v	Percent volume by volume
µg/L	micrograms per liter
2s	2 sigma
4,4-DDT	4 4-dichlorodiphenyltrichloroethane
Abs Diff	Absolute Difference
BPJ	Best Professional Judgement
BS	Blank Spike
CCB	Continuing Calibration Blank
CCV	Continuing Calibration Verification
CCVL	Continuing Calibration Verification Low
COC	Chain of Custody
COM	Combined Isotope Calculation
Cr (VI)	Hexavalent Chromium
CRI	Collision Reaction Interface
DoD	Department of Defense
DUSR	Data Usability Summary Report
EMPC	Estimated Maximum Possible Concentration
FBK	Field Blank Contamination
FDP	Field Duplicate
GC	Gas Chromatograph
GC/MS	Gas Chromatography/Mass Spectrometry
GPC	Gel Permeation Chromatography
H2	Hydrogen gas
HCl	Hydrochloric Acid
ICAL	Initial Calibration
ICB	Initial Calibration Blank
ICP/MS	Inductively Coupled Plasma/ Mass Spectrometry
ICV	Initial Calibration Verification
ICVL	Initial Calibration Verification Low
IPA	Isopropyl Alcohol
LC	Laboratory Control
LCS/LCSD	Laboratory Control Sample/Laboratory Control Sample Duplicate
MBK	Method Blank Contamination
MDC	Minimum Detectable Concentration
MDL	Laboratory Method Detection Limit
mg/kg	milligrams per kilogram
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NA	not applicable
ND	Non-Detect
NFG	National Functional Guidelines
NH_3	Ammonia
NYSDEC	New York State Department of Environmental Conservation
PAH	polycyclic aromatic hydrocarbon
PCB	Polychlorinated Biphenyl
PDS	Post Digestion Spike
PEM	Performance Evaluation Mixture
PFAS	Per- and Polyfluoroalkyl Substances
PFBA	Perfluorbutanoic Acid
PFD	Perfluorodecalin
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctanoic Acid
PFPeA	nonafluorovaleric acid
QAPP	Quality Assurance Project Plan
QC	Quality Control
QSM	Quality Systems Manual
R^2	R-squared value
Ra-226	Radium-226
Ra-228	Radium-228
RESC	Resolution Check Measure
RL	Laboratory Reporting Limit
RPD	Relative Percent Difference
RRF	Relative Response Factors
RT	Retention Time
SAP	sampling analysis plan
SDG	Sample Delivery Group
SIM	Selected ion monitoring
SOP	Laboratory Standard Operating Procedures
SPE	Solid Phase Extraction
SVOC	Semi-Volatile Organic Compounds
TIC	Tentatively Identified Compound
TKN	Total Kjeldahl Nitrogen
TPH	Total Petroleum Hydrocarbon
TPU	Total Propagated Uncertainty
u	atomic mass unit
USEPA	U.S. Environmental Protection Agency
VOC	Volatile Organic Compounds
WP	Work Plan

5. Qualifiers

The qualifiers below are from the USEPA National Functional Guidelines and the data in the DUSR may contain these qualifiers:

- Concentration (C) Qualifiers:

  U The compound was analyzed for but not detected. The associated value is either the compound quantitation limit if not detected by the analytical instrument or could be the reported or blank concentration if qualified by blank contamination. This can also be displayed as less than the associated compound quantitation limit (<RL or <MDL), or "ND".

  B The compound was found in the sample and its associated blank. Its presence in the sample may be suspect.

- Quantitation (Q) Qualifiers:

  E The compound was quantitated above the calibration range.

  D The concentration is based on a diluted sample analysis.

- Validation Qualifiers:

  J The compound was positively identified; however, the associated numerical value is an estimated concentration only.

  J+ The result is an estimated quantity, but the result may be biased high.

  J- The result is an estimated quantity, but the result may be biased low.

  J/UJ as listed in exception tables J applies to detected data and UJ applies to non-detected data as reported by the laboratory.

  UJ The compound was not detected above the reported sample quantitation limit; however, the reported limit is estimated and may or may not represent the actual limit of quantitation.

  NJ The analysis indicated the presence of a compound for which there is presumptive evidence to make a tentative identification; the associated numerical value is an estimated concentration only.

  R The sample results were rejected as unusable; the compound may or may not be present in the sample.

  S Result is suspect. See DUSR for details.

References

1. United States Environmental Protection Agency, 2020a. National Functional Guidelines for Inorganic Superfund Methods Data Review. EPA-542-R-20-006. November 2020.
2. United States Environmental Protection Agency, 2020b. National Functional Guidelines for Organic Superfund Methods Data Review. EPA-540-R-20-005. November 2020.
3. Thea Foss Waterway Esplanade Quality Assurance Project Plan. Hart Crowser. 1997.

14 July 2022

Darius Thompson
PW Engineering
747 Market Street, Rm 744
Tacoma, WA 98402

Subject: Foss Upland Esplanade

Enclosed are the analytical results for samples collected between 06/23/2022 and 06/24/2022.

Quality Control Data are included with the sample results for your review.

If you have any questions concerning this report, call me at (253)502-2130. Please note that remaining samples associated with this report will be discarded **3 months** from the date of this report unless we are notified otherwise.

Sincerely,

DocuSigned by:
Stuart Magoon
F41AFFAA30F64EB...

Stuart Magoon
Assistant Division Manager
Environmental Services Laboratory

cc.

PW Engineering	Project: **Foss Upland Esplanade**	
747 Market Street, Rm 744	Project Number: 662319	**Reported:**
Tacoma WA, 98402	Project Manager: Darius Thompson	14-Jul-22 09:35

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled
MW-5 HC#7	2206055-01	Water	24-Jun-22 12:35
MW-2 HC#7	2206055-02	Water	24-Jun-22 13:51
P3-MW-01R HC#7	2206055-03	Water	24-Jun-22 14:48
P3-MW-02 HC#7	2206055-04	Water	24-Jun-22 11:25
P3-MW-03 HC#7	2206055-05	Water	24-Jun-22 15:23
Landau Well HC#7	2206055-06	Water	24-Jun-22 10:01
DUP1-MW-5 HC#7	2206055-07	Water	24-Jun-22 12:36
DUP2-P3-MW-01R HC#7	2206055-08	Water	24-Jun-22 14:49
Trip Blank HC#7	2206055-09	Water	23-Jun-22 16:00

CHAIN OF CUSTODY, SAMPLE RECEIPT, PRESERVATION AND STORAGE

The samples were received under appropriate Chain of Custody procedures.

HOLDING TIMES

All analyses were performed within the required holding times.

METHODS

The samples were analyzed by the following methods:

EPA Method 6020B for Dissolved Metals Analysis
Washington Department of Ecology NWTPH-Gx, 1997 for Gasoline Analysis
Washington Department of Ecology NWTPH-Dx, 1997 for Diesel Analysis

MINIMUM REPORTING LIMITS

All analytes are reported to the Practical Quantitation Limit (PQL) which is below or no greater than the Minimum Project Reporting Limit.

BLANKS

Blanks were analyzed at the required frequencies of the methods. Analytes were not detected in the blanks, sample concentrations were greater than 10 times the blank values, or the analytes detected in the blanks were not detected in associated samples.

SURROGATE COMPOUNDS

Surrogate compounds were added to the NWTPH-Dx sample to monitor system performance: surrogate recoveries were within laboratory limits, except for 2-Fluorobiphenyl that recovered outside lower control limit of 50% in BFF0352-BLK2 (48%), BFF0352-BS4 (48.9%) and BFF0352-DUP2 (34.1%), 2-Fluorobiphenyl is within limits on sample 2206055-06. Data has been reported without qualifications.

LABORATORY CONTROL SAMPLES

Laboratory Control Samples were analyzed with these samples. The recoveries were within the laboratory limits.

DUPLICATE SAMPLE ANALYSIS

Duplicate analysis was performed with these samples. The Duplicate Relative Percent Differences (RPD) were within the project limits for analytes with concentrations greater than 5 times the reporting limit.

MATRIX SPIKE AND MATRIX SPIKE DUPLICATE ANALYSIS

Matrix Spike (MS) and/or Matrix Spike Duplicate (MSD) analysis was performed with these samples. The recoveries were within the laboratory limits except for BETX compounds that exceeds the upper QC limits in both the MS and MSD. Sample has not detection for BETX. No data has been qualified. Results are shown in the data pages.

INTERNAL STANDARDS

Internal Standards were added to these samples to monitor instrument performance related to calibration drift of matrix interference in the analysis by ICP-MS. The Internal Standards met the method criteria.

DATA AVAILABILITY

All data associated with the samples referenced in this report are archived at the Environmental Services Laboratory and are available upon request.

The results included in this report have been reviewed for compliance with the laboratory QA/QC plan and project QAPP.

DocuSigned by:
Monica Herbert
9E03038E4A0C412...

Reviewed By

PW Engineering	Project: **Foss Upland Esplanade**	
747 Market Street, Rm 744	Project Number: 662319	**Reported:**
Tacoma WA, 98402	Project Manager: Darius Thompson	14-Jul-22 09:35

Environmental Services Laboratory

MW-5 HC#7

2206055-01 (Water)

24-Jun-22 12:35

Analyte	Result		PQL	Units
Metals				
EPA 6020B_(7/14) Prepared: 27-Jun-22	Analyzed: 27-Jun-22			
Arsenic, Dissolved	1.00	U	1.00	ug/L
Copper, Dissolved	1.00	U	1.00	ug/L
Lead, Dissolved	1.00	U	1.00	ug/L
Nickel, Dissolved	1.00	U	1.00	ug/L
Zinc, Dissolved	**2.83**		**1.00**	**ug/L**

PW Engineering	Project: **Foss Upland Esplanade**	
747 Market Street, Rm 744	Project Number: 662319	**Reported:**
Tacoma WA, 98402	Project Manager: Darius Thompson	14-Jul-22 09:35

MW-2 HC#7

2206055-02 (Water)

24-Jun-22 13:51

Analyte	Result		PQL	Units
Metals				
EPA 6020B_(7/14) Prepared: 27-Jun-22	Analyzed: 27-Jun-22			
Arsenic, Dissolved	1.00	U	1.00	ug/L
Copper, Dissolved	1.00	U	1.00	ug/L
Lead, Dissolved	1.00	U	1.00	ug/L
Nickel, Dissolved	1.00	U	1.00	ug/L
Zinc, Dissolved	**2.01**		**1.00**	**ug/L**

PW Engineering	Project: **Foss Upland Esplanade**	
747 Market Street, Rm 744	Project Number: 662319	**Reported:**
Tacoma WA, 98402	Project Manager: Darius Thompson	14-Jul-22 09:35

P3-MW-01R HC#7

2206055-03 (Water)

24-Jun-22 14:48

Analyte	Result		PQL	Units
Metals				
EPA 6020B_(7/14) Prepared: 27-Jun-22	Analyzed: 27-Jun-22			
Arsenic, Dissolved	**1.55**		**1.00**	**ug/L**
Copper, Dissolved	**3.82**		**1.00**	**ug/L**
Lead, Dissolved	1.00	U	1.00	ug/L
Nickel, Dissolved	**1.22**		**1.00**	**ug/L**
Zinc, Dissolved	**4.42**		**1.00**	**ug/L**

PW Engineering	Project: **Foss Upland Esplanade**	
747 Market Street, Rm 744	Project Number: 662319	**Reported:**
Tacoma WA, 98402	Project Manager: Darius Thompson	14-Jul-22 09:35

P3-MW-02 HC#7

2206055-04 (Water)

24-Jun-22 11:25

Analyte	Result		PQL	Units
Metals				
EPA 6020B_(7/14) Prepared: 27-Jun-22	Analyzed: 27-Jun-22			
Arsenic, Dissolved	1.00	U	1.00	ug/L
Copper, Dissolved	1.00	U	1.00	ug/L
Lead, Dissolved	1.00	U	1.00	ug/L
Nickel, Dissolved	1.00	U	1.00	ug/L
Zinc, Dissolved	**1.21**		**1.00**	**ug/L**

PW Engineering	Project: **Foss Upland Esplanade**	
747 Market Street, Rm 744	Project Number: 662319	**Reported:**
Tacoma WA, 98402	Project Manager: Darius Thompson	14-Jul-22 09:35

P3-MW-03 HC#7

2206055-05 (Water)

24-Jun-22 15:23

Analyte	Result		PQL	Units
Metals				
EPA 6020B_(7/14) Prepared: 27-Jun-22	Analyzed: 27-Jun-22			
Arsenic, Dissolved	1.00	U	1.00	ug/L
Copper, Dissolved	1.00	U	1.00	ug/L
Lead, Dissolved	1.00	U	1.00	ug/L
Nickel, Dissolved	**4.39**		**1.00**	**ug/L**
Zinc, Dissolved	**3.36**		**1.00**	**ug/L**

PW Engineering	Project: **Foss Upland Esplanade**	
747 Market Street, Rm 744	Project Number: 662319	**Reported:**
Tacoma WA, 98402	Project Manager: Darius Thompson	14-Jul-22 09:35

Landau Well HC#7

2206055-06 (Water)

24-Jun-22 10:01

Analyte	Result		PQL	Units
Metals				
EPA 6020B_(7/14) Prepared: 27-Jun-22	Analyzed: 27-Jun-22			
Arsenic, Dissolved	5.00	U	5.00	ug/L
Copper, Dissolved	5.00	U	5.00	ug/L
Lead, Dissolved	5.00	U	5.00	ug/L
Nickel, Dissolved	5.00	U	5.00	ug/L
Zinc, Dissolved	5.00	U	5.00	ug/L
VOA				
EPA 8260D_4_(6/18) Prepared: 27-Jun-22	Analyzed: 27-Jun-22			
Benzene	2.5	U	2.5	ug/L
Ethylbenzene	2.5	U	2.5	ug/L
m,p-Xylene	5.0	U	5.0	ug/L
o-Xylene	2.5	U	2.5	ug/L
Toluene	2.5	U	2.5	ug/L
Surrogate: 1,2-Dichloroethane-d4	*100 %*		*26-175*	
Surrogate: 4-Bromofluorobenzene	*97 %*		*81-130*	
Surrogate: Fluorobenzene	*101 %*		*82-127*	
Surrogate: Toluene-d8	*104 %*		*86-126*	
WDOE NWTPH-Gx_(1997) Prepared: 27-Jun-22	Analyzed: 27-Jun-22			
NWTPH-Gasoline	250	U	250	ug/L
Surrogate: 4-Bromofluorobenzene	*97.2 %*		*50-150*	

PW Engineering	Project: **Foss Upland Esplanade**	
747 Market Street, Rm 744	Project Number: 662319	**Reported:**
Tacoma WA, 98402	Project Manager: Darius Thompson	14-Jul-22 09:35

Landau Well HC#7

2206055-06RE1 (Water)

24-Jun-22 10:01

Analyte	Result			PQL	Units
Semi-VOA					
WDOE NWTPH-Dx_(1997)	Prepared: 29-Jun-22	Analyzed: 13-Jul-22			
NWTPH-Diesel	0.10	U		0.10	mg/L
NWTPH-Heavy Oil	0.20	U		0.20	mg/L
Surrogate: 2-Fluorobiphenyl			*52.1 %*	*50-150*	
Surrogate: Pentacosane			*77.4 %*	*50-150*	
Surrogate: Terphenyl-d14			*74.0 %*	*50-150*	

PW Engineering	Project: **Foss Upland Esplanade**	
747 Market Street, Rm 744	Project Number: 662319	**Reported:**
Tacoma WA, 98402	Project Manager: Darius Thompson	14-Jul-22 09:35

DUP1-MW-5 HC#7

2206055-07 (Water)

24-Jun-22 12:36

Analyte	Result		PQL	Units
Metals				
EPA 6020B_(7/14) Prepared: 27-Jun-22	Analyzed: 27-Jun-22			
Arsenic, Dissolved	1.00	U	1.00	ug/L
Copper, Dissolved	1.00	U	1.00	ug/L
Lead, Dissolved	1.00	U	1.00	ug/L
Nickel, Dissolved	1.00	U	1.00	ug/L
Zinc, Dissolved	1.00	U	1.00	ug/L

PW Engineering	Project: **Foss Upland Esplanade**	
747 Market Street, Rm 744	Project Number: 662319	**Reported:**
Tacoma WA, 98402	Project Manager: Darius Thompson	14-Jul-22 09:35

DUP2-P3-MW-01R HC#7

2206055-08 (Water)

24-Jun-22 14:49

Analyte	Result		PQL	Units
Metals				
EPA 6020B_(7/14) Prepared: 27-Jun-22	Analyzed: 27-Jun-22			
Arsenic, Dissolved	**1.55**		**1.00**	**ug/L**
Copper, Dissolved	**3.39**		**1.00**	**ug/L**
Lead, Dissolved	1.00	U	1.00	ug/L
Nickel, Dissolved	**1.19**		**1.00**	**ug/L**
Zinc, Dissolved	**4.10**		**1.00**	**ug/L**

PW Engineering	Project: **Foss Upland Esplanade**	
747 Market Street, Rm 744	Project Number: 662319	**Reported:**
Tacoma WA, 98402	Project Manager: Darius Thompson	14-Jul-22 09:35

Trip Blank HC#7

2206055-09 (Water)

23-Jun-22 16:00

Analyte	Result		PQL	Units
VOA				
EPA 8260D_4_(6/18) Prepared: 27-Jun-22	Analyzed: 27-Jun-22			
Benzene	0.5	U	0.5	ug/L
Ethylbenzene	0.5	U	0.5	ug/L
m,p-Xylene	1.0	U	1.0	ug/L
o-Xylene	0.5	U	0.5	ug/L
Toluene	0.5	U	0.5	ug/L
Surrogate: 1,2-Dichloroethane-d4	*100 %*		*26-175*	
Surrogate: 4-Bromofluorobenzene	*97 %*		*81-130*	
Surrogate: Fluorobenzene	*103 %*		*82-127*	
Surrogate: Toluene-d8	*106 %*		*86-126*	

PW Engineering	Project: **Foss Upland Esplanade**	
747 Market Street, Rm 744	Project Number: 662319	**Reported:**
Tacoma WA, 98402	Project Manager: Darius Thompson	14-Jul-22 09:35

Metals - Quality Control

Environmental Services Laboratory

Sample ID / Analyte	Result		MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch BFF0314 - EPA 6020B_(7/14)											
Blank					Prepared & Analyzed: 27-Jun-22						
BFF0314-BLK1											
Arsenic, Dissolved	0.500	U	0.050	ug/L							
Copper, Dissolved	0.500	U	0.022	ug/L							
Lead, Dissolved	0.500	U	0.0061	ug/L							
Nickel, Dissolved	0.500	U	0.012	ug/L							
Zinc, Dissolved	0.50	U	0.22	ug/L							
Duplicate	**Source: 2206055-01**				Prepared & Analyzed: 27-Jun-22						
BFF0314-DUP1											
Arsenic, Dissolved	0.410		0.100	ug/L		0.408			0.6	20	
Copper, Dissolved	0.552		0.044	ug/L		0.433			24	20	
Lead, Dissolved	0.0958		0.0122	ug/L		0.0990			3	20	
Nickel, Dissolved	0.317		0.024	ug/L		0.347			9	20	
Zinc, Dissolved	3.27		0.44	ug/L		2.83			14	20	
LCS					Prepared & Analyzed: 27-Jun-22						
BFF0314-BS1											
Arsenic, Dissolved	49.7		0.050	ug/L	50.0		99	80-120		200	
Copper, Dissolved	125		0.022	ug/L	125		100	80-120		200	
Lead, Dissolved	15.1		0.0061	ug/L	15.0		101	80-120		200	
Nickel, Dissolved	199		0.012	ug/L	200		100	80-120		200	
Zinc, Dissolved	100		0.22	ug/L	100		100	80-120		200	
Matrix Spike	**Source: 2206055-01**				Prepared & Analyzed: 27-Jun-22						
BFF0314-MS1											
Arsenic, Dissolved	94.8			ug/L	100	0.204	95	70-130		20	
Copper, Dissolved	92.9			ug/L	100	0.216	93	70-130		20	
Lead, Dissolved	93.0			ug/L	100	0.0495	93	70-130		20	
Nickel, Dissolved	91.1			ug/L	100	0.174	91	70-130		20	
Zinc, Dissolved	93.4			ug/L	100	1.42	92	70-130		200	

PW Engineering	Project: **Foss Upland Esplanade**	
747 Market Street, Rm 744	Project Number: 662319	**Reported:**
Tacoma WA, 98402	Project Manager: Darius Thompson	14-Jul-22 09:35

VOA - Quality Control

Environmental Services Laboratory

Sample ID / Analyte	Result		MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch BFF0310 - EPA 8260D_4_(6/18)											
Blank					Prepared & Analyzed: 27-Jun-22						
BFF0310-BLK1											
Benzene	0.5	U	0.2	ug/L							
NWTPH-Gasoline	50.0	U	4.68	ug/L							
Toluene	0.5	U	0.2	ug/L							
Ethylbenzene	0.5	U	0.2	ug/L							
m,p-Xylene	1.0	U	0.4	ug/L							
o-Xylene	0.5	U	0.2	ug/L							
Surrogate: 4-Bromofluorobenzene	*10.3*			ug/L	*10.0*		*103*	*81-130*			
Surrogate: 4-Bromofluorobenzene	*10*			ug/L	*10.0*		*103*	*50-150*			
Surrogate: 1,2-Dichloroethane-d4	*9.16*			ug/L	*10.0*		*92*	*26-175*			
Surrogate: Fluorobenzene	*10.1*			ug/L	*10.0*		*101*	*82-127*			
Surrogate: Toluene-d8	*10.6*			ug/L	*10.0*		*106*	*86-126*			
Duplicate	**Source: 2206055-06**				Prepared & Analyzed: 27-Jun-22						
BFF0310-DUP1											
Benzene	2.5	U	1.0	ug/L		2.5 U				200	
NWTPH-Gasoline	250	U	23.4	ug/L		250 U				20	
Toluene	2.5	U	1.0	ug/L		2.5 U				200	
Ethylbenzene	2.5	U	1.0	ug/L		2.5 U				200	
m,p-Xylene	5.0	U	2.0	ug/L		5.0 U				20	
o-Xylene	2.5	U	1.0	ug/L		2.5 U				200	
Surrogate: 4-Bromofluorobenzene	*9.9*			ug/L	*10.0*		*98.6*	*50-150*			
Surrogate: 4-Bromofluorobenzene	*9.86*			ug/L	*10.0*		*99*	*81-130*			
Surrogate: 1,2-Dichloroethane-d4	*9.49*			ug/L	*10.0*		*95*	*26-175*			
Surrogate: Fluorobenzene	*10.4*			ug/L	*10.0*		*104*	*82-127*			
Surrogate: Toluene-d8	*10.2*			ug/L	*10.0*		*102*	*86-126*			
LCS					Prepared & Analyzed: 27-Jun-22						
BFF0310-BS1											
Benzene	5.4			ug/L	5.00		108	60.6-136		20	
Toluene	5.5			ug/L	5.00		111	62.8-131		20	
Ethylbenzene	5.4			ug/L	5.00		107	64.6-128		20	

VOA - Quality Control

Environmental Services Laboratory

Sample ID / Analyte	Result	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch BFF0310 - EPA 8260D_4_(6/18)										
m,p-Xylene	10.5		ug/L	10.0		105	61.1-135		20	
o-Xylene	5.0		ug/L	5.00		100	63.9-129		20	
Surrogate: 4-Bromofluorobenzene	*9.90*		ug/L	*10.0*		*99*	*81-130*			
Surrogate: 1,2-Dichloroethane-d4	*9.77*		ug/L	*10.0*		*98*	*26-175*			
Surrogate: Fluorobenzene	*10.1*		ug/L	*10.0*		*101*	*82-127*			
Surrogate: Toluene-d8	*10.5*		ug/L	*10.0*		*105*	*86-126*			
BFF0310-BS2										
NWTPH-Gasoline	70.0		ug/L	100		70.0	50-150		200	
Surrogate: 4-Bromofluorobenzene	*9.9*		ug/L	*10.0*		*98.8*	*50-150*			
Matrix Spike	**Source: 2206055-06**			Prepared & Analyzed: 27-Jun-22						
BFF0310-MS1										
Benzene	6.6		ug/L	5.00	0.0	132	76.2-116		20	
Toluene	6.3		ug/L	5.00	0.0	126	78.3-112		20	
Ethylbenzene	6.1		ug/L	5.00	0.0	122	78.8-110		20	
m,p-Xylene	12.4		ug/L	10.0	0.0	124	75.9-110		20	
o-Xylene	6.0		ug/L	5.00	0.0	121	78.4-110		20	
Surrogate: 4-Bromofluorobenzene	*9.82*		ug/L	*10.0*		*98*	*81-130*			
Surrogate: 1,2-Dichloroethane-d4	*9.04*		ug/L	*10.0*		*90*	*26-175*			
Surrogate: Fluorobenzene	*9.61*		ug/L	*10.0*		*96*	*82-127*			
Surrogate: Toluene-d8	*9.32*		ug/L	*10.0*		*93*	*86-126*			
Matrix Spike Dup	**Source: 2206055-06**			Prepared & Analyzed: 27-Jun-22						
BFF0310-MSD1										
Benzene	6.9		ug/L	5.00	0.0	138	76.2-116	5	20	
Toluene	6.9		ug/L	5.00	0.0	138	78.3-112	10	20	
Ethylbenzene	6.9		ug/L	5.00	0.0	139	78.8-110	13	20	
m,p-Xylene	13.5		ug/L	10.0	0.0	135	75.9-110	9	20	
o-Xylene	6.6		ug/L	5.00	0.0	133	78.4-110	9	20	
Surrogate: 4-Bromofluorobenzene	*10.2*		ug/L	*10.0*		*102*	*81-130*			
Surrogate: 1,2-Dichloroethane-d4	*10.0*		ug/L	*10.0*		*100*	*26-175*			
Surrogate: Fluorobenzene	*10.0*		ug/L	*10.0*		*100*	*82-127*			
Surrogate: Toluene-d8	*9.71*		ug/L	*10.0*		*97*	*86-126*			

PW Engineering	Project: **Foss Upland Esplanade**	
747 Market Street, Rm 744	Project Number: 662319	**Reported:**
Tacoma WA, 98402	Project Manager: Darius Thompson	14-Jul-22 09:35

Semi-VOA - Quality Control

Environmental Services Laboratory

Sample ID / Analyte	Result	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch BFF0352 - WDOE NWTPH-Dx_(1997)										
Blank				Prepared: 29-Jun-22 Analyzed: 13-Jul-22						
BFF0352-BLK2										
NWTPH-Diesel	0.10 U	0.10	mg/L							
NWTPH-Heavy Oil	0.20 U	0.20	mg/L							
Surrogate: 2-Fluorobiphenyl	*0.024*		mg/L	*0.0500*		*48.0*	*50-150*			
Surrogate: Terphenyl-d14	*0.033*		mg/L	*0.0500*		*66.8*	*50-150*			
Surrogate: Pentacosane	*0.035*		mg/L	*0.0500*		*70.7*	*50-150*			
Duplicate	**Source: 2206055-06RE1**			Prepared: 29-Jun-22 Analyzed: 13-Jul-22						
BFF0352-DUP2										
NWTPH-Diesel	0.10 U	0.10	mg/L		0.10 U				50	
NWTPH-Heavy Oil	0.19 U	0.19	mg/L		0.19 U				50	
Surrogate: 2-Fluorobiphenyl	*0.017*		mg/L	*0.0487*		*34.1*	*50-150*			
Surrogate: Terphenyl-d14	*0.036*		mg/L	*0.0487*		*74.3*	*50-150*			
Surrogate: Pentacosane	*0.038*		mg/L	*0.0487*		*78.4*	*50-150*			
LCS				Prepared: 29-Jun-22 Analyzed: 13-Jul-22						
BFF0352-BS4										
NWTPH-Diesel	0.30	0.10	mg/L	0.500		60.3	50-150		200	
NWTPH-Heavy Oil	0.71	0.20	mg/L	1.00		71.1	50-150		200	
Surrogate: 2-Fluorobiphenyl	*0.024*		mg/L	*0.0500*		*48.9*	*50-150*			
Surrogate: Terphenyl-d14	*0.037*		mg/L	*0.0500*		*73.1*	*50-150*			
Surrogate: Pentacosane	*0.038*		mg/L	*0.0500*		*76.4*	*50-150*			

PW Engineering	Project: **Foss Upland Esplanade**	
747 Market Street, Rm 744	Project Number: 662319	**Reported:**
Tacoma WA, 98402	Project Manager: Darius Thompson	14-Jul-22 09:35

Notes and Definitions

U	Analyte Not Detected at or above the associated value
UJ	Analyte Not Detected at or above the associated estimated value
J	The analyte was positively identified. The associated value is an estimate. For BOD Analysis: The sample dilutions set-up for the BOD analysis did not meet the oxygen depletion criteria of at least 2 mg/l dissolved oxygen depletion. Therefore the reported BOD result is estimated biased high
ND	Analyte NOT DETECTED at or above the reporting limit
E	Analyte was determined above the upper quantitation range of the method. The associated value is an estimate.
NJ	There is evidence the analyte is present. The associated value is an estimate.
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
H	The sample dilutions set up for the BOD analysis failed to meet the criteria of a residual dissolved oxygen of at least 1 mg/l. Therefore actual concentration is likely greater than the reported result.

Chain of Custody

326 East D Street
Tacoma
WA, 98421-1801

phone (253) 502-2130
fax (253) 502-2170

Lab Work Order Number 2206055

Client Name: PW Engineering	Project Name: Foss Upland Esplanade
Client Contact: Darius Thompson	Project Number: 662319
Address: 747 Market Street, Rm 744	Project Description:
City: Tacoma	PO Number: 61000073538
State/Zip: WA, 98402	Sampler Signatures:
Phone: (253) 591-5395 / (253) 594-7941	Fax:
Sampler: R. Dozier	

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type	Matrix Code	Container Count	Preservation Code	Arsenic, Dissolved 6020B::Copper, Dissolved 6020B::Lead, Dissolved 6020B::Nickel, Dissolved 6020B::Zinc, Dissolved 6020B	:NWTPH_Gx::VOA_8260_BTEX	:NWTPH_Dx	Sample Number	Sample Comments
MW-5	6/24/22	1235	G	W	1	1					
MW-2		1351	G	W	1	1					
P3-MW-01R		1448	G	W	1	1					
P3-MW-02		1125	G	W	1	1					
P3-MW-03		1523	G	W	1	1					
Landau Well		1001	G	W	9	1	6	2			Containers for Dx/Gx Dup provided
DUP1 - MW-5		1236	G	W	1	1					
DUP2 - P3-MW-01R		1449	G	W	1	1					
Trip Blank			G	W	3		3				

Requested Turn Around

Rush requests subject to additional charge.
Rush requests subject to lab approval.

Standard (days)

Expedited (days)

Due Date

Relinquished By: R. Dozier	Received By:	Date/Time: 6/24/22 16:02
Relinquished By:	Received By:	Date/Time:
Relinquished By:	Received By:	Date/Time:

Comments: 11.8°C

Cooler Numbers and Temperatures: Default Cooler

Matrix Codes: W=Ground Water

Cont. Codes: =125 mL WM HDPE HNO3 Filter, =40 mL VOA HCl

Tiffany Ryan 6/27/22