REGION 10
SEATTLE, WA 98101

August 13, 2025

TECHNICAL MEMORANDUM

SUBJECT: Porewater Sampling Results
McCormick & Baxter Superfund Site
Portland, OR

FROM: Kathleen Emory, Environmental Engineer

TO: Anne Christopher, RPM

Introduction

The McCormick & Baxter Superfund Site is a former wood treating facility, which operated from 1944 – 1991. It is located on the east bank of the Willamette River in Portland, Oregon. Although located within the Portland Harbor Superfund Site, McCormick & Baxter Superfund Site is a separate Superfund site. The remedy selected in the Record of Decision (ROD) includes a subsurface barrier wall, soil cap and sediment cap. The sediment cap is of particular interest for this technical memo and was designed to eliminate risks to human health and the environment, such as direct contact with contaminated sediment by fish and crayfish. The September 2021 Five-Year Review stated that there was a buckling issue with the articulated concrete block (ACB) that armors the sediment cap in Willamette Cove. The sediment cap area is divided into twelve grid cells called compliance monitoring areas that determine where porewater samples are collected: one sample per compliance monitoring area. Figure 1 depicts the 12 grid cells and the corresponding porewater sample for the 2021 Five Year Review.

EPA collected porewater and surface water samples in February 2025. In addition to analyzing for contaminants of concern (COCs), EPA recorded water quality parameters (pH, dissolved organic carbon (DOC), temperature) and analyzed for calcium, magnesium, sodium, sulfate, potassium, chloride, and alkalinity because they were needed for the Biotic Ligand Model to determine the bioavailability of copper. EPA's aquatic life freshwater quality criteria for copper is based on the Biotic Ligand Model. The Biotic Ligand Model predicts the bioavailability of metals in receiving waters for various water chemistry conditions (https://www.windwardenv.com/). This was calculated for one surface water sample.

Objective

This porewater sampling event will conclude whether the sediment cap is still functioning as designed despite the buckling of the ACB in Willamette Cove through evaluating COC concentrations in porewater. Data collected in this event will be compared to existing data to examine remedy protectiveness and better understand current conditions.

Sampling Activities

In February 2025, the sampling team collected porewater samples from the sediment cap and surface water samples from the Willamette River. Ten porewater samples were collected from locations where buckling of the ACB was observed and an additional porewater sample from each grid cell was collected along the rest of the shoreline. Two collocated surface water samples were also collected during this sampling effort. The exact sample locations are shown in Figure 2. Samples were collected during low tide to the extent possible in order to ensure that porewater was representative of groundwater and not surface water. Table 1 contains the timing of high and low tide during the sampling event. The push point piezometer was driven into the cap through gaps in the ACB, through the gravel layer, Geotextile membrane, armoring rock, and into the sand layer for sub-armor porewater sample collection. A YSI ProDSS measured water quality parameters of the porewater and surface water at each sample location to help determine that the porewater was groundwater and not surface water. For example groundwater typically has lower conductivity, dissolved oxygen, and oxidation reduction potential than surface water. Surface water samples were collected at the top of the water column. Water quality parameter results are presented in Table 2.

Results

Table 3 contains the data that is discussed in the following subsections.

Metals

Arsenic, copper and chromium were not detected in any sample (porewater or surface water). Zinc was detected at a maximum concentration of 12 µg/L, less than the 1996 ambient water quality criteria (AWQC) of 110 µ/L and the current aquatic life AWQC of 36 µg/L. The Biotic Ligand Model calculated current copper AWQC is 7.6 µg/L and was consistent across model runs that used Site-specific and recommended regional water parameters. The Site-specific model run used data from the surface water location MB-SW-12.

PAHs

Acenaphthene, fluoranthene, and naphthalene were detected in both surface water and porewater at concentrations less than their respective 1996 AWQC and current AWQC. Carcinogenic polycyclic aromatic hydrocarbons (cPAHs) were calculated as a benzo(a)pyrene-equivalent concentration using the EPA potency equivalency factions. The carcinogenic PAHs are benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, benzo[b]fluoranthene, benzo[k]fluoranthene, chrysene, dibenzo[a.h]anthracene, and indeno(1,2,3-cd)pyrene results. Non-detects were treated as zeros. cPAHs were detected in three samples at two sampling locations (surface water at location 1 and porewater at location 16) with concentrations of 0.03 µg/L, not exceeding the 1996 or current AWQC.

PCP

Pentachlorophenol was not detected.

Conclusions

Water Quality Parameters

Surface and porewater water quality parameters were compared at collocated sample locations. Surface water typically has a positive oxidation-reduction potential (ORP), while within Willamette Cove ORP in porewater tended to be negative in this sampling event. At sample location 8 the surface water ORP was negative. This may indicate that sample location 8 is a groundwater seep. The potential for the buckling to cause a seep at location 8 should be investigated further as recommended below. ORP measurements in surface and porewater are shown on Figure 3.

Sample location 1 was located on the edge of the ACB, which may be why water quality parameters such as ORP were similar between the surface water and porewater at that location. Another reason for these similarities is that the samples were collected close to high tide, so it is possible that the porewater sample was surface water instead of the intended groundwater. Surface water temperature exceeded that of porewater at locations 1, 11, and 13. These results are shown on Figure 4.

Sampling locations 11 through 16 are along the Willamette River (Figure 2). Porewater parameters appear more like surface water at locations 11 through 15, while the porewater sample at location 16 appears to be groundwater. Sample locations 11 through 15 are along the river where the barrier wall is present, location 16 is upgradient of the barrier wall relative to groundwater flow. Based on these results, it appears that the barrier wall is performing as designed by impeding the flow of groundwater to the river. Samples from locations 11 and 13 were collected after high tide, which may also explain the porewater exhibiting surface water quality values. Samples from locations 12, 14, and 15 were collected at low tide and therefor support the barrier wall is impeding groundwater flow to the river.

Sub-armor Porewater

A comparison of the maximum detected concentrations of acenapthene and fluoranthene between 2010 and 2025 is presented in Table 4. Although the maximum detected concentrations increased between 2010 and 2025, all results were less than their respective 1996 or current AWQC.

Recommendations

The sediment cap is performing as designed and protective of human health and the environment. However, further investigation at sampling location 8 is needed to confirm whether there is a groundwater seep at that location. A groundwater seep, if present, should continue to be monitored for protectiveness of human health and the environment. If future investigations show that the sediment cap is not protective of human health and the environment due to a seep and/or ACB buckling, then sediment cap will need to be repaired so that it continues to be protective.

As part of the Sediment Cap Operation and Maintenance, the buckles in the sediment cap should continue to be monitored and the cap repaired as needed to ensure that it is still at design thickness and continues to be protective.

Table 1

Date	High Tide		Low Tide	
	Time	Feet NAVD	Time	Feet NAVD
2/10/2025	1459	10.04	1005	7.76
2/11/2025	1548	10.00	1116	7.71
2/12/2025	1634	9.96	1211	7.67

Table 2

Location	Latitude	Longitude	Water Type	Date	Time	DO (mg/L)	ORP (mV)	SEC mS/cm	Turbidity (NTU)	pH	Temp (C)	Notes
MB-PW-01	45.5804	-122.74446	PW	2/10/2025	1410	1.2	141.9	55	3.95	6.55	4.8	Edge of ACB, Willamette Cove Buckling Areas
MB-SW-01	45.5804	-122.74446	SW	2/10/2025	1429	12.7	82.8	57.2	5.58	7.57	6.5	Edge of ACB, Willamette Cove Buckling Areas
MB-PW-02	45.5791	-122.74536	PW	2/11/2025	1045	0	-117.3	0.228	5.92	6.73	6.4	Willamette Cove Buckling Areas
	45.5791	-122.74536	SW	2/11/2025	930	12.9	280	0.091	15.5	7.04	4.6	Willamette Cove Buckling Areas
MB-PW-03	45.47902	-122.74548	PW	2/11/2025	1022	0	-104.9	0.381	2.64	6.7	7.4	Willamette Cove Buckling Areas
	45.47902	-122.74548	SW	2/11/2025	1030	13.5	106.1	0.091	5.3	7.17	4.4	Willamette Cove Buckling Areas
MB-PW-04	45.57898	-122.74547	PW	2/11/2025	1114	1.6	-87.2	0.127	3.4	7.07	5.2	Willamette Cove Buckling Areas
	45.57898	-122.74547	SW	2/11/2025	1144	13	137.8	0.071	5.05	7.23	4.5	Willamette Cove Buckling Areas
MB-PW-05	45.57992	-122.7447	PW	2/11/2025	1211	0	-136.9	0.788	3.83	6.91	5.7	Willamette Cove Buckling Areas
	45.57992	-122.7447	SW	2/11/2025	1140	13.1	36.8	0.095	6.2	7.27	5.1	Willamette Cove Buckling Areas
MB-PW-06	45.57962	-122.74487	PW	2/11/2025	1306	0	-116.4	0.506	1.5	6.95	7.7	Willamette Cove Buckling Areas
	45.57962	-122.74487	SW	2/11/2025	1248	13.5	51	0.107	5.5	7.5	6.7	Willamette Cove Buckling Areas

Location	Latitude	Longitude	Water Type	Date	Time	DO (mg/L)	ORP (mV)	SEC mS/cm	Turbidity (NTU)	pH	Temp (C)	Notes
MB-PW-07	45.57958	-122.74492	PW	2/11/2025	1259	0	-127.1	0.622	1.1	6.85	7.8	Willamette Cove Buckling Areas
	45.57958	-122.74492	SW	2/11/2025	1252	13.4	40.1	0.131	5.75	7.19	6.2	Willamette Cove Buckling Areas
MB-PW-08	45.57949	-122.74499	PW	2/12/2025	1425	0	-83.1	0.52	1.18	6.77	9.1	Willamette Cove Buckling Areas, potential seep
	45.57949	-122.74499	SW	2/12/2025	1422	11.7	-30	0.173	4.85	7.36	6.3	Willamette Cove Buckling Areas , potential seep
MB-PW-09	45.57941	-122.74506	PW	2/12/2025	1359	0	-89.2	0.394	3.75	6.73	7.9	Willamette Cove Buckling Areas
	45.57941	-122.74506	SW	2/12/2025	1342	13.2	99.4	0.104	33.24	7.12	6.4	Willamette Cove Buckling Areas
MB-PW-10	45.57935	-122.74516	PW	2/12/2025	1348	0	-97.3	0.4	1.06	6.64	8.4	Willamette Cove Buckling Areas
	45.57935	-122.74516	SW	2/12/2025	1329	13.5	125.7	0.103	4.71	7.14	6	Willamette Cove Buckling Areas
MB-PW-11	45.57836	-122.74519	PW	2/10/2025	1558	12.8	138.7	0.088	87.63	6.97	5.3	Willamette side
	45.57836	-122.74519	SW	2/10/2025	1622	13.1	120.9	.089	8.63	7.46	5.5	Willamette side
MB-PW-12	45.57813	-122.74476	PW	2/11/2025	851	5	263.1	0.096	5.92	6.91	5.3	Willamette side
MB-SW-12	45.57813	-122.74476	SW	2/11/2025	913	12.9	175.3	0.094	8.25	7.34	4.1	Willamette side
MB-PW-13	45.5778	-122.74327	PW	2/10/2025	1618	12.9	206.6	0.103	11.79	6.96	5.3	Willamette side
	45.5778	-122.74327	SW	2/10/2025	1627	13.1	198.6	0.093	9.7	7.2	6	Willamette side
MB-PW-14	45.57771	-122.74184	PW	2/12/2025	933	11.2	264.5	0.089	8.14	6.62	4.1	Willamette side

Location	Latitude	Longitude	Water Type	Date	Time	DO (mg/L)	ORP (mV)	SEC mS/cm	Turbidity (NTU)	pH	Temp (C)	Notes
	45.57771	-122.74184	SW	2/12/2025	905	Nd	287.2	0.094	13.44	7.24	2.9	Willamette side
MB-PW-15	45.57738	-122.74087	PW	2/11/2025	1019	10.3	271	0.093	7.08	6.61	5.8	Willamette side
	45.57738	-122.74087	SW	2/11/2025	1033	13.2	237.7	0.097	6	7.05	5.2	Willamette side
MB-PW-16	45.57656	-122.73927	PW	2/12/2025	1126	0	-23.4	0.215	12	6.03	8.4	Willamette side
	45.57656	-122.73927	SW	2/12/2025	1105	13.1	141.5	0.107	11.6	6.67	6.6	Willamette side

Table 3

Sample #	Location	Filtered	PCP (µg/L)	cPAH (µg/L)	Arsenic (µg/L)	Chromium III (µg/L)	Copper (µg/L)	Zinc (µg/L)	Acenaphthene (µg/L)	Fluoranthene (µg/L)	Naphthalene (µg/L)
1996 AWQCs			13[A]	0.031[H]	190	210	12	110	520	54	620
Current AWQCs			0.3[H]		150[A] 2100[H]	24[A]	7.6	36[A] 2,600,0000[H]	520[A] 99[H]	14[H]	
Detection Limits			0.1	0.0189	25	5	5	5	0.025	0.025	0.025
25074000	MB-PW-01	N	ND	ND					0.026	0.026	0.026
25074001	MB-PW-01	Y			ND	ND	ND	ND			
25074002	MB-PW-01	N	ND	ND	ND	ND	ND	ND	76	0.39	0.027
25074003	MB-PW-02	Y			ND	ND	ND	ND			
25074004	MB-PW-03	N	ND	ND	ND	ND	ND	ND	39	0.026	0.026
25074005	MB-PW-03	Y			ND	ND	ND	6.6			
25074006	MB-PW-04	N	ND	ND	ND	ND	ND	ND	9.1	0.023	0.025
25074007	MB-PW-04	Y			ND	ND	ND	ND			
25074008	MB-PW-05	N	ND	ND	ND	ND	ND	8.8	ND	ND	ND
25074009	MB-PW-05	Y			ND	ND	ND	7.5			
25074010	MB-PW-06	N	ND	ND	ND	ND	ND	ND	0.058	ND	ND
25074011	MB-PW-06	Y			ND	ND	ND	5.3			
25074012	MB-PW-07	N	ND	ND	ND	ND	ND	ND	ND	ND	ND
25074013	MB-PW-07	Y			ND	ND	ND	5.2			
25074014	MB-PW-08	N	ND	ND	ND	ND	ND	ND	0.026	0.026	0.026
25074015	MB-PW-08	Y			ND	ND	ND	ND			
25074016	MB-PW-09	N	ND	ND	ND	ND	ND	ND	0.035	0.027	0.027
25074017	MB-PW-09	Y			ND	ND	ND	6.2			
25074018	MB-PW-10	N	ND	ND	ND	ND	ND	6.1	ND	0.026	0.026
25074019	MB-PW-10	Y			ND	ND	ND	6			
25074020	MB-PW-11	N	ND	ND					0.026	0.026	0.026
25074021	MB-PW-11	Y			ND	ND	ND	ND			
25074022	MB-PW-12	N	ND	ND	ND	ND	ND	9.1	0.028	0.028	0.028
25074023	MB-PW-12	Y			ND	ND	ND	5.4			

Sample #	Location	Filtered	PCP (µg/L)	cPAH (µg/L)	Arsenic (µg/L)	Chromium III (µg/L)	Copper (µg/L)	Zinc (µg/L)	Acenaphthene (µg/L)	Fluoranthene (µg/L)	Naphthalene (µg/L)
1996 AWQCs			13[A]	0.031[H]	190	210	12	110	520	54	620
Current AWQCs			0.3[H]		150[A] 2100[H]	24[A]	7.6	36[A] 2,600,0000[H]	520[A] 99[H]	14[H]	
Detection Limits			0.1	0.0189	25	5	5	5	0.025	0.025	0.025
25074024	MB-PW-13	N	ND	ND					ND	ND	ND
25074025	MB-PW-13	Y			ND	ND	ND	ND			
25074026	MB-PW-14	N	ND	ND	ND	ND	ND	ND	0.026	0.026	0.026
25074027	MB-PW-14	Y			ND	ND	ND	ND			
25074028	MB-PW-15	N	ND	ND	ND	ND	ND	12	ND	ND	
25074029	MB-PW-15	Y			ND	ND	ND	5.7			
25074030	MB-PW-16	N	ND	0.03	ND	ND	ND	6.9	56	0.8	0.2
25074031	MB-PW-16	Y			ND	ND	ND	ND			
25074032	MB-PW-16	N	ND	0.03	ND	ND	ND	7.1	58	0.82	0.22
25074033	MB-PW-16	Y			ND	ND	ND	5.8			
25074034	Blank PW	N	ND	ND	ND	ND	ND	ND	ND	ND	ND
25074035	Blank PW	Y			ND	ND	ND	ND			
25074036	MB-SW-01	N	ND	0.03					0.027	0.065	0.027
25074037	MB-SW-01	Y			ND	ND	ND	ND			
25074038	MB-SW-12	N	ND	ND	ND	ND	ND	ND	0.027	0.027	0.027
25074039	MB-SW-12	Y			ND	ND	ND	ND			
25074040	MB-SW-12	N	ND						0.027	0.027	0.027
25074041	MB-SW-12	Y			ND	ND	ND	ND			

A = Aquatic Life AWQC
H = Human Health AWQC
ND = non detect

Table 4

Contaminant	2010 Maximum Detection (µg/L)	2025 Maximum Detection (µg/L)
Arsenic	35.4	ND
Chromium	0.43	ND
Copper	2.3	ND
Zinc	15.7	12
PCP	0.32	ND
Acenaphthene	61.5	76
Fluoranthene	0.46	0.82
Naphthalene	16.1	0.22

ND = non detect

Figure 1: Compliance Monitoring Areas

Figure 2: February 2025 Porewater and Surface Water Locations

Figure 3: Oxidation Reduction Potential in Porewater and Surface Water

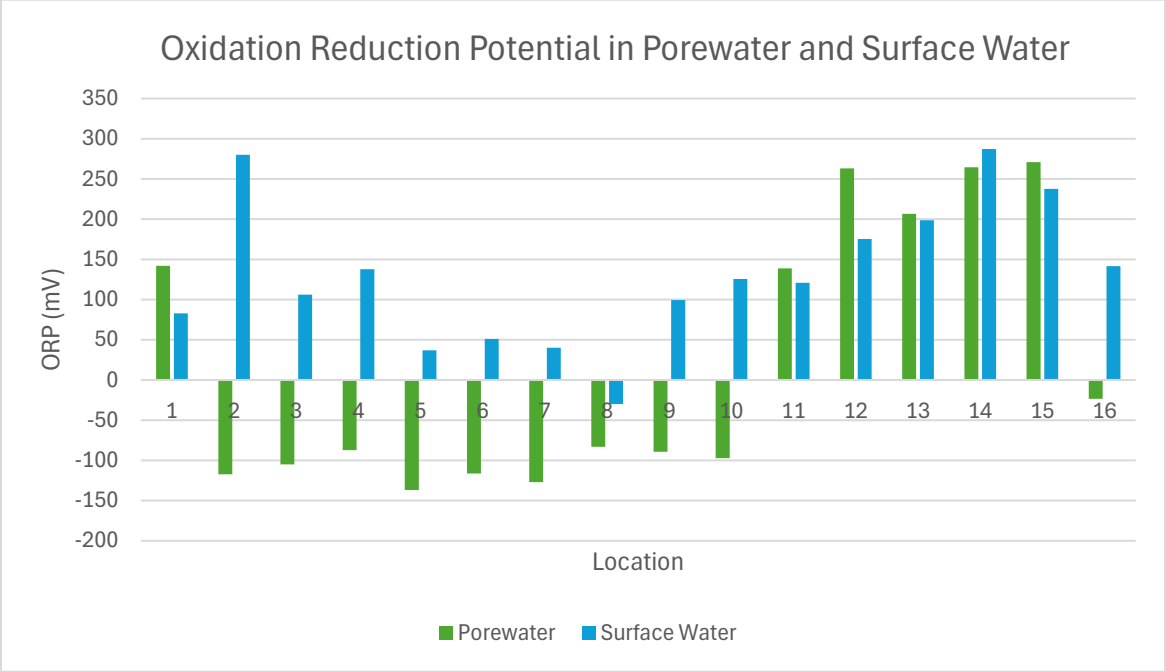
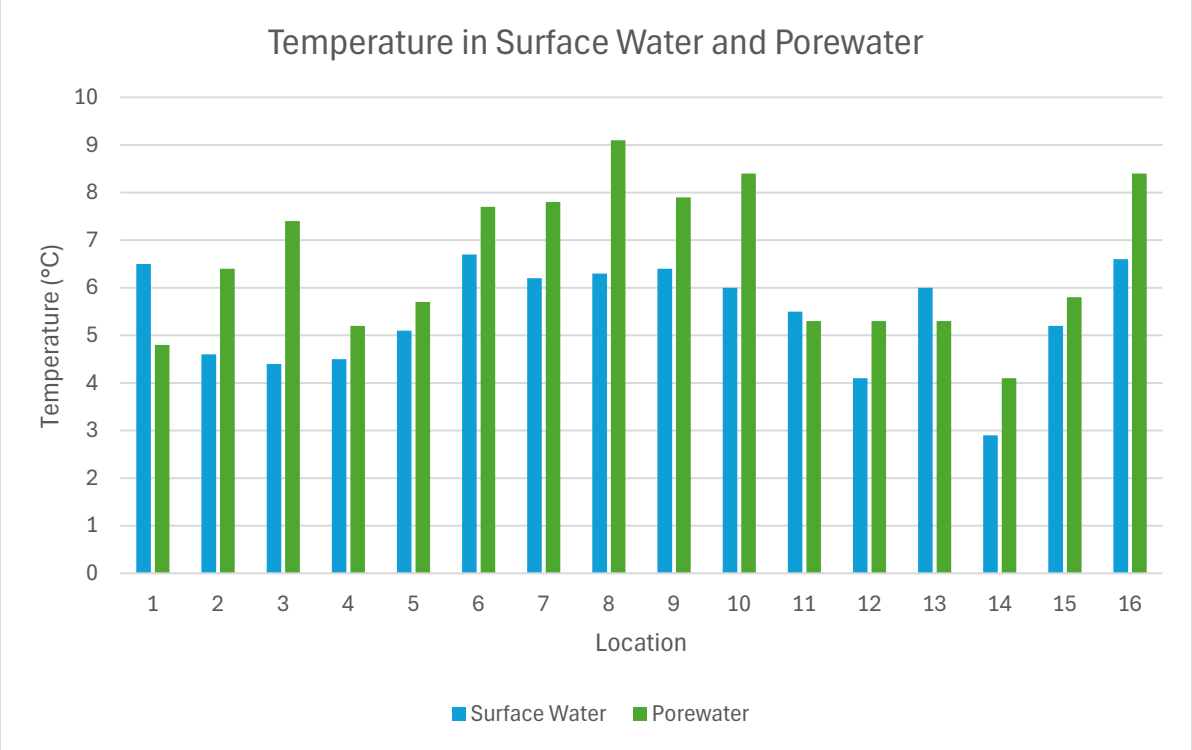


Figure 4: Temperature in Surface Water and Porewater



Attachments

1. Raw Data
    a. Metals
    b. Anions
    c. PAH
    d. TOC
    e. Alkalinity
    f. PCP
2. Total cPAH Calculation
3. Biotic Ligand Model Output
4. Porewater Sampling Logs
5. YSI Calibration Records
6. Sampling photos

1. Raw Data

2. cPAH Calculation

3. Biotic Ligand Model Output

4. Porewater Sampling Logs

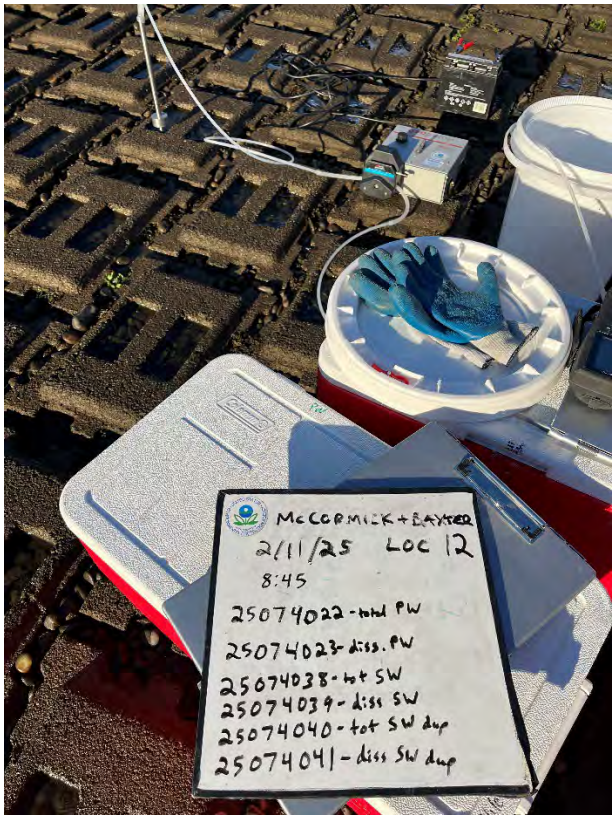
5. YSI Calibration Records

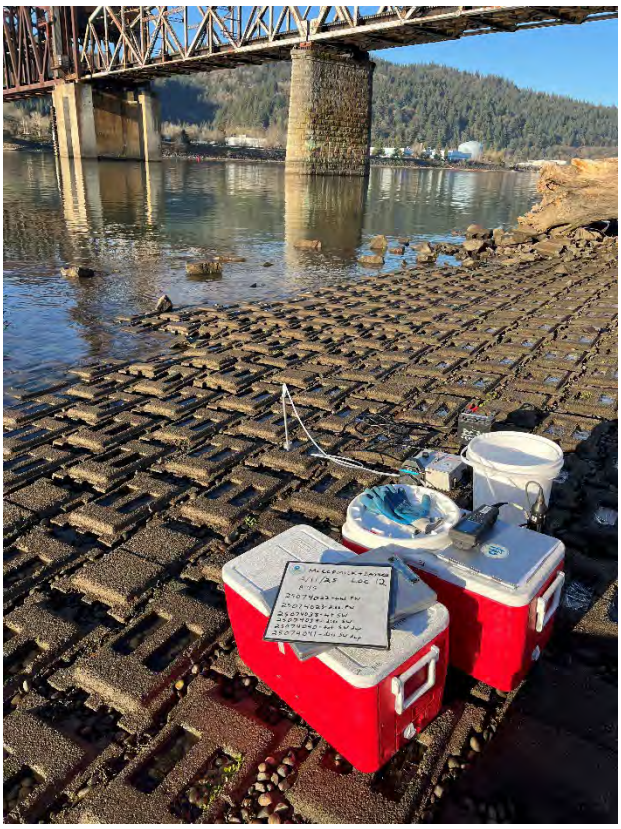
6. Sampling Photos


McCormick Bay Site
Date: 2/1/25
Time: 1130


McCormick Bay Site

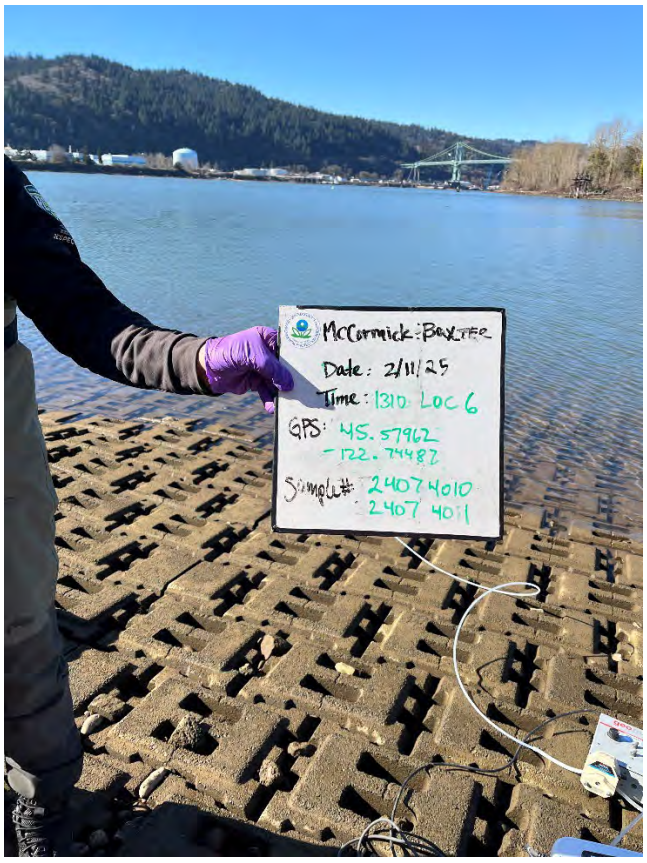

McCormick Baxter
2/11/25 Loc 8
Time: 2:25pm
Sample#: 24074014
24074015
GPS: 45.57949
-122.74449


McCORMICK+BAXTER
2/11/25 LOC 12
8:45
25074022 - tot PW
25074023 - diss. PW
25074038 - tot SW
25074039 - diss SW
25074040 - tot SW dup
25074041 - diss SW dup




McCormick:Baxter
Date: 2/11/25
Time: 0952
GPS: 45.57910
-122.74536


McCormick-Baxter
2/11/25 Loc 7
13:00
2507401Z-dup
2507401B-Archived
GPS 45.57958
-122.74492


McCormick-Baxter
Date: 2/11/25
Time: 1310 Loc 6
GPS: 45.57962
-122.74487
Sample#: 2407 4010
2407 4011

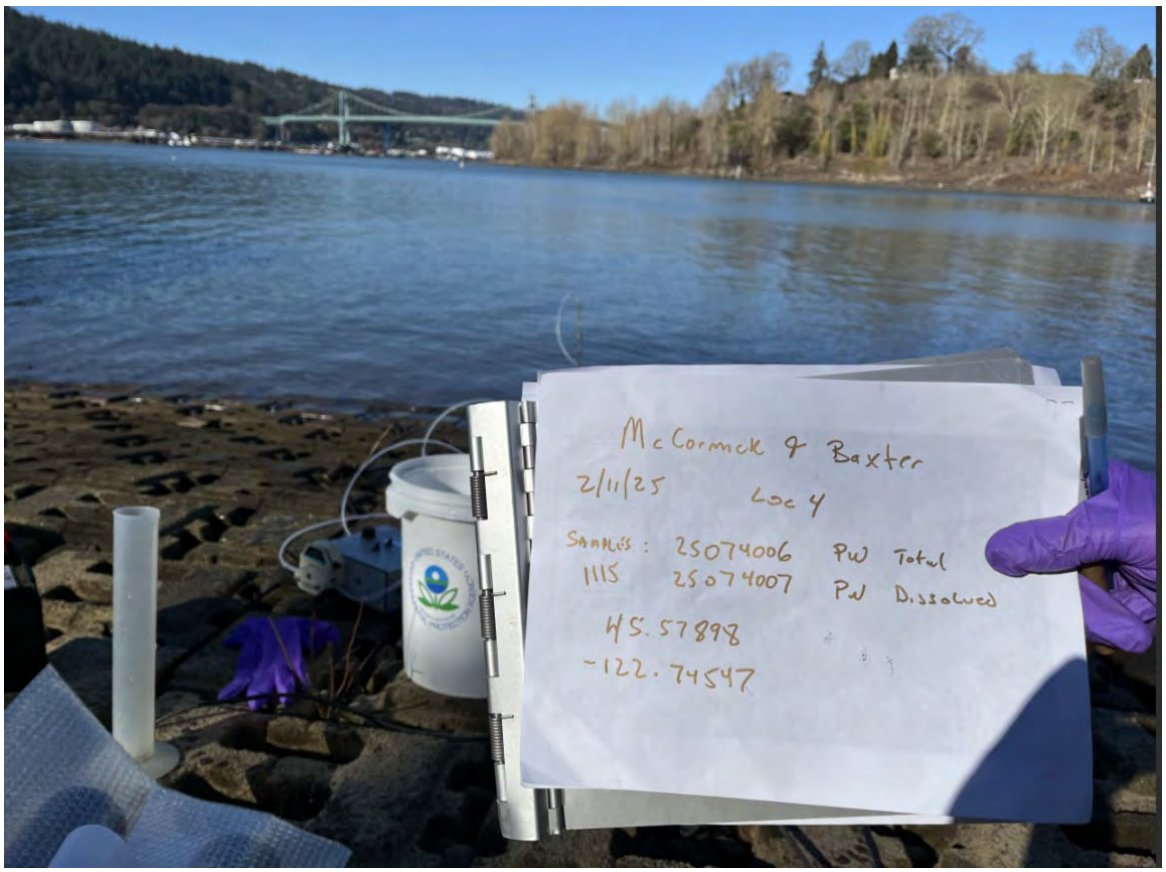

McCormick Bay Site
Date: 2/11/25
Time: 1035
GPS: WS. 53735
-122. 74087
Sensor ID#: 2407 4078
2407 4029

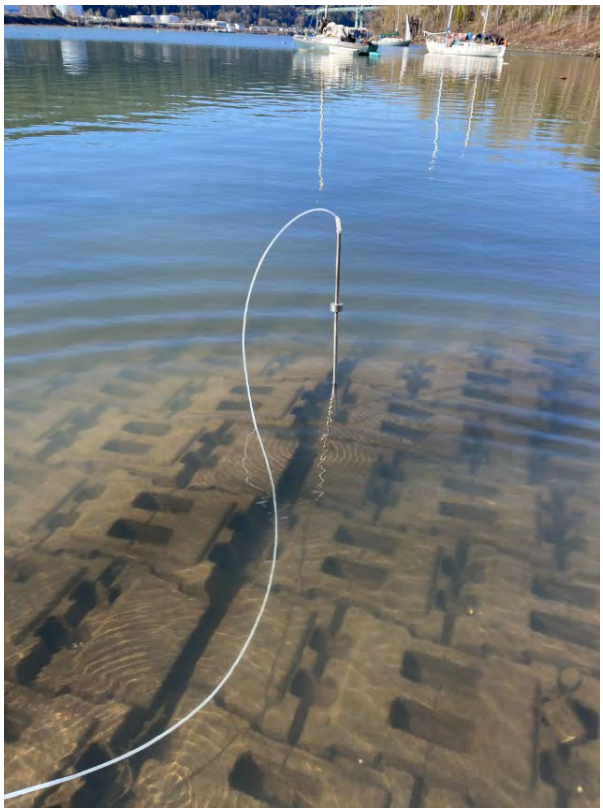

McCormick Bay Site
Date: 2/11/25
Time: 1035
GPS: WS. 53735
-122. 74087
Sensor ID#: 2407 4078
2407 4029
geo pump


Mcrarmick-Baxter
Date: 2/10
Time: 16:20
GPS: 45.57780°
-122.74327°


Mcrarmick-Baxter
Date: 2/10
Time: 16:20
GPS: 45.57780°
-122.74327°
Sample# 25074024 total
25074025 dissolved


McCormick+Baxter
Date: 2/10
Time: 16:20
GPS: 45.57780°
-122.74327°
Sample# 25074024 total
25074025 dissolved


McCormick & Baxter
2/11/25
Loc 4
Samples: 25074006 PW Total
1115 25074007 PW Dissolved
45.57898
-122.74547




McCormick:Baxter
Date: 2/11/25
Time: 12:15 Loc 5
GPS: 45.57992
-122.74470
Sample# 240740008
-40,4009


McCormick:Baxter
Date: 2/11/25
Time: 12:15 Loc 5
GPS: 45.57992
-122.74470
Sample# 240740008
-40,4009