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Sawyer Street 2008 Semi-annual Groundwater Monitoring Technical Memorandum

Environmental Monitoring, Sampling, and Analysis

New Bedford Harbor Superfund Site

New Bedford Harbor, MA

Final Technical Memorandum

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To: Robert Leitch, USACE North Atlantic Division New England District

From: Deirdre Dahlen, Battelle

Subject: Sawyer Street 2008 Semi-annual Groundwater Monitoring Results

This Technical Memorandum presents a summary of the groundwater monitoring activities conducted at the Sawyer Street Confined Disposal Facility (CDF) in New Bedford, Massachusetts during the 2008 semi-annual monitoring period. The 2008 monitoring study is a continuation of a multi-year groundwater sampling program to sample six groundwater wells located at the perimeter of the CDF. Results from previous programs are presented in ENSR (2006) and Battelle (2008a).

Results from the monitoring study are used to assess potential trends in concentrations of polychlorinated biphenyls (PCBs) as Aroclor and selected metals (cadmium, chromium, copper, and lead) and to evaluate the integrity of the CDF. At the request of the U.S. EPA, groundwater sampled in 2008 was also analyzed for volatile organic compounds (VOCs).

Field Activity Summary

Sampling was conducted in the spring and fall of 2008, on May 19-20, 2008 and November 6-7, 2008. During both events, *in-situ* water quality measurements (temperature, specific conductivity, dissolved oxygen [DO], pH, Oxidative Redox Potential [ORP], turbidity), groundwater levels, and samples of groundwater were collected at six wells located at the perimeter of the CDF, identified as MW-1, MW-3, MW-4A, MW-5, MW-6, and MW-7A (Figure 1). All field measurements and groundwater collection were conducted according to the Field Sampling Plan (FSP) developed for this investigation (Battelle, 2008b). Field activities are summarized briefly below.

Groundwater sampling was performed according to the procedures for Low-Flow (Low-Stress) Purging and Sampling based on EPA Region I Low Stress (flow) Purging and Sampling Groundwater Procedure for the Collection of Groundwater Samples from Monitoring Wells, Rev. 2, July 30, 1996 (EPA, 1996). A bladder pump (equipped with dedicated Teflon bladders) was used during both sampling events. Dedicated sample tubing was used to collect groundwater samples to minimize the risk of sample contamination and cross contamination between wells. Upon arrival for sample collection, the water level was measured with a cleaned water level tape and the well volume was calculated. The water level tape was cleaned between wells following decontamination procedures described in the FSP (Battelle, 2008b). The pump was then affixed to the dedicated tubing which was placed into the well. The water depth was measured again before purging the well to account for any water displacement from the pump. Groundwater samples were collected for PCBs (as Aroclor), metals, and VOC analysis once the well was purged and all diagnostic parameters (i.e., pH, DO, specific conductivity, turbidity, temperature, and ORP) achieved a steady state. The flow rate was verified using a graduated cylinder and timepiece and then recorded on the field log sheets.

Quality control (QC) samples were also collected to assess data quality in terms of precision and potential contamination. Field-based QC samples included one field duplicate sample and one equipment blank per sampling event. Additional groundwater was also collected for the preparation of laboratory-based QC samples (i.e., matrix spike and matrix spike duplicate).

Field measurements were recorded on detailed field logs sheets provided in Appendix A. The integrity of the groundwater samples was maintained by using cleaned, dedicated sampling tubing for each well, by not introducing contaminants into the samples during collection (e.g., wells were sampled from lowest contamination to highest contamination to reduce potential cross-contamination issues; the stainless steel bladder pump was cleaned in between wells), by collecting the samples in clean bottles provided by the analytical laboratories, by keeping the samples cold on ice during transport to the analytical laboratories, and by analyzing the samples within the required holding time.

In-situ Water Quality Summary

Water quality parameters were measured during the initial pumping of groundwater from the wells before the actual groundwater sample collection. *In-situ* measurements were made using an YSI® (Yellow Springs Instruments) multi-meter sonde and a flow-thru cell. The flow-thru cell was disconnected from the discharge line during the actual sample collection. The YSI® sonde was calibrated and used according to the manufacturer's specifications. Calibration records are documented on the field logs (Appendix A). Once the diagnostic parameters had stabilized, sample collection was initiated. *In-situ* measurements are summarized in Table 1.

Chemistry Water Quality Summary

Groundwater samples were analyzed for PCBs (as Aroclor), metals, and VOCs. PCB Aroclor analysis was performed by TestAmerica in Burlington, Vermont; metals analysis was performed by Battelle Marine Science Laboratory in Sequim, Washington; and VOC analysis was performed by Alpha Analytical in Mansfield, Massachusetts. Sample results are summarized in Table 2, and are compared to the Massachusetts Contingency Plan (MCP), Method 1 category GW-3 criteria for groundwater that has a potential to discharge to a surface water body (MADEP, 2008). Complete test results are provided in Appendix B.

Consistent with results from previous monitoring years (ENSR, 2006 and Battelle, 2008a), PCB and metals concentrations in all the groundwater samples collected during the May and November 2008 events were below the MCP GW-3 criteria (Table 2). Individual PCB Aroclors were undetected in all the groundwater samples except Aroclor 1242 at MW-4A (0.043 µg/L) during the May sampling event and Aroclor 1254 at MW-5 (0.032 µg/L) during the November sampling event (Appendix B). The target metals cadmium, chromium, copper, and lead were detected in all of the groundwater samples, albeit at low concentrations often comparable to low-level equipment blank contamination (see Quality Control section). Groundwater sampled at MW-7A, located along the southern boundary of the CDF, contained the highest concentrations of cadmium and copper (Table 2). The highest lead concentrations were measured in groundwater in well MW-1 (Table 2), located along the western boundary of the CDF. Chromium concentrations within each sampling event were relatively uniform across most locations; the lowest concentrations were measured at wells MW-5 and MW-6 during the spring event and at well MW-6 during the fall event.

With the exception of acetone, target VOCs were undetected in all the groundwater samples collected during the May and November 2008 events (Appendix B). While measured concentrations of acetone were comparable to low-level background contamination (see Quality Control section), sample concentrations were at least three orders of magnitude lower than the MCP GW-3 criteria (Table 2).

Quality Control

Analytical data received third party validation and the data were qualified according to Region 1 Data Validation guidelines. Qualifiers reported with the data represent the final qualifier assigned by the data validator. Results from the field QC samples were also evaluated to assess data quality in terms of precision (field replicate) and potential contamination (equipment blank) that may contribute to contaminant concentrations measured in the field samples. Results from the field replicate samples are summarized in Table 3 and results for the equipment blanks are presented with the sample data in Table 2.

Overall, PCB, metals, and VOCs results were comparable between the original and the replicate samples (Table 3), indicating that the sample collection methods were reproducible and that representative groundwater samples were collected.

Low-level contamination was measured in the equipment blanks: PCB Aroclor 1242 was detected at 0.095 µg/L in the fall 2008 blank; target metals were detected in equipment blanks during both sampling events; and acetone and methylene chloride were detected in the spring 2008 blank (Table 2). Potential impacts to data quality are:

- PCBs – The low-level PCB contamination does not appear to impact data quality because Aroclor 1242 was undetected in the associated field samples.
- Metals – Sample concentrations measured at levels less than five times the equipment blank values have been qualified by the data validator. While low-level contamination may have contributed to sample concentrations, all metals concentrations in all of the groundwater samples were well below the MCP GW-3 criteria (Table 2).
- VOCs – Sample concentrations of acetone measured at levels less than ten times the equipment blank value have been qualified by the data validator. While the low-level acetone contamination may have contributed to sample concentrations, acetone concentrations in all of the groundwater samples were at least three orders of magnitude below the MCP GW-3 criteria. The low-level methylene chloride contamination does not appear to impact data quality because methylene chloride was undetected in the associated field samples.

Summary

Semi-annual monitoring was performed in 2008 at the Sawyer Street CDF as part of the ongoing groundwater monitoring program. Groundwater levels, water quality parameters, organic contaminants, and metals were monitored in all six wells at the facility. Analysis of groundwater samples indicates that although low-level detections of PCB Aroclor, metals, and VOCs were observed, concentrations were all well below MCP GW-3 criteria. Overall, the groundwater data collected during the 2008 semi-annual monitoring suggest that the integrity of the CDF is currently maintained.

Literature Cited

Battelle, 2008a. Technical Memorandum: Sawyer Street 2007 Semi-annual Groundwater Monitoring Results -New Bedford, Massachusetts. Prepared by Battelle. May 2008.

Battelle, 2008b. Groundwater Monitoring Final Field Sampling Plan-New Bedford, Massachusetts. Prepared by Battelle. May 2008.

ENSR, 2006. Final Sawyer Street Groundwater Report: New Bedford Harbor Superfund Site - New Bedford, Massachusetts. Prepared by ENSR Corporation. December 2006.

EPA, 1996.EPA Region I Low Stress (flow) Purging and Sampling Groundwater Procedure for the Collection of Groundwater Samples from Monitoring Wells, Rev. 2, July 30, 1996.

Massachusetts Department of Environmental Protection (MADEP), 2008. MCP Method 1 Groundwater Standards. 310 CMR 40.0974(2). http://www.mass.gov/dep/cleanup/laws/0974_2.htm

Figure 1: Sawyer Street CDF Monitoring Well Locations

Table 1: Summary of *In-situ* Groundwater Data Collected Immediately Prior to Sampling

Event	Well ID	Sample Date/ Time	Depth to Water (ft)	pH	Specific Cond. (µS/cm)	Temp-erature (°C)	DO (mg/L)	Turbidity (NTU)	ORP (mV)	Purge Volume (L)	Flow Rate (mL/ min)	Color/ Odor	Draw-down[(a)] (ft)
May 2008	MW-7A	5/19/2008 12:23	10.89	6.63	860	11.56	0.93	12	242.7	8.586	102	clear	-0.38
	MW-6	5/19/2008 15:18	13.78	7.19	604	12.69	0.3	5.7	4.5	7.705	75	clear/no odor	-0.59
	MW-1	5/19/2008 17:33	17.03	6.91	932	12.26	0.84	7.1	5.8	3.62	45		-2.48
	MW-5	5/20/2008 10:05	10.09	7.45	3263	11.32	0.19	4.1	-51.4	2.95	74	clear/no odor	-1.79
	MW-4A	5/20/2008 12:08	11.5	6.81	5074	13.01	0	4.8	-275.5	3.525	65	clear/sulfide	-2.29
	MW-3	5/20/2008 14:22	15.52	7.02	3872	12.12	0.48	5.3	-77	4.4	75	yellow color	-1.82
November 2008	MW-7A	11/6/2008 8:28	11.11	6.66	877	15.29	0.9	0.1	204.8	2.35	55	clear	-0.15
	MW-6	11/6/2008 10:03	13.78	7.3	520	14.93	0.5	1.5	111	5.69	60		-0.86
	MW-1	11/6/2008 12:14	16.76	6.8	911	15.05	0.77	0.5	3.8	3.64	35	clear	-1.91
	MW-5	11/6/2008 13:01	9.61	7.85	1878	14.71	1.85	2.2	-154.7	2.6	60	sulfur odor	-1.61
	MW-4A	11/7/2008 8:55	12	7.06	4370	14.52	0.52	2.7	-352.2	4.51	65		-2.12
	MW-3	11/7/2008 9:16	15.82	7.41	4401	14.24	0.28	9.8	-212.7	3.01	55	light orange & no odor	-1.39

[(a)] Drawdown is the distance in feet the water level changed during the sampling process.

Table 2: PCB, Metal and VOC Groundwater Results, May and November 2008 Sampling Events

Well ID	Sample Date	Result (µg/L)					
		Total PCB[a]	Cadmium	Chromium	Copper	Lead	Acetone
MW-1	5/19/2008	— U[b]	0.249	5.35	0.984 U[c]	0.739	2.79 EB
	11/6/2008	— U[b]	0.435	1.78 U[c]	1.46 U[c]	0.894 U[c]	10.3
MW-3	5/20/2008	— UJ[b]	0.124	6.36	1.95	0.085 U[c]	8.4 EB
	11/7/2008	— U[b]	0.03	5.63	0.855 U[c]	0.063 U[c]	5.36
MW-4A	5/20/2008	0.043 J	0.028 U[c]	6.57	1.46	0.071 U[c]	3.05 EB
	11/7/2008	— UD[b]	0.027	5.62	2.27	0.175 U[c]	5.32
MW-5	5/20/2008	— U[b]	0.046 U[c]	1.89 U[c]	1.12 U[c]	0.061 U[c]	16 EB
	11/6/2008	0.032 J	0.052	4.04	2.10	0.274 U[c]	5 U
MW-6	5/19/2008	— U[b]	0.044 U[c]	2.45 U[c]	0.453 U[c]	0.057 U[c]	1.26 EB
	11/6/2008	— UJ[b]	0.052	0.346 U[c]	0.666 U[c]	0.183 U[c]	23.3
MW-7A	5/19/2008	— U[b]	0.711	5.28	4.99	0.071 U[c]	5 U
	11/6/2008	— U[b]	0.648	1.01 U[c]	4.99	0.023 U[c]	5 U
MCP GW-3 Criteria[d]		**10**	**4**	**300**	**NA**	**10**	**50000**
Equipment Blank	5/20/2008	— UJ[b]	0.011 J	0.843	0.269	0.077	7.19
	11/5/2008	0.095	0.005 U	0.608	0.354	0.078	5

[a] Total PCB calculated as the sum of Aroclors 1016, 1221, 1232, 1242, 1248, 1254 and 1260; a value of zero (0) used in summation for non-detects. For example, total PCB was calculated as follows for sample MW-4A collected on 05/20/2008:

Parameter	Result (µg/L)	Final Qual	Result (µg/L)	Comment
Aroclor 1016	0.047	U	0	zero substituted for non-detect
Aroclor 1221	0.047	U	0	
Aroclor 1232	0.047	U	0	
Aroclor 1242	0.043	J	0.043	J
Aroclor 1248	0.047	U	0	zero substituted for non-detect
Aroclor 1254	0.047	U	0	
Aroclor 1260	0.047	U	0	
			0.043 J	**Total PCB**

[b] PCB Aroclors undetected in the study samples at concentrations above the laboratory reporting limit (see Appendix B).
[c] Chemical detected at concentration <5X equipment blank values.
[d] MCP: Massachusetts Contingency Plan, Method 1 MCP GW-3 standard from 310 CMR 40.0974(2).

Key:
EB: Chemical not detected at concentration above 10X equipment blank values.
U: Chemical not detected at concentration above the laboratory reporting limit.
J: Estimated value.
NA: Not applicable.

Table 3: Field Replicate Results, May and November 2008 Sampling Events

Sampling Event/Well	Parameter	Result (µg/L)		RPD
		Sample	Replicate	
May 2008/ Well MW-5	Total PCB[a]	— U[b]	— U[b]	NA
	Cadmium	0.046 U[c]	0.043 U[c]	7%
	Chromium	1.89 U[c]	1.98 U[c]	5%
	Copper	1.12 U[c]	1.05 U[c]	6%
	Lead	0.061 U[c]	0.056 U[c]	9%
	Acetone	16 EB	16 EB	0%
November 2008/ Well MW-3	Cadmium	0.03	0.031	3%
	Chromium	5.63	5.92	5%
	Copper	0.855 U[c]	0.944 U[c]	10%
	Lead	0.063 U[c]	0.069 U[c]	9%
November 2008/Aerovox Well MW-6A[d]	Aroclor 1254	2.30 D	1.90 J	19%
	Tetrachloroethene	5.27	5.07	4%
	Cis-1,2-dichloroethene	14.3	14.4	1%
	Trichloroethene	113	113	0%

[a] Total PCB calculated as the sum of Aroclors 1016, 1221, 1232, 1242, 1248, 1254 and 1260; a value of zero (0) used in summation for non-detects.
[b] PCB Aroclors undetected in the study samples at concentrations above the laboratory reporting limit (see Appendix B).
[c] Chemical detected at concentration <5X equipment blank values.
[d] Groundwater monitoring at the Sawyer Street CDF and Aerovox site was performed in November 2008 as a single event. As a result, a shared field replicate was collected, for common test parameters (PCB and VOC), to satisfy the field QC requirements.

Key:
EB: Chemical not detected at concentration above 10X equipment blank values.
U: Chemical not detected at concentration above the laboratory reporting limit.
J: Estimated value.
D: Concentration from analysis of the sample at a secondary dilution.
NA: Not applicable
RPD: relative percent difference.