

June 29, 2017

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Mr. Kyle Jellison
Maine Department of Environmental Protection
17 State House Station
Augusta, Maine 04333-0017

Subject: 1st Quarter 2017 Short-Term Comprehensive Monitoring Plan Data Report
Orrington Remediation Site, Orrington, Maine

Dear Mr. Jellison:

Results from monitoring conducted in the first quarter of 2017 at the Orrington Remediation Site (Site) are provided in this letter report. Samples of groundwater, domestic water, surface water, and sediment were obtained according to the February 24, 2017 Short-Term Comprehensive Monitoring Plan (CMP), beginning in February 2017. Sampling locations included in the Short-Term CMP are shown on Figure 1.

Sampling in the first quarter 2017 was conducted to satisfy the following monitoring programs:

- Interim Extraction System (IES) Monitoring;
- Landfill 5 Groundwater Monitoring Program;
- Short-Term Remediation Monitoring; and
- Site Perimeter Monitoring.

Sampling was conducted during the weeks of February 13 and March 20, 2017. Samples were sent via courier to Alpha Analytical Laboratory (Alpha) of Westborough, Massachusetts, for analysis of parameters according to the Short-Term CMP and described further in the sections below.

Analytical results were quantified to the laboratory's method detection limit (MDL). Concentrations detected between the MDL and the laboratory's reporting limit (RL) were qualified by Alpha as estimated (J) values. Data were validated according to procedures outlined in the Short-Term CMP. Final laboratory analytical reports and electronic data deliverables (EDDs) containing validated data were submitted to MEDEP on April 12 and May 24.

All laboratory analytical data are considered usable for project objectives. Data validation reports are provided in Attachment 1.

IES MONITORING

Groundwater extraction rates from the five extraction wells that comprise the IES have been stable since established at the current nominal extraction rates in June 2015, as reported in monthly and quarterly reports in 2015 and 2016. The four northern extraction wells operate at a nominal flow rate of six gallons per minute (gpm), and the southernmost extraction well, EW-3, operates at a nominal flow rate of four gpm.

Beginning in late November 2016, the pump in MW-601 started limiting response to higher flows. By late December, with the potentiometer at 100%, the maximum flow rate decreased from six to approximately two gpm. In mid-January 2017, Woodard & Curran and SME personnel pulled the pump from this extraction well and found the brass fitting to have been corroded. The fitting was replaced with stainless steel, and the pump was replaced with a spare while the well was off-line. Flows were returned to the normal operation pumping rates noted above, and remained stable beyond the end of the first quarter.

Water level elevations at and surrounding the five extraction wells comprising the IES are recorded hourly by data logging pressure transducers. Pressure transducer graphs from individual monitoring points are provided in Attachment 2, and transducer data are provided in Attachment 3. Average groundwater elevations are shown on Figure 2, along with the interpreted groundwater surface in the area immediately surrounding the IES. To remove the effects of tidal variations to groundwater levels, the average water levels recorded over a three-day period between March 17 and 19, 2017 were used to construct the contours shown on Figure 2. Average water level elevations during this period indicate drawdown of 0.5 to 1.5 feet at the extraction wells, and hydraulic capture of groundwater extending beyond EW-1 and EW-3. Figure 2 illustrates that the IES is successful in capturing mercury in the groundwater emanating from the Landfill 1 area before it discharges to the river.

Quarterly monitoring of IES extraction wells and the Groundwater Treatment Plant (GWTP) Influent was conducted according to the Short-Term CMP on March 20, 2017. Monitoring parameters are provided in Table 1.

TABLE 1
INTERIM EXTRACTION SYSTEM MONITORING

Monitoring Locations	Monitoring Frequency	Sample Parameters	Sampling Date
Extraction Wells EW-1, EW-2, EW-3, EW-4, and MW-601	Quarterly	Total mercury, chloropicrin, chloride	March 20, 2017
GWTP Influent	Quarterly	Total mercury, chloropicrin, MPS VOCs, chloride, alkalinity, iron, manganese, and sodium	March 20, 2017

A summary of analytical results is provided in Table 2. Analytical results from March 2017 sampling indicate chloropicrin and chloride concentrations generally consistent with past monitoring results. Elevated mercury concentrations were detected relative to recent monitoring, from extraction wells EW-2, EW-3, and EW-4. Detected concentrations of mercury and chloropicrin over time are shown on Figure 2.

TABLE 2
LABORATORY ANALYTICAL DATA SUMMARY – MARCH 20, 2017

Parameter	Analytical Method	EW-1	EW-2	EW-3	EW-4	MW-601	GWTP Influent
Mercury (µg/L)	7470	57.4	10.7	18.9	88.7	107	60.9
Chloropicrin (µg/L)	8011	2.99	13,600	2,020	5,250	885	4,710
Chloride (mg/L)	E300	200	530	460	500	390	420
Average Pumping Rate (gpm)	-	6	6	4	6	6	28

Summary tables of field parameters and laboratory analytical data are provided in Attachment 4.

LANDFILL 5 MONITORING

Landfill 5 Detection and Assessment monitoring was conducted according to the Short-Term CMP during the week of March 20, 2017. A summary of the Landfill 5 monitoring programs is provided in Table 3. Data have been submitted electronically to MEDEP as noted above, and will be provided in an annual report in the first quarter of 2018, according to the usual

schedule of reporting. Laboratory analytical results are generally consistent with recent monitoring results, with detected concentrations within the historical range of detections. Summary data tables of field parameters and laboratory analytical data are provided in Attachment 5.

TABLE 3
LANDFILL 5 MONITORING PROGRAMS

Program	Frequency	Monitoring Wells	Sample Parameters
Detection Monitoring	Semiannual (Quarters 1 and 3) ⁽²⁾	B-304-B1/O1 ⁽¹⁾ B-306-B3 ⁽¹⁾ B-307-B1/B2 B-307-O1 ⁽¹⁾	Total organic halogens, total organic carbon, pH, specific conductance, temperature, iron, manganese, sodium, mercury, chloride, sulfate, phenols
Assessment Monitoring	Quarterly	B-303-B1/B2/B3/O1 ⁽¹⁾ B-306-B1/B2	VOCs, mercury(unfiltered), pH, specific conductance
<p><u>Notes:</u></p> <p>1. Monitoring wells B-304-O1, B-306-B3, B-307-O1, and B-303-O1 have historically either been dry or yielded an insufficient quantity of groundwater to obtain a groundwater sample.</p> <p>2. Quarters 1 and 3 are for January through March and July through September, respectively.</p>			

REMEDIATION MONITORING

Mallinckrodt began remediation monitoring according to the Short-Term CMP in February 2017. Remediation monitoring during the first quarter 2017 included monthly and quarterly monitoring in the vicinity of the Scrap Metal Yard and Southerly Stream remediation areas. A summary of these monitoring programs is provided in Table 4. Summary tables of field parameters, laboratory analytical data, and water level elevations from remediation monitoring are provided in Attachment 6.

TABLE 4
REMEDIATION MONITORING PROGRAMS

Area	Media	Locations	Parameters	Frequency
Scrap Metal Yard and Southerly Stream (middle)	Groundwater	MW-405-O1, Chlorate Building MH	Total Mercury	Quarterly
	Surface Water	SW15-5A		Monthly
	Sediment	SD15-5, SD15-6A		Monthly
	Water Level	MW-405-O1/B1, MW-706-O1/B1, PZ-3	N/A	Quarterly
Southerly Stream (southern)	Groundwater	B-321-B2, B327-O1, MW-504-O1/B1, MW-511-B2/B1, MW-702-O1/B2	Total Mercury	Quarterly
	Surface Water	SW17-1	Total Mercury	Monthly
	Water Level	B-321-O1/B1/B2, B-327-O1, MW-504-O1/B1, MW-505-B1/B2, MW-509-B1, MW-511-B1/B2, MW-702-O1/B1/B2, MW-703-B1/B2	N/A	Quarterly

Sampling in the vicinity of the Scrap Metal Yard remediation area was conducted on February 15 and March 22, 2017, in general accordance with the Short-Term CMP. During the February monitoring event, the surface water and sediment sampling locations were not accessible due to the presence of high snow drifts. All other monitoring locations were accessible and samples were obtained according to the plan.

Surface water and groundwater data are generally consistent with recent monitoring results, with detected concentrations of mercury consistent with or lower than recent results. The exception to this is March 2017 sampling of the Chlorate Building underdrain (Chlorate Building MH). Specific conductivity and the detected mercury concentration in the March sample are higher than the data from February. Although the data were considered usable following validation, the laboratory report included a note about matrix interference. SME returned to this sampling location during May (this sampling was not part of the Short-Term CMP schedule) to follow up on these anomalous results. The June quarterly sampling took place the week of June 19, 2017. Laboratory analytical data will be validated and reported to MEDEP according to the usual schedule.

Sediment sampling results from location SD15-5 in March 2017 indicate lower mercury concentrations than baseline sampling conducted in 2015. No samples were collected from location SD15-6A prior to remediation monitoring. All sediment data from SMY sampling indicated concentrations below the MPS of 2.2 milligrams per kilogram (mg/Kg).

Sampling in the vicinity of the Southerly Stream remediation area was conducted on February 14 and 15 and March 21, 2017, in general accordance with the Short-Term CMP. A sample could not be obtained from MW-511-B1 during either event because the monitoring point was frozen. All other monitoring locations were accessible and samples were obtained according to the plan. Mercury analytical results are generally consistent with recent monitoring. Where mercury was detected above laboratory reporting limits, the concentrations are within the range of recent detections. No samples were collected from surface water sampling location SW17-1 prior to remediation monitoring, so there is no baseline with which to compare; however, mercury concentrations from this location are below the MPS for on-Site surface water (0.91 micrograms per liter, or µg/L).

SITE PERIMETER MONITORING

A summary of the Site Perimeter monitoring program is provided in Table 5. Site Perimeter monitoring was conducted during the week of March 20, 2017. Sampling was conducted according to the Short-Term CMP, with several exceptions. The sampling team was not able to reach the well bottom of B-320-B1 with sampling tubing during the March sampling event. During a subsequent site visit, SME's crew was able to thread tubing to an appropriate sampling depth and a grab sample was collected during the May sampling event. This well was also sampled during the 2nd quarter June monitoring round. Monitoring well materials were installed in P-13 according to MEDEP approval, during the week of June 5, 2017, and monitoring wells P-13-B1 and P-13-B2 were developed during the week of June 5. These wells were sampled during the 2nd quarter June monitoring round. Monitoring points MW-511-B1, MW-704-O1, and MW-704-O2 were frozen during the March sampling event, and no samples were obtained. All other monitoring was conducted according to the Short-Term CMP.

TABLE 5

SITE PERIMETER MONITORING PROGRAM

Monitoring Locations	Site Area	Sample Parameters
P-13	Landfill 3	Total mercury, chloropicrin, MPS VOCs, chloride
MW-704-O1/O2	Landfill 2	Total mercury, chloride
MW-511-B1/B2	Ferry Road	Total mercury, chloride
B-321-B1/B2	Ferry Road	Total mercury, chloride
Haseltine and Safian residences	Ferry Road	Total mercury, chloride
B-320-O1/B1	Landfill 1	Total mercury, chloropicrin, chloride, MPS SVOCs

Laboratory analytical results are generally consistent with recent monitoring results, with detected concentrations within the historical range of detections. From the samples obtained

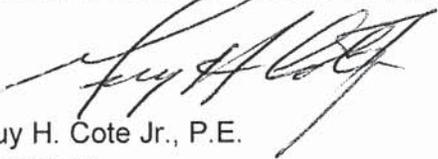
in March 2017, the only exception is chloropicrin at B-320-O1, which was not detected above laboratory reporting limits ($<0.203 \mu\text{g /L}$), below previously-detected concentrations of 12 to 18 $\mu\text{g /L}$. Summary data tables of field parameters and laboratory analytical data are provided in Attachment 7.

CLOSING

The 2nd quarter 2017 sampling and water level monitoring event was completed during the week of June 19, 2017 and MEDEP was informed of that sampling schedule. If you have any questions concerning the monitoring programs conducted as part of the Short-Term CMP, please do not hesitate to contact Kathryn Zeigler, Lisa Jacob, or me.

Very truly yours,

SEVEE & MAHER ENGINEERS, INC.



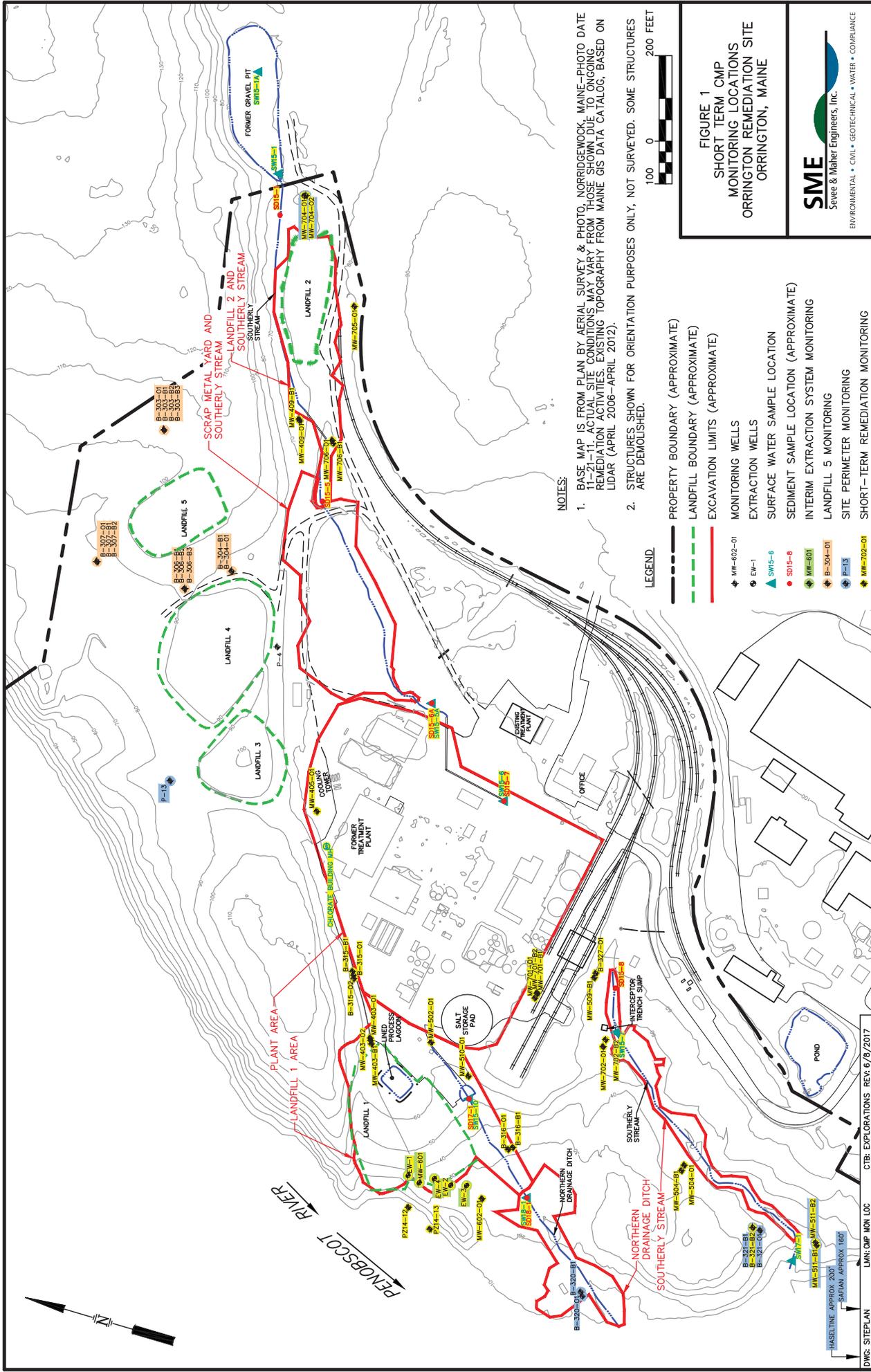
Guy H. Cote Jr., P.E.
President

cc: Kathryn Zeigler, Mallinckrodt US LLC
John Beane, Maine DEP
Chris Greene, Geosyntec

Attachments:

- Figure 1 – Short-Term CMP Monitoring Locations
- Figure 2 – Interpreted Groundwater Phreatic Surface
- Figure 3 – Mercury and Chloropicrin Concentration Plots
- Attachment 1 – Data Validation Reports
- Attachment 2 – Transducer Graphs
- Attachment 3 – Transducer Data (Excel Format)
- Attachment 4 – Interim Extraction System Data Summary Tables
- Attachment 5 – Landfill 5 Data Summary Tables
- Attachment 6 – Remediation Monitoring Data Summary Tables
- Attachment 7 – Site Perimeter Data Summary Tables

FIGURES



NOTES:

1. BASE MAP IS FROM PLAN BY AERIAL SURVEY & PHOTO, NORBRIDGECK, MAINE—PHOTO DATE 11-21-11. ACTUAL SITE CONDITIONS MAY VARY FROM THOSE SHOWN DUE TO ONGOING REMEDIATION ACTIVITIES. EXISTING TOPOGRAPHY FROM MAINE GIS DATA CATALOG, BASED ON LIDAR (APRIL 2006-APRIL 2012).
2. STRUCTURES SHOWN FOR ORIENTATION PURPOSES ONLY, NOT SURVEYED. SOME STRUCTURES ARE DEMOLISHED.



FIGURE 1
SHORT TERM CMP
MONITORING LOCATIONS
ORRINGTON REMEDIATION SITE
ORRINGTON, MAINE



- LEGEND**
- PROPERTY BOUNDARY (APPROXIMATE)
 - - - LANDFILL BOUNDARY (APPROXIMATE)
 - - - EXCAVATION LIMITS (APPROXIMATE)
 - ◆ MW-602-01 MONITORING WELLS
 - ⊙ EW-1 EXTRACTION WELLS
 - ▲ SW15-6 SURFACE WATER SAMPLE LOCATION
 - SD15-5 SEDIMENT SAMPLE LOCATION (APPROXIMATE)
 - ⊕ IW-601 INTERIM EXTRACTION SYSTEM MONITORING
 - ⊕ P-35 LANDFILL 5 MONITORING
 - ⊕ P-35 SITE PERIMETER MONITORING
 - ⊕ MW-702-01 SHORT-TERM REMEDIATION MONITORING

CTB: EXPLORATIONS, REV. 6/8/2017

LMN: CMP MON LOC

BASELINE APPROX 2007
 SAGIAN APPROX 160

DWG: SITEPLAN

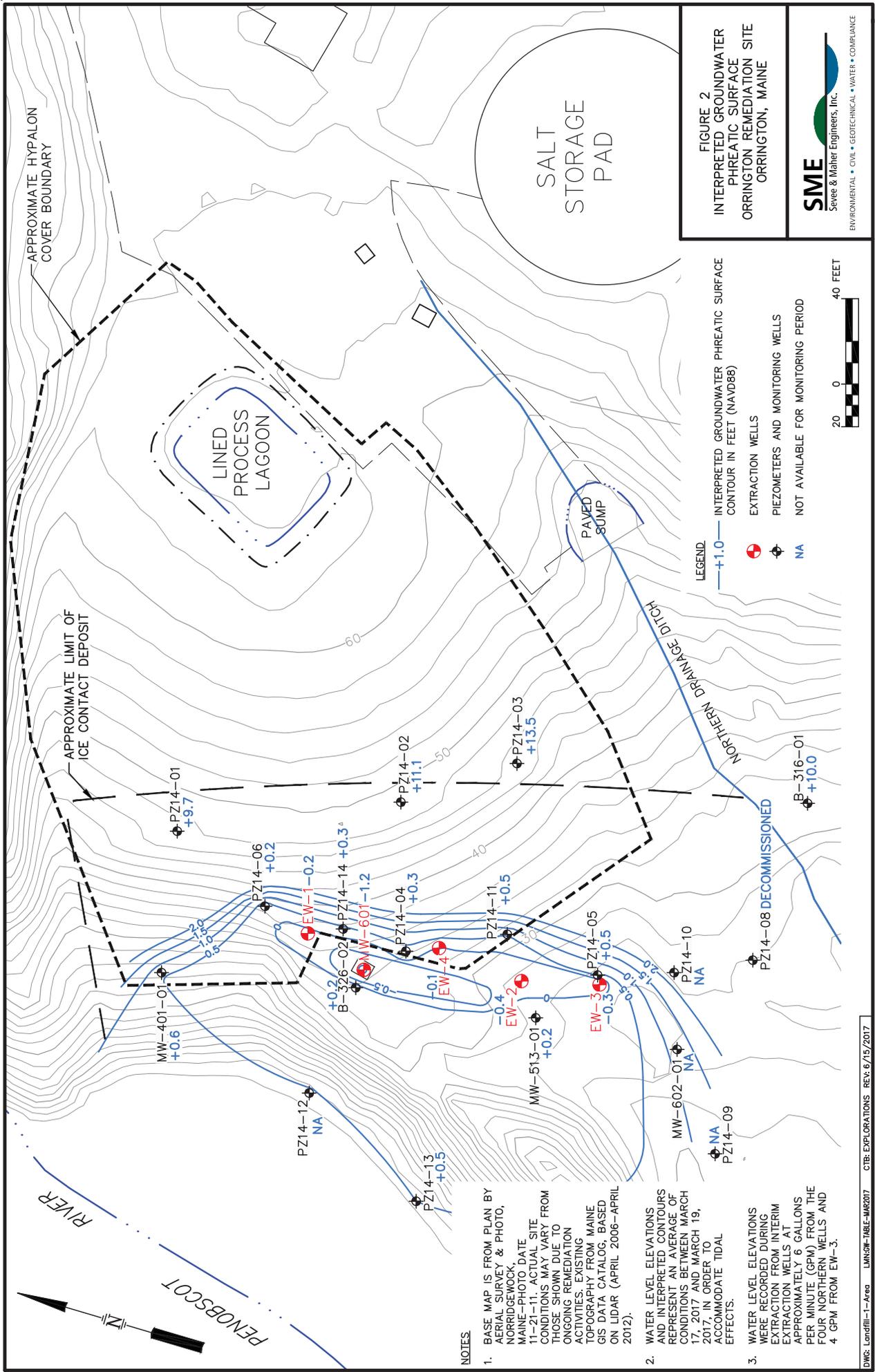


FIGURE 3
MERCURY AND CHLOROPICRIN CONCENTRATION PLOTS
INTERIM EXTRACTION SYSTEM
ORRINGTON REMEDIATION SITE
ORRINGTON, MAINE

