

September 21, 2017

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

Subject: 2nd Quarter 2017 Short-Term Comprehensive Monitoring Plan Data Report
Orrington Remediation Site, Orrington, Maine

Dear Mr. Jellison:

Results from monitoring conducted in the second 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). Sampling locations included in the Short-Term CMP are shown on Figure 1.

Sampling in the second 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 April 24, May 22, May 29, and June 19, 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 Maine Department of Environmental Protection (MEDEP) on June 15, July 26, and August 18.

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 each operate at a nominal flow rate of 6 gallons per minute (gpm), and the southernmost extraction well, EW-3, operates at a nominal flow rate of 4 gpm.

In May 2017, water was observed seeping to the ground surface around the steel casing of EW-2. A grab sample of water from the seep was obtained and submitted for laboratory analysis of chloropicrin and mercury. As Mallinckrodt reported to MEDEP (via email, May 30, 2017), the seep grab sample contained both parameters at concentrations near or within the range of concentrations detected in samples from EW-2, indicating that the seep water was groundwater migrating up the well casing from a leak in the piping. Flows from the IES wells were adjusted to suspend extraction from EW-2 and increase extraction rates from the other four wells by approximately one gpm each, and these pumping rates were maintained during the ten-day period until the leak was repaired. On June 8th a limited excavation was conducted around EW-2, which exposed a loose connection at a union collar. Connections were tightened and the line was pressure tested. No leaks were observed during a 45-minute testing period, after which the excavation was backfilled. Flows were returned to the normal operation pumping rates noted above and remained stable beyond the end of the second 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 four-day period between June 15 and 18, 2017 were used to construct the contours shown on Figure 2. Average water level elevations during this period indicate drawdown of about 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 June 19, 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	June 19, 2017
GWTP Influent	Quarterly	Total mercury, chloropicrin, MPS VOCs, chloride, alkalinity, iron, manganese, and sodium	June 19, 2017

A summary of analytical results is provided in Table 2. Analytical results from June 2017 sampling indicate mercury, chloropicrin, and chloride concentrations are generally consistent with past monitoring results. There were minor laboratory quality control issues with the initial run of chloropicrin analyses, discussed in greater detail in the data validation report provided in Attachment 1, and the results were qualified as estimated (J) during validation. The laboratory re-extracted the samples and ran a second batch; however, the second extraction was beyond the laboratory hold time. The concentrations from the second batch analytical results for all extraction well and GWTP Influent samples were lower than the initial run. Since the validated data are considered usable for project objectives, the data from the initial run are included and discussed herein. Detected concentrations of mercury and chloropicrin over time are shown on Figure 2.

TABLE 2
LABORATORY ANALYTICAL DATA SUMMARY – JUNE 19, 2017

Parameter	Analytical Method	EW-1	EW-2	EW-3	EW-4	MW-601	GWTP Influent
Mercury (µg/L)	7470	60.0	4.34	7.28	47.7	74.0	39.5
Chloropicrin (µg/L)	8011	29.9	13,000	3,150	7,790	2,880	5,900
Chloride (mg/L)	E300	160	350	270	380	300	300
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 Assessment monitoring was conducted according to the Short-Term CMP during the week of June 19, 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
Notes: 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. 2. Quarters 1 and 3 are for January through March and July through September, respectively.			

REMEDATION MONITORING

Mallinckrodt began remediation monitoring, according to the Short-Term CMP, in February 2017. Remediation monitoring during the second quarter 2017 included monthly and quarterly monitoring in the vicinity of the Scrap Metal Yard, Southerly Stream, and Landfill 2 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.

Sampling in the vicinity of the Scrap Metal Yard remediation area was conducted on April 24, May 22 and 24, and June 20 and 21, 2017, in general accordance with the Short-Term CMP. No samples were collected at SD15-5 during second quarter monitoring since there is no longer a drainage swale and therefore no sediment accumulation in that area due to re-grading associated with remediation activities. All other monitoring locations were accessible and samples were obtained according to the plan.

TABLE 4
REMEDATION 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
Landfill 2 and Southerly Stream (northern)	Groundwater	MW-74-O1/O2	Total Mercury, Carbon Tetrachloride	Monthly
	Groundwater	MW-409-O1/B1, MW-705-O1, MW-706-O1/B1		Quarterly
	Surface Water	SW15-1, SW15-1A, SW15-5A	Total Mercury	Monthly
	Sediment	SD15-1, SD15-6A		Monthly
	Water Level	B-301-O1/O2/B1, MW-409-O1/B1, MW-74-O1/O2, MW-705-O1, MW-706-O1/B1	N/A	Quarterly

Surface water and groundwater data are generally consistent with recent monitoring results, including sampling from the Chlorate Building underdrain (Chlorate Building MH). As reported in the 1st quarter data transmittal report, measured specific conductivity, and detected mercury concentration in March 2017 sampling were higher than the results of initial remediation monitoring at this location from sampling in February 2017. This location was re-sampled in May 2017 (not part of the Short-Term CMP schedule for this location) and again in June 2017 as part of Short-Term CMP monitoring; observations and laboratory data remain consistent with the March 2017 results. Mercury concentrations at this monitoring point remained above the MPS of 2 micrograms per liter (µg/L) during the second quarter 2017; however, all groundwater from the Chlorate Building underdrain system is collected and transmitted to the GWTP for treatment and discharge.

As noted above, no sediment samples were obtained from location SD15-5 during second quarter monitoring. Sediments from location SD15-6A had mercury concentrations below the MPS of 2.2 milligrams per kilogram (mg/Kg) during second quarter monitoring.

Sampling in the vicinity of the Southerly Stream remediation area was conducted on April 24, May 22, and June 20 and 21, 2017, in general accordance with the Short-Term CMP. All 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 and below the MPS. Samples were not 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 µg/L).

Remediation monitoring in the vicinity of the Landfill 2 remediation area began in May 2017. Sampling was conducted on May 22 and 30, and June 20 and 21, 2017, in accordance with the Short-Term CMP. Groundwater and surface water analytical results are consistent with recent monitoring and below MPS where parameters were detected above laboratory reporting limits. Sediments obtained in second quarter monitoring had mercury concentrations below the MPS.

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 June 19, 2017. Sampling was conducted according to the Short-Term CMP, which included the first monitoring round conducted at newly-completed monitoring locations P-13-B1 and P-13-B2. A summary of Site Perimeter monitoring is provided in Table 5.

TABLE 5
SITE PERIMETER MONITORING PROGRAM

Monitoring Locations	Site Area	Sample Parameters
P-13-B1, P-13-B2	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 or below the historical range of detections. Samples from newly-installed monitoring points P-13-B1 and P-13-B2 had concentrations below either laboratory reporting limits or the MPS, with the exception of chloropicrin (40.1 micrograms per liter, or µg/L) and carbon tetrachloride (4.1 µg/L) detected at P-13-B1. The second set of samples from these new monitoring points will be obtained during third quarter Site Perimeter monitoring in September 2017.

Summary data tables of field parameters and laboratory analytical data are provided in Attachment 7.

CLOSING

The third quarter 2017 sampling and water level monitoring event was conducted during the week of September 11, 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.



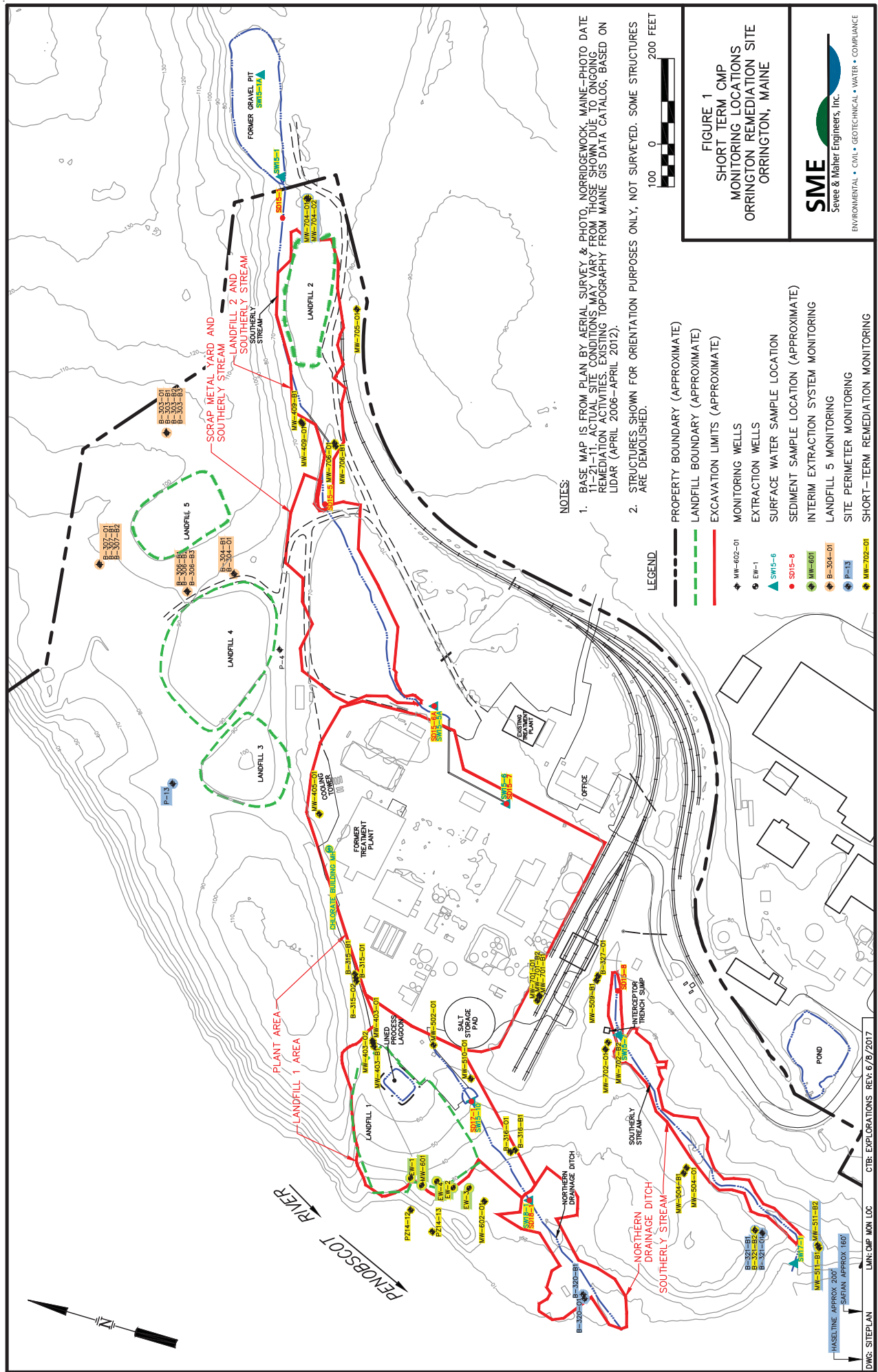
Guy H. Cote Jr., P.E.
President

cc: Kathryn Zeigler, Mallinckrodt US LLC
Chris Evans, 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



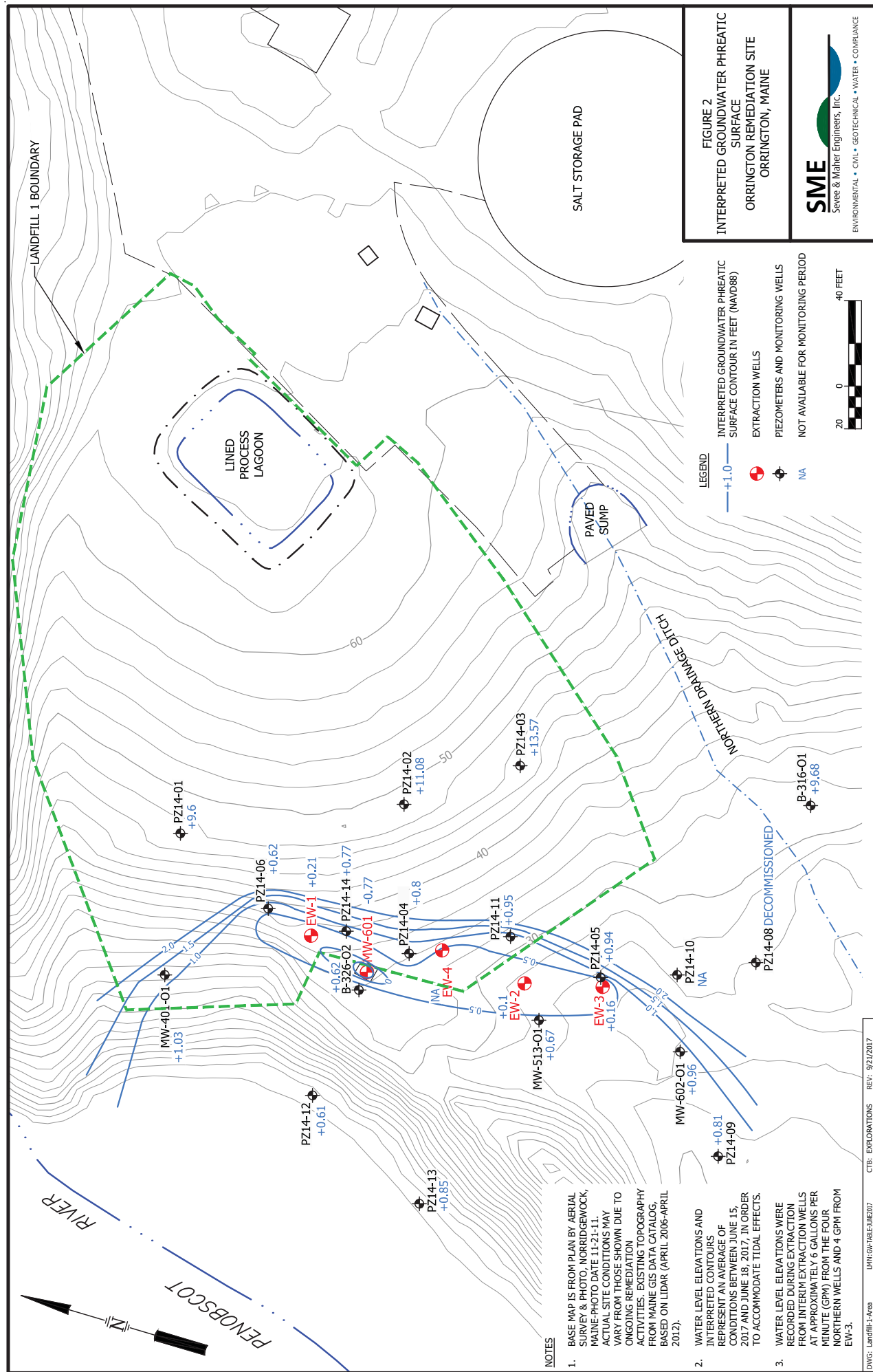


FIGURE 3

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

