

November 28, 2017

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

Subject: 3rd Quarter 2017 Short-Term Comprehensive Monitoring Plan Data Report
Orrington Remediation Site, Orrington, Maine

Dear Mr. Jellison:

Results from monitoring conducted in the third 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 third 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 July 17, August 14, and September 11, 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 August 29, September 22, October 19, and November 20, 2017.

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.

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 September 5 and 7, 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 September 13, 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	September 13, 2017
GWTP Influent	Quarterly	Total mercury, chloropicrin, MPS VOCs, chloride, alkalinity, iron, manganese, and sodium	September 13, 2017

A summary of analytical results is provided in Table 2. Analytical results from September 2017 sampling indicate mercury, chloropicrin, and chloride concentrations are generally consistent with past monitoring results. There was a quality control issue with the initial run of chloropicrin analysis from the sample obtained from EW-1 (discussed in greater detail in the data validation report provided in Attachment 1). At a dilution of 5 times, the laboratory qualified the result with an “E” flag to indicate that the result is estimated because it exceeded the calibration range. The extract for a dilution at 10 times was analyzed outside of technical hold time, and is considered estimated. Since the reported concentration of this volatile parameter in the second

run is higher than the initial E-qualified result, we accept the estimated concentration from the higher dilution, which is included and discussed herein. Detected concentrations of mercury and chloropicrin over time are shown on Figure 2.

TABLE 2
LABORATORY ANALYTICAL DATA SUMMARY – SEPTEMBER 13, 2017

Parameter	Analytical Method	EW-1	EW-2	EW-3	EW-4	MW-601	GWTP Influent
Mercury (µg/L)	7470	98.1	3.80	5.58	41.7	118	55.5
Chloropicrin (µg/L)	8011	66.5	9,120	1,260	8,510	1,940	3,400
Chloride (mg/L)	E300	420	360	250	410	500	400
Average Pumping Rate (gpm)	-	6	5.5	4	5.5	6	27

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 September 11, 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 third 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.

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-704-O1/O2, MW-705-O1, MW-706-O1/B1	N/A	Quarterly

Sampling in the vicinity of the Scrap Metal Yard remediation area was conducted on July 17 and 19, August 15 and 16, and September 13, 2017, in general accordance with the Short-Term CMP. No samples were collected at SD15-5 during September 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.

Surface water is generally consistent with recent monitoring results. Groundwater from the Chlorate Building underdrain (Chlorate Building MH) had a lower reported mercury concentration than samples from the prior two quarters. Results were consistent with concentrations detected in February 2017, and in earlier samples from nearby SW15-9 (former surface/storm water monitoring point that included the Chlorate Building underdrain discharge).

As noted above, no sediment samples were obtained from location SD15-5 during third quarter monitoring. Sediments from location SD15-6A had mercury concentrations above the MPS of 2.2 milligrams per kilogram (mg/Kg), but below baseline sampling conducted in 2015¹ during third quarter monitoring.

Sampling in the vicinity of the Southerly Stream remediation area was conducted on July 17, August 15, and September 12 and 13, 2017, in 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 was conducted on July 17 and 19, August 15 and 16, and September 13, 2017, in general accordance with the Short-Term CMP. Groundwater monitoring at five monitoring wells was scheduled for this program; however, these samples were not obtained in September due to a planning oversight. Although not in the third quarter, an extra sampling of these five monitoring points is planned for November in order to complete the intended number of sampling rounds at these points.

Groundwater and surface water analytical results are consistent with recent monitoring and below MPS where parameters were detected above laboratory reporting limits. As noted above, sediments from location SD15-6A had mercury concentrations above the MPS of 2.2 milligrams per kilogram (mg/Kg), but below baseline sampling conducted in 2015 during third quarter monitoring. Other sediments obtained in third 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 September 11, 2017. Sampling was conducted according to the Short-Term CMP. A summary of Site Perimeter monitoring is provided in Table 5.

¹ Sevee & Maher Engineers, Inc., March 25, 2016. Current Conditions Monitoring Data Transmittal, Orrington Remediation Site, Orrington, Maine.

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, with the exception of P-13-B1. Concentrations of chloropicrin and carbon tetrachloride in samples obtained from this monitoring point in September were both higher than previous concentrations and above MPS. Additionally, given the high concentrations of chloropicrin in the two samples (parent and field duplicate) obtained from this location and the resulting dilutions, laboratory reporting limits for other volatile compounds were elevated, including two parameters (methylene chloride and 1,1-dichloroethene) for which the reporting limits were above MPS during third quarter monitoring. Follow-up sampling was conducted in October, and results were generally consistent with September sampling. October data will be reported to MEDEP in the 4th quarter data transmittal, and validated data will be submitted to MEDEP according to Short-Term CMP procedures. Monitoring of these points will be conducted on a quarterly basis as established in the Short-Term CMP. Additionally, hydrogeology and groundwater geochemistry of this area of the Site will be the subject of additional investigations and testing, intended for 2018.

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

CLOSING

The fourth quarter 2017 sampling and water level monitoring event is scheduled to be conducted during the week of December 11, 2017 and MEDEP has been 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 or me.

Very truly yours,

SEVEE & MAHER ENGINEERS, INC.



Lisa J. Jacob, C.G.
Senior Geologist

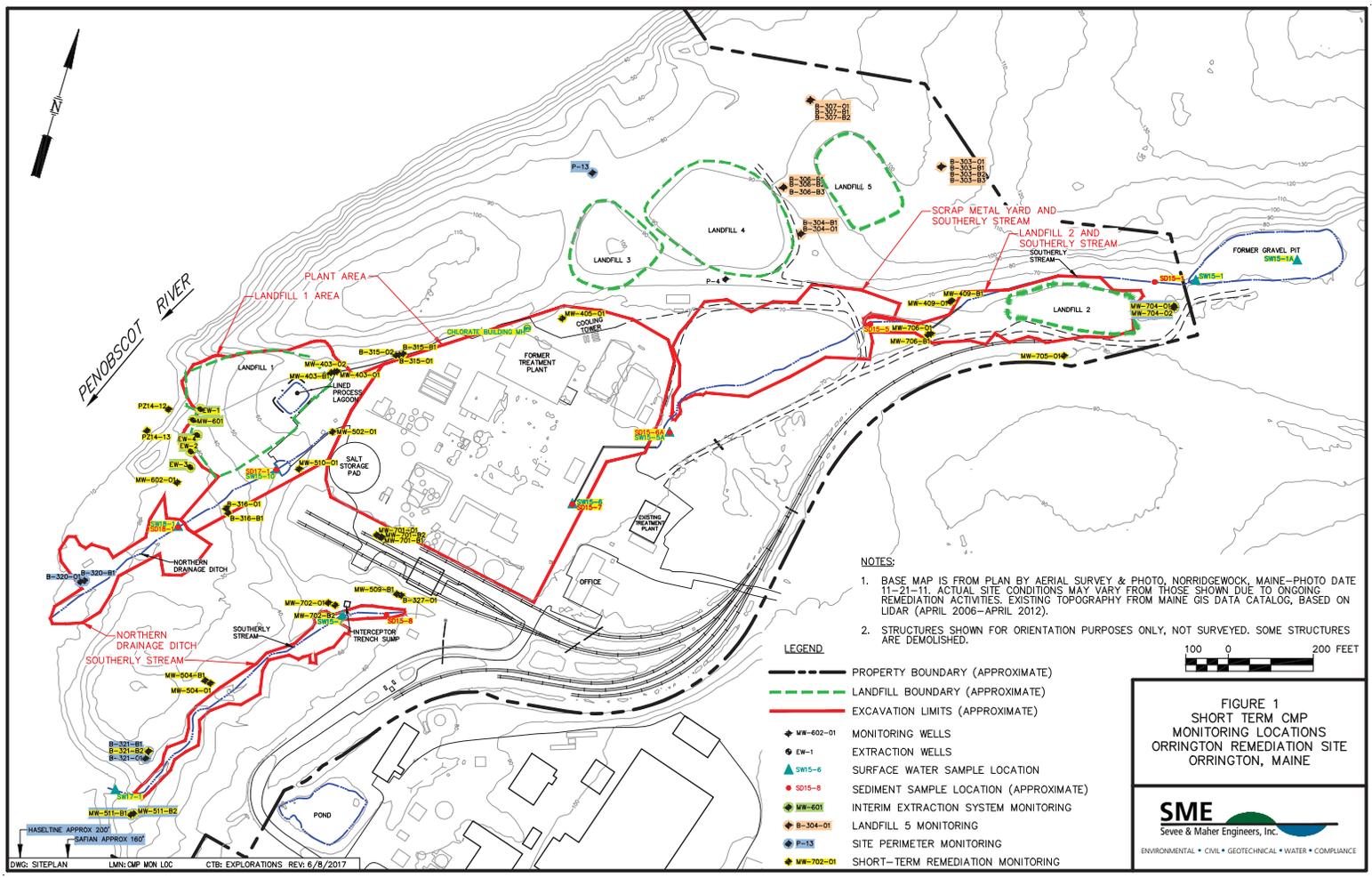
Attachments:

- 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

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

FIGURES

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NOTES:

1. BASE MAP IS FROM PLAN BY AERIAL SURVEY & PHOTO, NORRIDGEWOCK, 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.

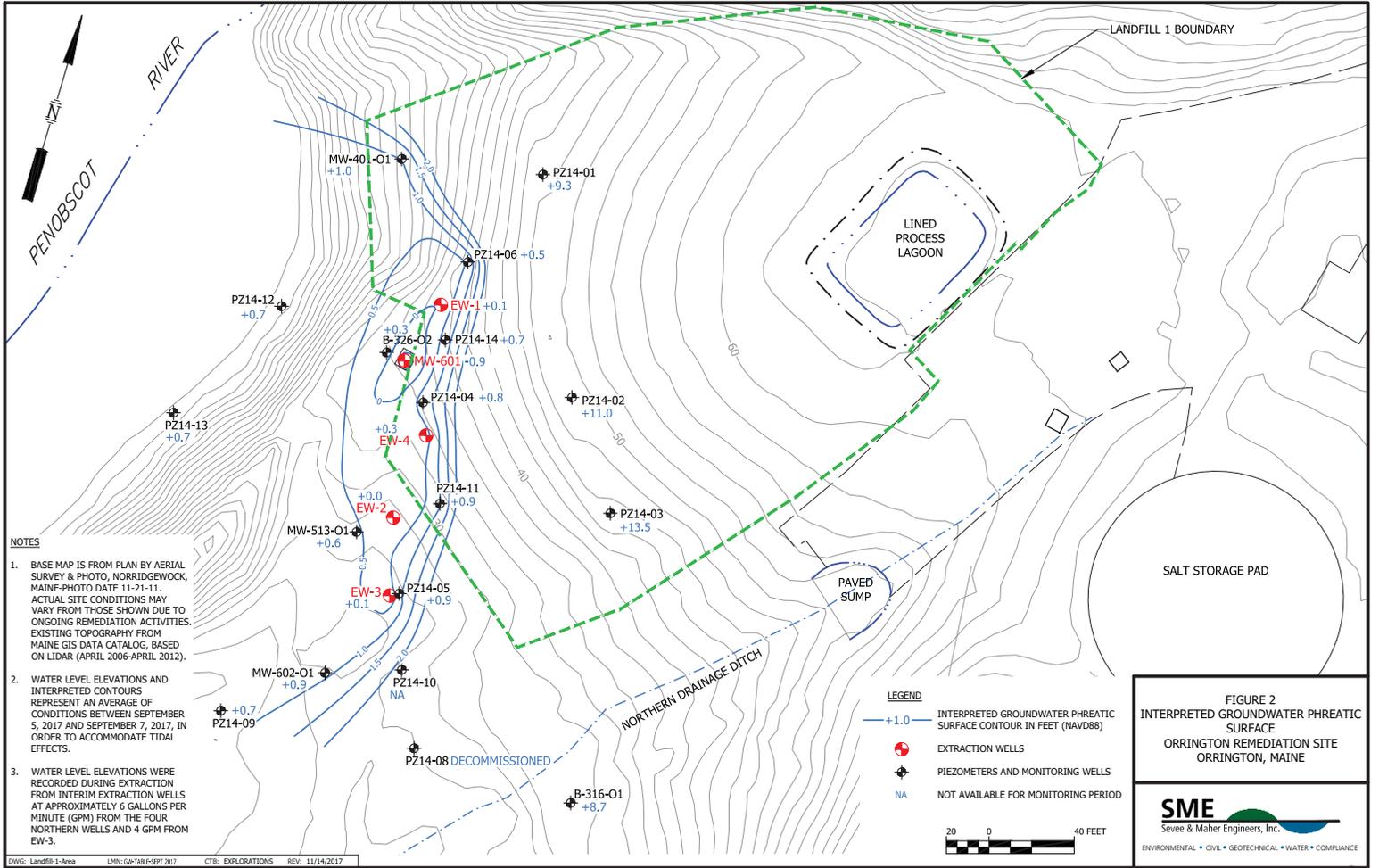
- LEGEND**
- PROPERTY BOUNDARY (APPROXIMATE)
 - - - LANDFILL BOUNDARY (APPROXIMATE)
 - EXCAVATION LIMITS (APPROXIMATE)
 - MW-602-01 MONITORING WELLS
 - EW-1 EXTRACTION WELLS
 - ▲ SW15-6 SURFACE WATER SAMPLE LOCATION
 - SD15-8 SEDIMENT SAMPLE LOCATION (APPROXIMATE)
 - MW-601 INTERIM EXTRACTION SYSTEM MONITORING
 - B-304-01 LANDFILL 5 MONITORING
 - P-13 SITE PERIMETER MONITORING
 - MW-702-01 SHORT-TERM REMEDIATION MONITORING



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



HASELTINE, APPROX 2001
SAFIAN, APPROX 1607
DWG: SITEPLAN LMY: CMP MON LOC CTR: EXPLORATIONS REV: 6/8/2017



NOTES

1. BASE MAP IS FROM PLAN BY AERIAL SURVEY & PHOTO, NORRIDGEWOCK, 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. WATER LEVEL ELEVATIONS AND INTERPRETED CONTOURS REPRESENT AN AVERAGE OF CONDITIONS BETWEEN SEPTEMBER 5, 2017 AND SEPTEMBER 7, 2017, IN ORDER TO ACCOMMODATE TIDAL EFFECTS.
3. WATER LEVEL ELEVATIONS WERE RECORDED DURING EXTRACTION FROM INTERIM EXTRACTION WELLS AT APPROXIMATELY 6 GALLONS PER MINUTE (GPM) FROM THE FOUR NORTHERN WELLS AND 4 GPM FROM EW-3.

FIGURE 2
INTERPRETED GROUNDWATER PHREATIC SURFACE
ORRINGTON REMEDIATION SITE
ORRINGTON, MAINE

SME
 Sevee & Maher Engineers, Inc.
 ENVIRONMENTAL • CIVIL • GEOTECHNICAL • WATER • COMPLIANCE

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

