# APPENDICES

# Appendix A

# Pre-design Activities Report

# REVIEW DRAFT PRE-DESIGN ACTIVITIES REPORT

## Southern Cove

Orrington Remediation Site
Orrington, Maine

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# Table of Contents

# List of Tables

# List of Figures

# Attachments

# Acronyms

| | |
|---|---|
| ADCP | Acoustic Doppler Current Profiler |
| bgs | below ground surface |
| CMS | Corrective Measures Study |
| IDL | Interactive Data Language |
| Maine BEP | State of Maine Board of Environmental Protection |
| Mallinckrodt | Mallinckrodt US LLC |
| Maine DEP | Maine Department of Environmental Protection |
| NAD 83 | North American Datum of 1983 |
| NAVD 88 | North American Vertical Datum of 1988 |
| Order | Maine BEP Order dated August 19, 2010, and effective April 3, 2014, which incorporates, with modifications, the Compliance Order issued by Maine DEP dated November 24, 2008 |
| PD | pre-design |
| PRMSP | Penobscot River Mercury Study Panel |
| RCRA | Resource Conservation and Recovery Act |
| RTK | real-time kinematic |
| SI | Site Investigation |
| Site | Orrington Remediation Site |
| SPT | Standard Penetration Test |
| S/S | Stabilization/Solidification |
| TCLP | Toxicity Characteristic Leaching Procedure |
| TSS | total suspended solids |
| USCS | Unified Soil Classification System |
| Work Plan | *Southern Cove Pre-Design Work Plan* |

# Section 1. Introduction

## 1.1 Purpose

This report presents the results of the pre-design field activities conducted in accordance with the *Southern Cove Pre-Design Work Plan* (Work Plan; Anchor QEA and CDM 2015), subsequent work plan modifications requested during the field work and approved by the Maine Department of Environmental Protection (Maine DEP), and a work plan addendum approved by Maine DEP on September 4, 2015. The purpose of the pre-design (PD) activities was to provide field information to support the design of sediment remediation and restoration of the Penobscot River Southern Cove Area (Southern Cove) at the Orrington Remediation Site (Site) located at 99 Industrial Way, Orrington, Maine.

The remedial requirements for Southern Cove are described in the State of Maine Board of Environmental Protection (Maine BEP) Order dated August 19, 2010, and effective April 3, 2014, which incorporates, with modifications, the Compliance Order issued by the Maine DEP dated November 24, 2008 (Order). The Maine DEP and Maine BEP decisions were based on review of data from the Southern Cove sampling and analysis efforts completed during the Site Investigation (SI) and Corrective Measures Study (CMS) phases. Additional details on the SI and CMS are provided in the Work Plan.

All PD work was completed in accordance with the *Quality Assurance Project Plan* (CDM Smith 2014a), the *Project Health and Safety Plan* (CDM Smith 2014b), and the *Health and Safety Plan* (Anchor QEA 2014) prepared specifically for PD data collection activities in Southern Cove.

Field data collection conducted as part of this work included the following:

- Bathymetric Survey
- Hydrodynamic study (including Acoustic Doppler Current Profiler [ADCP] survey and tide gaging)
- Geotechnical Investigations
- Disposal Characterization
- Treatability Studies
- Sediment Chemical Characterization
- Vegetation Survey

## 1.2 Background

The Southern Cove is located in the Penobscot River bordering the Site, as shown in **Figure 1-1**. A full description of the Site, which included a former manufacturing plant and five landfills, is included in the *Site Investigation Report* (SI Report; CDM 1998), and the *Corrective Measures Studies* (CDM 2003). The Southern Cove lies to the south of the historical manufacturing plant area, on the eastern side of the main channel of the Penobscot River. The Penobscot River is subject to tidal fluctuations up to 16 feet and a portion of the cove is tidal mudflats exposed under low tide conditions. During the operational life of the facility, the cove received runoff from a site drainage outfall, the Southerly Stream, and the Northern Drainage Ditch depicted in **Figure 1-1**.

Over the course of the investigation phase (beginning with the SI) , a total of 250 sediment samples were collected from Southern Cove and analyzed for mercury; some samples were also analyzed for additional physical parameters. The majority of these samples were collected and reported as part of the SI and CMS, which were reviewed by Maine DEP and the Maine BEP, and formed the basis of their final decisions on the remedial actions required for the Southern Cove.

Fourteen of the 250 samples were collected as part of an additional study conducted by the Penobscot River Mercury Study Panel (PRMSP) between 2008 and 2013 within the Penobscot River Estuary (and including Southern Cove). The *Penobscot River Mercury Study Panel Final Report* (PRMSP 2013) was submitted in April 2013 to the United States District Court (District of Maine). The more recent PRMSP data generally confirms previous findings; however, these data are not being relied upon for final contaminant delineation and remedial design of Southern Cove removal because these data were not collected by Mallinckrodt and sampling objectives and procedures differed from that of other sampling efforts.

# Section 2. Bathymetric Survey

A bathymetric survey of Southern Cove was conducted on June 29 and 30, 2015. Coverage was targeted to include all areas up to the maximum high tide line, and bathymetry within the survey area is shown in **Figure 2-1**. The technical report for the bathymetric survey is included in **Attachment A.1,** and methods are summarized below.

## 2.1 Methods

Aqua Survey, Inc., (Aqua Survey) conducted the survey using an R2Sonic 2022 multibeam system, which included an integrated multibeam projector and receiver, an SMC-108 motion reference unit, a Hemisphere VS-110 satellite compass, a Castaway Conductivity Temperature Depth Meter, and an AML Micro-X sound velocity probe.

Vertical and horizontal positioning was provided by a Trimble MS750 real-time kinematic (RTK) GPS with centimeter accuracy. The RTK system used a virtual reference network of base stations via internet connection from KeyNetGPS VRS service. Prior to commencing the survey, the RTK system was checked against an on-Site reference described as control point no. 1. The RTK antenna was mounted directly above the multibeam transducer to eliminate offset errors. All results were produced in the Maine -1801 East North American Datum of 1983 (NAD 83) coordinate system with units in U.S. Survey Feet horizontal datum and North American Vertical Datum of 1988 (NAVD 88). During the bathymetric survey, location of the multibeam was determined using the RTK-GPS.

Raw multibeam sonar data were logged in HYPACK and processed using HySweep multibeam editor. Data were corrected in real time for vessel heave, pitch, and roll in the HYPACK software via integration with an SMC-108 motion reference unit, and correlated in real time to position data. Sound velocity in water was monitored throughout the survey and multibeam data were corrected according to the recorded sound velocities, which changed throughout the tidal cycle. After the survey was conducted, the multibeam system was calibrated using a patch test to solve for the alignment values between the motion sensor reference frame and the multibeam reference frame. Data were reviewed for any potential issues, and outliers and data drop-out points were removed.

All areas within the targeted survey area up to the high tide line were able to be surveyed using the multibeam system. Data collection was hindered in some areas by the vegetation growing on the mudflats, but data were deemed sufficient to provide required coverage for the bathymetric survey.

# Section 3. Hydrodynamic Study

## 3.1 Tide Gage

A pressure sensor logger was deployed at the Site to measure tidal fluctuations in water level from 5:00 p.m. on June 15, 2015, to 7:00 p.m. on June 19, 2015. The location of the tide gage is shown in **Figure 3-1**. The pressure sensor membrane of the pressure logger was 1 inch off the sediment surface where it was attached to a temporary metal stake driven into the river bottom below the low tide level. A second pressure sensor logger was deployed on the vessel conducting sediment sampling to measure atmospheric pressure during the duration of the water depth sensor deployment, so that the water depth sensor readings could be adjusted for changing barometric pressure. Water levels over the tidal cycle show a tidal flux of approximately 16 feet. These data were used to understand tidal ranges to determine low tide work windows and to support design.

## 3.2 Acoustic Doppler Current Profiler Survey

Aqua Survey conducted an ADCP survey on August 3, 2015, along transects shown in **Figure 3-1**. An ADCP is a hydroacoustic current meter similar to a sonar, which measures water current velocities over a depth range. This is accomplished by transmitting and receiving sound signals of varying frequencies, which scatter back from particles at regular depth intervals within the water column.

The ADCP survey measured the vertical variation in current magnitude and direction along cross-channel transects traveled by the survey vessel. Data were collected at 0.25-meter depth intervals every 6 to 10 feet along the survey vessel transects. Three transects across the river were surveyed every hour over a 12-hour period to capture an entire tidal cycle.

### 3.2.1 Methods

A Teledyne RDI Rio Grande 1,200-kilohertz ADCP system was used. Vertical and horizontal positioning was provided by a Trimble MS750 RTK-GPS with centimeter accuracy. RTK corrections were obtained using a virtual reference network of base stations via internet connection from KeyNetGPS service. Prior to commencing the survey, the RTK system was checked against an on-Site reference described as control point no. 1, which is a reference. All results were produced in the Maine -1801 East NAD 83 coordinate system with units in U.S. Survey Feet horizontal datum and NAVD 88. A full technical report describing field work, including equipment calibration, is included in **Attachment A.2**.

Raw ADCP data were logged and processed using HYPACK software. Positioning data were adjusted in real time to account for the offset distance between the ADCP system and the RTK-GPS. Data were corrected in real time for vessel heave, pitch, and roll in the HYPACK software via integration with an SMC-108 motion reference unit and correlated in real time to position data.

Processed data were exported into tabular data files. For each point along the transect, the tabular data included the time, date, GPS coordinates, water depth, and speed/orientation of current. These data were processed and analyzed using GIS and Interactive Data Language (IDL) software.

### 3.2.2 Results

Maximum measured surface and depth-averaged current velocities during the ebb and flood tides near the channel-ward permiter of the Southern Cove are summarized in **Table 3-1**. Depth-averaged velocities were determined by summing up the recorded velocities in the water column and dividing by the cumulative depth. The table shows that velocities during ebb and flood tide are generally between 2 and 3.5 feet per second. Appendix B of the CMIP presents design analyses using this data.

**Table 3-1: Penobscot River Measured Water Velocities**

| ADCP Transect (see Figure 3-1) | Flood Tide | | Ebb Tide | |
|---|---|---|---|---|
| | Surface Velocity (ft/s) | Depth-Averaged Velocity (ft/s) | Surface Velocity (ft/s) | Depth-Averaged Velocity (ft/s) |
| Upstream Transect | 3.5 | 2.6 | 3.2 | 2.7 |
| Middle Transect | 2.9 | 2.3 | 3.5 | 2.8 |
| Downstream Transect | 2.8 | 2.1 | 3.2 | 3.1 |

Notes:
ADCP = Acoustic Doppler Current Profiler
ft/s = feet per second

# Section 4. Geotechnical Evaluation

## 4.1 Objective

This section summarizes the findings of the geotechnical evaluation performed between June 17 and 19, 2015, in accordance with the Work Plan (Anchor QEA 2015). The objective of the investigation was to collect geotechnical field information and samples to inform design elements of the turbidity barriers and tidal flat access road for remedial efforts. Six of the PD sampling locations were selected specifically for geotechnical data collection with the following objectives:

- Support design of the turbidity barrier, including three sample locations located outside the sediment removal areas and near, or at the break between, Southern Cove and the edge of the Penobscot River Channel (SD-SC-01, SD-SC-02, and SD-SC-03; see **Figure 1-1**)
- Support design of an equipment access road across the intertidal area of Southern Cove (SD-SC-04, SD-SC-05, and SD-SC-06; see **Figure 1-1**)

## 4.2 Methods

Borings were advanced by driving casing from a barge-mounted drill rig, with the exception of SD-SC-04, which was collected using a hand auger on the exposed tidal flat, and SD-SC-06, which was advanced using a vibracore from a boat; both of these locations were within the intertidal zone. Some minor adjustments in location from the Work Plan were made in the field due to access limitations. Navigation and recording of exploration locations were performed using a Trimble Geo6000XH differential GPS. The horizontal datum used was NAD 83 State Plane Maine East.

Oversight of the investigation, including borehole logging, sample collection, and labeling, was performed by an Anchor QEA, LLC, geotechnical engineer. Sediment samples were delivered to CDM Smith, Inc., Geotechnical Laboratory in Somerville, Massachusetts, for laboratory testing on June 23, 2015. Boring logs are included in **Attachment A.3**.

Soil and sediment samples were obtained using disturbed sampling methods, as follows:

- For drilled explorations (SD-SC-01, SD-SC-02, SD-SC-02B, SD-SC-03, and SD-SC-05), disturbed sampling was performed using split-spoon samplers with 2- or 3-inch outside diameters. The larger diameter sampler (and its compatible automatic hammer) was used when gravel-sized materials were encountered.
- For the hand auger exploration (SD-SC-04), samples were collected in the sampler barrel.
- For vibracore sampling (SD-SC-06), a 4-inch-diameter steel core barrel with a flexible polyethylene core liner was used for sample collection.

Standard Penetration Tests (SPTs) were performed within the explorations advanced by driving casing, and blow counts recorded on boring logs. Field measurements using a pocket penetrometer and a handheld shear vane tester were done on fine-grained sediments (silt and clay) when adequate sample recovery was achieved.

Sample recovery length was recorded and the soil units were classified and logged in accordance with the Unified Soil Classification System (USCS; ASTM D2487). The samples were labeled, stored, and sealed in water-tight glass jars to minimize moisture loss. Samples were delivered to the testing laboratory in the jars. A total of 25 disturbed samples were submitted to the testing laboratory—16 for analysis and 9 for archiving. These samples were tested for index properties, including moisture content and grain size distribution.

## 4.3 Results

The explorations (drilled and manual) were performed to depths ranging from 1.5 to 22.5 feet below the mudline. Exploration depths were limited by refusal, or they extended to 10 feet below the depth at which a dense material was encountered. **Table 4-1** is a summary of the explorations.

**Table 4-1: Geotechnical Explorations**

| Sample Location | Easting (x)[1] | Northing (y)[1] | Type of Exploration | Date of Exploration | Termination Depth (feet)[2] |
|---|---|---|---|---|---|
| SD-SC-01 | 898640.1 | 391223.3 | Drive Casing | 6/17/15 | 15 |
| SD-SC-02 | 898415.88 | 390788.97 | Drive Casing | 6/18/15 | 16.4 |
| SD-SC-02B | 898415.9 | 390779.6 | Drive Casing | 6/19/15 | 22.5 |
| SD-SC-03 | 898464.3 | 390354.1 | Drive Casing | 6/17/15 | 18 |
| SD-SC-04 | 898773 | 390946.9 | Hand Auger | 6/17/15 | 1.5 |
| SD-SC-05 | 898761.1 | 390667 | Drive Casing | 6/19/15 | 8 |
| SD-SC-06 | 898770.8 | 390259.1 | Vibracore | 6/19/15 | 1.9 |

Notes:
1) Horizontal datum is NAD 83 Maine State Plane East, U.S. Survey Feet.
2) Termination depth is relative to the ground surface/mudline.

Three tests for Atterberg limits were performed and are summarized in **Table 4-2**. Clay was encountered in SD-SC-05 and SD-SC-06, and field measurements using a pocket penetrometer and handheld shear vane shear tester were performed at the time of sampling; results are provided in **Table 4-3**. Laboratory results are included in **Attachment A.4** and a full summary of geotechnical analysis results is presented in **Table 4-4**.

**Table 4-2: Atterberg Limits**

| Sample Location | Atterberg Limits | | |
|---|---|---|---|
| | Liquid Limit | Plastic Limit | Plasticity Index |
| SD-SC-02 | No Value | No Value | Non-Plastic |
| SD-SC-05 | 139 | 69 | 70 |
| SD-SC-05 | 28 | 15 | 13 |
| SD-SC-06 | 38 | 19 | 19 |

**Table 4-3: Penetrometer and Shear Test Results**

| Sample Location | Depth (feet) | Pocket Penetrometer*, Average (tsf) | Shear Vane Reading*, Average (kg/cm$^2$) |
|---|---|---|---|
| SD-SC-05 | 6 to 8 | 1.3 | 2.0 |
| SD-SC-06 | 0.5 to 1.9 | 0.7 | 2.8 |

Notes:
* Values are uncorrected.
kg/cm$^2$ = kilograms per square centimeter
tsf = tons per square foot

**Table 4-4: Summary of Geotechnical Laboratory Results**

| Sample Location | Sample Depth (feet below mudline) | | | Moisture Content (%) | Particle Size Summary | | | USCS Symbol |
|---|---|---|---|---|---|---|---|---|
| | Top | Bottom | Recovery (feet) | | Gravel (%) | Sand (%) | Fines (%) | |
| SD-SC-01 | 3.5 | 5.0 | 0.4 | 13.5 | 37.6 | 52.7 | 9.7 | SW-SM |
| SD-SC-01 | 6.0 | 7.5 | 0.5 | 10.6 | 44.6 | 45.9 | 9.5 | SW-SM |
| SD-SC-01 | 9.0 | 10.5 | 0.3 | 11.5 | 58.1 | 38.3 | 3.6 | GW |
| SD-SC-02 | 6.0 | 7.5 | 0.2 | 14.5 | 20.2 | 70.0 | 9.8 | SW-SM |
| SD-SC-02 | 8.5 | 10.0 | 0.6 | 12.4 | 37.8 | 58.6 | 3.6 | SP |
| SD-SC-02 | 13.5 | 15.0 | 0.3 | 13.4 | 33.9 | 62.3 | 3.8 | SP |
| SD-SC-02 | 21 | 22.5 | 0.2 | 10.4 | 36.8 | 46.3 | 16.9 | SM |
| SD-SC-03 | 8.5 | 10.0 | 0.6 | 13.7 | 20.0 | 72.4 | 7.6 | SW-SM |
| SD-SC-03 | 17.6 | 18.0 | 0.2 | 15.2 | 29.0 | 58.5 | 12.5 | SM |
| SD-SC-04 | 1.0 | 1.5 | 0.5 | 23.1 | 9.8 | 86.6 | 3.6 | SP |
| SD-SC-05 | 0.0 | 2.0 | 1.0 | 130.1 | 0.0 | 10.6 | 89.4 | MH |
| SD-SC-05 | 2.5 | 3.5 | 1.0 | 16.8 | 19.1 | 78.0 | 2.9 | SP |
| SD-SC-05 | 3.5 | 4.0 | 0.5 | 22.4 | 7.5 | 80.4 | 12.1 | SM |
| SD-SC-05 | 4.0 | 6.0 | 2.0 | 16.8 | 7.5 | 78.0 | 14.5 | SM |
| SD-SC-05 | 6.0 | 8.0 | 2.0 | 20.2 | 0.0 | 32.2 | 67.8 | CL |
| SD-SC-06 | 0.5 | 1.9 | 1.0 | 31.5 | 0.0 | 10.1 | 89.9 | CL |
| SD-SC-21 | 0.0 | 0.5 | 0.5 | 34.0 | 23.1 | 64.8 | 12.1 | SW-SM |

Notes:
CL = lean (low-plasticity) clay
GW = well-graded gravel
MH = elastic (high-plasticity) silt
SM = silty sand
SP = poorly graded sand
SW-SM = well-graded sand with silt
USCS = Unified Soil Classification System

Based on field characterization and laboratory results, the following soil units were encountered, described from the ground surface/mudline downward.

Brown sandy silt occured at varying thicknesses between 0.5 and 2 feet below ground surface (bgs) within most of the intertidal mudflats. However, this layer was absent toward the northern side of Southern Cove.

Sand and gravel alluvium, consisting of poorly sorted sand with varying amounts of silt, sand, and cobbles, was the predominant material encountered in borings. The deposit was present at the surface at the northern end of the cove, but was covered with brown silt in most intertidal areas. At the borings located at the outer edge of the cove (SD-SC-01, SD-SC-02, and SD-SC-03), this unit extended from the mudline to termination at 22.5 feet bgs. At SD-SC-05, the alluvium was encountered from 3.5 to 6 feet bgs, layered between an upper silt and lower clay layer. The lower clay layer consisted of soft to stiff olive gray clay and was only present at SD-SC-05 and SD-SC-06, located within the intertidal area of the southern end of the cove.

According to available information, the Site is underlain by metamorphic rock that varies substantially in elevation (CDM 1998). CDM's mapping noted dipping bedrock at approximately the break between the beach and the underwater river slope. Given the wide range of bedrock elevations mapped below the upland portion of the Site, depth to bedrock within Southern Cove cannot be estimated.

## 4.4 Work Plan Deviations

The following deviations from the Work Plan occurred:

- Undisturbed Shelby tube samples were not collected during field activities since suitable materials for sampling was not encountered, and thus unconsolidated-undrained triaxial test(s) were not performed.
- Ash and organic matter were not tested because collected samples brought to the laboratory had no visual identification of organic materials.

# Section 5. Disposal Characterization

Four composite samples (SD-SC-07 through SD-SC-10) were collected from the sediment removal areas to characterize material for handling and disposal requirements; See locations on **Figure 1-1.** Each composite sample, with the exception of samples for volatile organic compound analyses, was composited from material collected from four subsampling locations surrounding the sample location shown on Figure 1-1. The samples tested for Toxicity Characteristic Leaching Procedure (TCLP) volatile organic compounds were not composited and were collected as discrete grab samples from the first composite subsampling location.

The TCLP testing results are summarized in **Table 5-1**, including comparison to the estimated requirements of the waste disposal facility. No exceedances of federal TCLP test criteria were noted. Non-TCLP characterization analytical results are summarized in **Table 5-2**.

**Table 5-1: Waste Characterization – TCLP Test Data (mg/L)**

| | Estimated Disposal Requirements | SD-SC-07 0 to 24 inches | SD-SC-08 0 to 24 inches | SD-SC-09 0 to 25 inches | SD-SC-10 0 to 18 inches (including duplicate sample results) | |
|---|---|---|---|---|---|---|
| **TCLP Metals** | | | | | | |
| Arsenic | <5.0 | 0.02 J | 1 U | 0.03 J | 0.05 J | 0.04 J |
| Barium | <100.00 | 0.1 J | 0.12 J | 0.06 J | 0.09 J | 0.08 J |
| Cadmium | <1.0 | 0.1 U | 0.1 U | 0.1 U | 0.1 U | 0.1 U |
| Chromium | <5.0 | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U |
| Lead | <5.0 | 0.5 U | 0.5 U | 0.5 U | 0.5 U | 0.03 J |
| Mercury | <0.2 | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Selenium | <1.0 | 0.5 U | 0.5 U | 0.5 U | 0.5 U | 0.5 U |
| Silver | <5.0 | 0.1 U | 0.1 U | 0.1 U | 0.1 U | 0.1 U |
| **TCLP Volatiles** | | | | | | |
| Benzene | <0.5 | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U |
| Carbon tetrachloride | <0.5 | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U |
| Chlorobenzene | <100.0 | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U |
| Chloroform | <6.0 | 0.0075 U | 0.0075 U | 0.0075 U | 0.0075 U | 0.0075 U |
| 1,2-Dichloroethane | <0.5 | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U |
| Vinyl Chloride | <0.2 | 0.01 U | 0.01 U | 0.01 U | 0.01 U | 0.01 U |
| **TCLP Semi-volatiles (Base Neutrals)** | | | | | | |
| 1,4-Dichlorobenzene | <7.5 | 0.025 U | 0.025 U | 0.025 U | 0.025 U | .0025 U |
| Hexachlorobenzene | <0.13 | 0.01 U | 0.01 U | 0.01 U | 0.01 U | 0.01 U |
| Hexachlorobutadiene (Hexachloro-1,3-butadiene) | <0.5 | 0.01 U | 0.01 U | 0.01 U | 0.01 U | 0.01 U |
| Hexachloroethane | <3.0 | 0.01 U | 0.01 U | 0.01 U | 0.01 U | 0.01 U |
| Nitrobenzene | <2.0 | 0.01 U | 0.01 U | 0.01 U | 0.01 U | 0.01 U |
| Pyridine | <5.0 | 0.025 U | 0.025 U | 0.025 U | 0.025 U | 0.025 U |

| | Estimated Disposal Requirements | SD-SC-07 0 to 24 inches | SD-SC-08 0 to 24 inches | SD-SC-09 0 to 25 inches | SD-SC-10 0 to 18 inches (including duplicate sample results) | |
|---|---|---|---|---|---|---|
| 2,4-Dinitrotoluene | <0.13 | 0.025 U | 0.025 U | 0.025 U | 0.025 U | 0.025 U |
| **TCLP Semi-volatiles (Acid Compounds)** | | | | | | |
| 2-Methylphenol (o-Cresol) | <200.0 | 0.025 U | 0.025 U | 0.025 U | 0.025 U | 0.025 U |
| 3-Methylphenol & 4-Methylphenol (m&p-Cresol) | <200.0 | 0.025 U | 0.025 U | 0.025 U | 0.025 U | 0.025 U |
| Cresol, Total | <200.0 | | | | | |
| Pentachlorophenol | <100.0 | 0.05 U | 0.05 U | 0.05 U | 0.05 U | 0.05 U |
| 2,4,5-Trichlorophenol | <400.0 | 0.025 U | 0.025 U | 0.025 U | 0.025 U | 0.025 U |
| 2,4,6-Trichlorophenol | <2.0 | 0.025 U | 0.025 U | 0.025 U | 0.025 U | 0.025 U |
| **TCLP HERBICIDES** | | | | | | |
| 2,4-D (2,4-Dichlorophenoxyacetic acid) | <10.0 | 0.025 U | 0.025 U | 0.025 U | 0.025 U | 0.025 U |
| 2,4,5-TP (Silvex) | <1.0 | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U |
| **TCLP Pesticides** | | | | | | |
| Chlordane | <0.03 | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Endrin | <0.02 | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Heptachlor | <0.008 | 0.0001 U | 0.0001 U | 0.0001 U | 0.0001 U | 0.0001 U |
| Hexachlorocyclohexane (BHC), gamma- (Lindane) | <0.4 | 0.0001 U | 0.0001 U | 0.0001 U | 0.0001 U | 0.0001 U |
| Methoxychlor | <10.0 | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Toxaphene | <0.5 | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |

Notes:

1) Sample depth is reported as below mudline.

J = Compound analyzed, but the result value was estimated.

mg/L = milligrams per liter

TCLP = Toxicity Characteristic Leaching Procedure

U = Compound analyzed but not detected above detection limit.

## Table 5-2: Waste Characterization – Non-TCLP Analytical Results

| | Units | Depth Below Mudline | | | | |
|---|---|---|---|---|---|---|
| | | SD-SC-07 | SD-SC-08 | SD-SC-09 | SD-SC-10 | |
| | | 0 to 24 inches | 0 to 24 inches | 0 to 25 inches | 0 to 18 inches | 0 to 18 inches* |
| Chloride | mg/kg | 13J | 38J | 430J | 170J | 320J |
| Cyanide | mg/kg | 10U | 10U | 10U | 10U | 10U |
| Flash Point | deg F | 70U | 70U | 70U | 70U | 70U |
| Gravel | pct | 26.1 | 24.7 | **U** | **U** | NA |
| Liquid Limit | unitless | NV | NV | NV | NV | NA |
| Mercury | mg/kg | 2.1J | 24J | 15J | 4J | 12J |
| Moisture (Water) Content | pct | 25.1 | 44.2 | 220.4 | 226.7 | NA |
| pH | SU | 5.9 | 5.3 | 5.6 | 5.8 | 5.6 |
| Plastic Limit | unitless | NP | NP | NP | NP | NA |
| Plasticity Index | unitless | NP | NP | NP | NP | NA |
| Sand | pct | 64.1 | 52.5 | 16.2 | 16.1 | NA |
| Sulfate | mg/kg | 130 | 200 | 1100 | 670 | 960 |
| Sulfide, Reactive | mg/kg | 10U | 10U | 10U | 10U | 10U |
| Total fines (Reported, Not Calculated) | pct | 9.8 | 22.8 | 83.8 | 83.9 | NA |
| Total Organic Carbon (Laboratory Average) | pct | 0.182 | 1.18 | 8.55 | 7.16 | 4.69 |
| Total Solids | pct | 87.7 | 77.7 | 42.2 | 44.4 | 35.2 |

Notes:
* Field Duplicate
deg F = degree Fahrenheit
J = estimated based on data validation
mg/kg = milligrams per kilogram
NP = non-plastic
pct = percent
SU = standard units
U = not detected
NA = Not analyzed

# Section 6. Treatability Testing

## 6.1 Objectives and Approach

Treatability testing was conducted to evaluate passive dewatering methods and to evaluate the need to add a dewatering polymer or drying agent(s) to pass a paint filter test prior to transport of material to the disposal facility. A detailed technical report describing methods and results is included in **Attachment A.5**.

Samples for treatability testing were collected as bulk samples composited over the anticipated removal areas to provide sufficient and representative sample volume for the treatability tests. Four composite samples (SD-SC-07 through SD-SC-10; see **Figure 1-1**) were collected from within the extents of the sediment removal areas on June 16, 2015, through June 19, 2015, and were submitted to CDM Smith to conduct the treatability testing. Based on a review of physical characteristics of the four samples, CDM Smith classified material into two groups and composited the material into two samples for treatability testing. The two types of material are as follows:

- SD-SC-07 was classified as coarse-grained material, mainly sand with silt and gravel.
- SD-SC-08, SD-SC-09, and SD-SC-10 were classified as fine-grained soils with moderate to high organic content; organic silt with sand. These samples were composited together.

Treatability tests were conducted to evaluate the following:

- Rate that material would dewater by gravity drainage, and the chemical composition of the dewatering drainage
- Need for and quantity of various drying agents to stabilize the sediment by absorbing water prior to overland transport and landfill disposal
    - Samples were prepared for the paint filter test using a range of drying agents, including useable Site soils excavated from the landfills, Type II Portland cement, sawdust, wood shavings, and wood ash. Drying agents were blended with the sediment at increasing concentrations ranging from 0 to 20% with the objective of passing the paint filter test.

A data report prepared by CDM Smith that includes a summary of the field program, sample preparation, treatability testing methods, and results is provided in Attachment A.5. Results of the study are also summarized in the following section.

## 6.2 Summary of Findings

The treatability tests generally indicate that the representative dredged material has good drainage characteristics over a short-term dewatering period and will pass the paint filter test with a range of drying agents. The analytical results of the dewatering effluent indicate that most of the requirements of influent to the water treatment plant are met, with the exception of total suspended solids (TSS), which exceeded the concentration threshold.

### 6.2.1 Dewatering Study Results

The effectiveness of passive dewatering techniques to decrease moisture content in test material was evaluated using a hanging chamber apparatus. Decant and effluent water were collected and measured at intervals over a dewatering duration of 4 days to determine the rate of dewatering. At the same time intervals, moisture content of the material was measured.

The rate of dewatering measured over the test period is depicted in **Figure 6-1** and data collected during the study are summarized in **Table 6-1**.

**Table 6-1: Dewatering Test – Rates and Volumes**

| Date | Elapsed Time (hr) | Effluent Water (mL) | Decant Water (mL) | Rate of Dewatering (mL/hr) |
|---|---|---|---|---|
| **SD-SC-07** | | | | |
| Approximate Total Volume of Water in Sample at the Start of the Test (mL): | | 5,284 | | - |
| 6/16/2015 | 0 | Start of Test | | |
| 6/16/2015 | 1 | 217.4 | - | 217.4 |
| 6/16/2015 | 1.9 | | 754.2 | 838.0 |
| 6/17/2015 | 16.8 | 423.1 | - | 28.4 |
| 6/17/2015 | 21.4 | 39.2 | - | 8.5 |
| 6/18/2015 | 40.5 | 94.8 | - | 5.0 |
| 6/18/2015 | 47.6 | 2.5 | - | 0.4 |
| 6/19/2015 | 63.8 | 5.2 | - | 0.3 |
| Total Effluent and Decant Volume (mL): | | 1,536.4 | | - |
| **SD-SC-08, -09, -10 (Composite)** | | | | |
| Approximate Total Volume of Water in Sample at the Start of the Test (mL): | | 13,840 | | - |
| 6/16/2015 | 0 | Start of Test | | |
| 6/16/2015 | 0.5 | 73.8 | | 147.6 |
| 6/17/2015 | 15.3 | 259.7 | 1065.2 | 89.5 |
| 6/17/2015 | 20 | 36.2 | 319.7 | 75.7 |
| 6/17/2015 | 22 | | 59.7 | 29.9 |
| 6/18/2015 | 38.9 | 84.9 | 524 | 36.0 |
| 6/18/2015 | 43.2 | 0.5 | 50.9 | 12.0 |
| 6/19/2015 | 62.3 | 20.1 | 51.5 | 3.7 |
| Total Effluent and Decant Volume (mL): | | 2,546.2 | | - |

Notes:
– = not applicable
hr = hour
mL = milliliter

The moisture content of the SD-SC-07 sediments decreased from approximately 23.6% at the start of the test to 13.7% at the end of the test. The moisture content of the SD-SC-08-09-10 composite sediments decreased from approximately 153.1 to 118.9% over the test period.

At the end of the dewatering testing, a sample of the effluent was submitted for chemical testing. Analytical results were compared to the requirements for influent to the Site's water treatment facility, as shown in **Table 6-2**. Effluent quality met treatment plant requirements except for TSS. In addition, a portion of the water samples were kept at the CDM Smith Geotechnical Laboratory and the rate of settling was measured (as turbidity) to support pretreatment design. Results are summarized in Attachment A.5.

**Figure 6-1 Rate of Dewatering Source: CDM 2015 Treatability Test Report (Attachment A.5)**

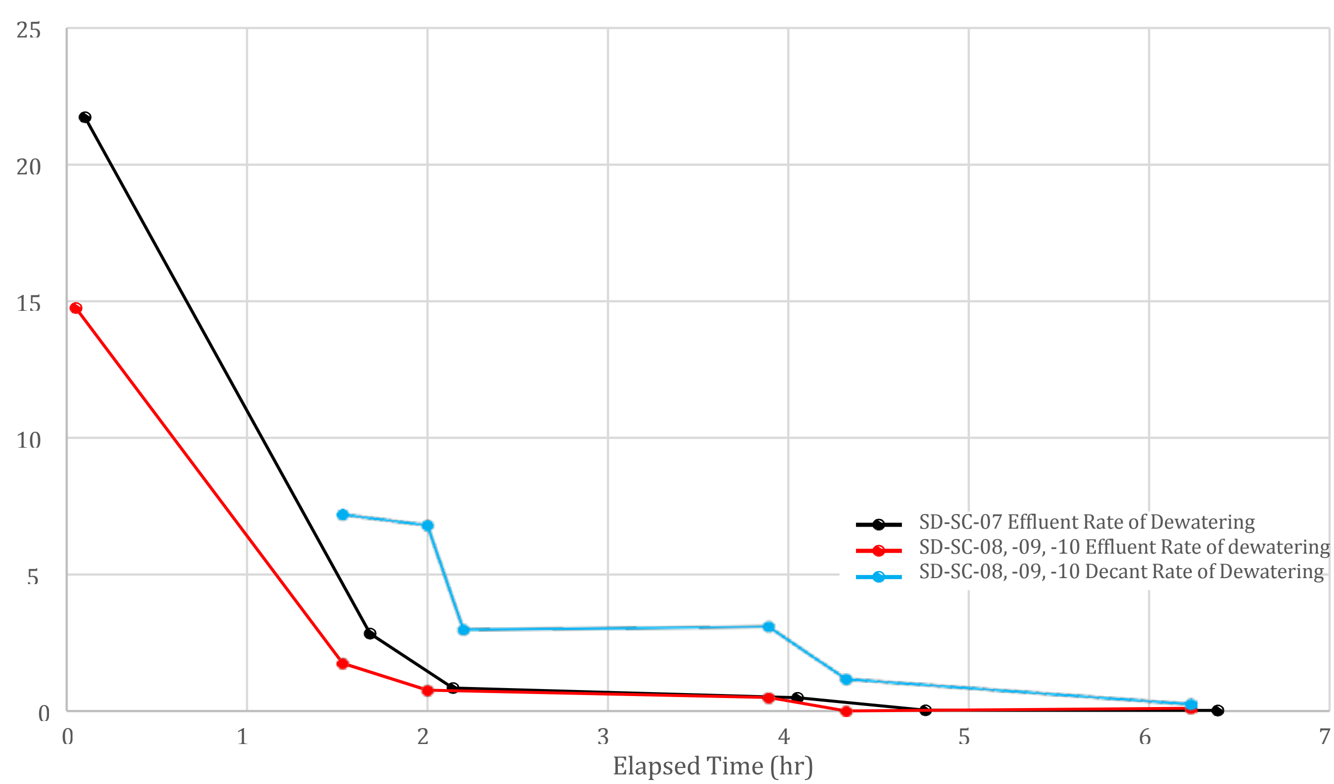


**Table 6-2: Dewatering Study Effluent Water Testing**

| Parameter | Units | Orrington Water Treatment Plant Requirements | Sample Location | |
|---|---|---|---|---|
| | | | SD-SC-07 | Composite SD-SC-08, -09, -10 |
| **Conventionals** | | | | |
| Total Dissolved Solids | mg/L | - | 630 | 690 |
| Total Suspended Solids | mg/L | 200 | -- | 1,500* |
| Biochemical Oxygen Demand (5 day) | mg/L | - | 27 | <20(1) |
| Total Organic Carbon | mg/L | - | 35 | 40 |
| pH | SU | 3.5 – 10.5 | 6.8 | 7.7 |
| **Metals** | | | | |
| Arsenic, Total | mg/L | - | 0.0684 | 0.0394 |
| Barium, Total | mg/L | - | 0.314 | 0.0621 |
| Cadmium, Total | mg/L | - | 0.0069 | <0.005 |
| Chromium, Total | mg/L | - | 0.500 | 0.086 |
| Lead, Total | mg/L | - | 0.506 | 0.0574 |
| Mercury, Total | mg/L | ** | 1.656* | 0.0042 |
| Selenium, Total | mg/L | - | <0.01 | <0.01 |
| Silver, Total | mg/L | - | <0.007 | <0.007 |

Notes:

** Based on information from the Orrington Wastewater Treatment Plant operator, elevated levels of mercury can be accepted by the treatment plant.

– = not applicable

mg/L = milligrams per liter

SU = standard unit

### 6.2.2 Stabilization/Solidification Study

The Stabilization/Solidification (S/S) study was conducted to determine if any amendments would be required for the dredged sediments to pass the paint filter test, which is required by the disposal facility. S/S reagents were added to the sediment material in increment amounts and then tested. Additional tests were done "dynamically" by shaking the sample to simulate vibrations during material transport. Results are presented in **Tables 6-3** and **6-4.**

### Table 6-3: Static Paint Filter Test – Summary of Results

| Reagent | Reagent Dosage (%) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Sediment Composite SD-SC-07 | | | | | Sediment Composite SD-SC-08, -09, -10 | | | | |
| | 0 | 2.5 | 5 | 10 | 20 | 0 | 2.5 | 5 | 10 | 20 |
| Type II Portland Cement | P | - | - | - | - | F | P | P | P | P |
| Sawdust | | - | - | - | - | | P | P | P | P |
| Wood Shavings | | - | - | - | - | | P | P | - | - |
| Wood Ash | | - | - | - | - | | P | P | P | - |
| TP-SMY-01 Fill | | P | P | - | - | | P | P | P | - |
| TP-SMY-02 Fill | | P | P | - | - | | P | P | P | - |
| TP-SMY-01 & TP-SMY-02 Fill | | P | P | - | - | | P | P | P | - |
| TP-SMY-01 & TP-SMY-02 | | P | P | - | - | | P | P | P | - |

Paint filter test was performed in accordance with EPA Method 9095B.
P – Passed paintfilter test
F = Failed paintfilter test
“-“ = Test not performed

### Table 6-4: Dynamic Paint Filter Tests – Summary of Results

| Reagent | Reagent Dosage (%) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Sediment Composite SD-SC-07 | | | | | Sediment Composite SD-SC-08, -09, -10 | | | | |
| | 0 | 2.5 | 5 | 10 | 20 | 0 | 2.5 | 5 | 10 | 20 |
| Type II Portland Cement | P | - | - | - | - | F | P | P | P | P |
| Sawdust | | - | - | - | - | | F | P | P | P |
| Wood Shavings | | - | - | - | - | | P | P | - | - |
| Wood Ash | | - | - | - | - | | P | P | P | - |
| TP-SMY-01 Fill | | P | P | - | - | | P | P | P | - |
| TP-SMY-02 Fill | | P | P | - | - | | P | P | P | - |
| TP-SMY-01 & TP-SMY-02 Fill | | P | P | - | - | | F | P | P | - |
| TP-SMY-01 & TP-SMY-02 Peat | | P | P | - | - | | P | P | P | - |

Paint filter test was performed in accordance with EPA Method 9095B.
P – Passed paintfilter test
F = Failed paintfilter test
“-“ = Test not performed

# Section 7. Sediment Chemical Characterization

Sediment samples were collected for chemical characterization from locations shown on **Figure 1-1**. Sample data are presented in the Mercury Data Report in **Attachment A.6**. The Data Usability Assessment, including data validation reports, is included in **Attachment A.7**.

A full discussion of sample results and delineation of mercury is provided in the Delineation Technical Memorandum included in Appendix C of the CMI Plan.

# Section 8. Vegetation Survey

A Site inspection was conducted on Thursday, May 28, 2015, to identify the extent of wetland communities within the project area, identify the species present, and determine whether any of these species are on the Maine list of rare, threatened and endangered species (Maine Natural Areas Program 2015). At the time of the visit, the plants within the wetland had not reached full growth for the season, but had grown enough for the extent and species present to be identified. The Southern Cove wetland was accessed by foot during low tide, and boundaries of the wetland and component communities were mapped using a handheld Trimble GPS unit. The survey included landward and waterward edges of the wetland, truncating the landward edge at the transition to the shoreline vegetative community because disturbance to shoreline vegetation is unexpected during Southern Cove remediation.

Three separate wetland communities were identified covering 2.1 acres, as shown in **Figure 8-1**. The three communities were composed of the following:

- A high marsh community, previously identified as the "sedge bed," growing near the shoreline on a thick base of peat
- Multiple, sparse beds of common three-square growing in soft, unconsolidated mud
- A small bed of densely growing hardstem bulrush embedded within the sparse common three-square, which appeared to be growing partly on a small chunk of peat mat as well as soft mud

Plant density within the sparse common three-square bed decreased with distance from the shoreline. The total acreage of each community and the species present is as follows:

- High marsh/sedge bed: 0.15 acre
  - Dominant species
    - *Schoenoplectus pungens* – common three-square
    - *Typha angustifolia* – narrow-leaved cattail
    - *Triglochin maritima* – seaside arrowgrass
    - *Schoenoplectus acutus* – hardstem bulrush
    - *Eleocharis rostellata* – beaked spikerush
  - Secondary species
    - *Alisma subcordatum* – American water-plantain
    - *Sium suave* – water parsnip
    - *Mimulus ringens* – Allegheny monkeyflower
- Sparse common three-square: 1.9 acres
  - *Schoenoplectus pungens* – common three-square
- Dense hardstem bulrush: 0.03 acre
  - *Schoenoplectus acutus* – hardstem bulrush

Only one of the species identified are on the Maine rare, threatened and endangered plants; beaked spikerush is identified as threatened in Maine, as of September 2015, and was identified in the high marsh community at the Site (Maine Natural Areas Program 2015).

# Section 9. References

Anchor QEA (Anchor QEA, LLC), 2014. *Health and Safety Plan*. Southern Cove, Orrington Remediation Site. Prepared for CDM Smith, Inc. December 2014.

Anchor QEA, LLC, and CDM Smith, Inc., 2015. *Southern Cove Pre-design Work Plan.* Orrington Remediation Site, Orrington, Maine. Prepared for Mallinckrodt US LLC. June 2015.

CDM (Camp Dresser & McKee Inc.), 1998. Site Investigation Report Volume I. HoltraChem Manufacturing Site, Orrington, Maine. December 22, 1998; Revised August 15, 2001.

CDM, 2003. Corrective Measures Study. Mallinckrodt Inc., HoltraChem Manufacturing Site, Orrington, Maine. May 27, 2003; Revised September 19, 2003.

CDM Smith (CDM Smith, Inc.), 2014a. Quality Assurance Project Plan. Orrington Remediation Site, Orrington, Maine. Revision No. 01. December 15, 2014.

CDM Smith, 2014b. Project Health and Safety Plan. Orrington Remediation Site, Orrington, Maine. October 9, 2014.

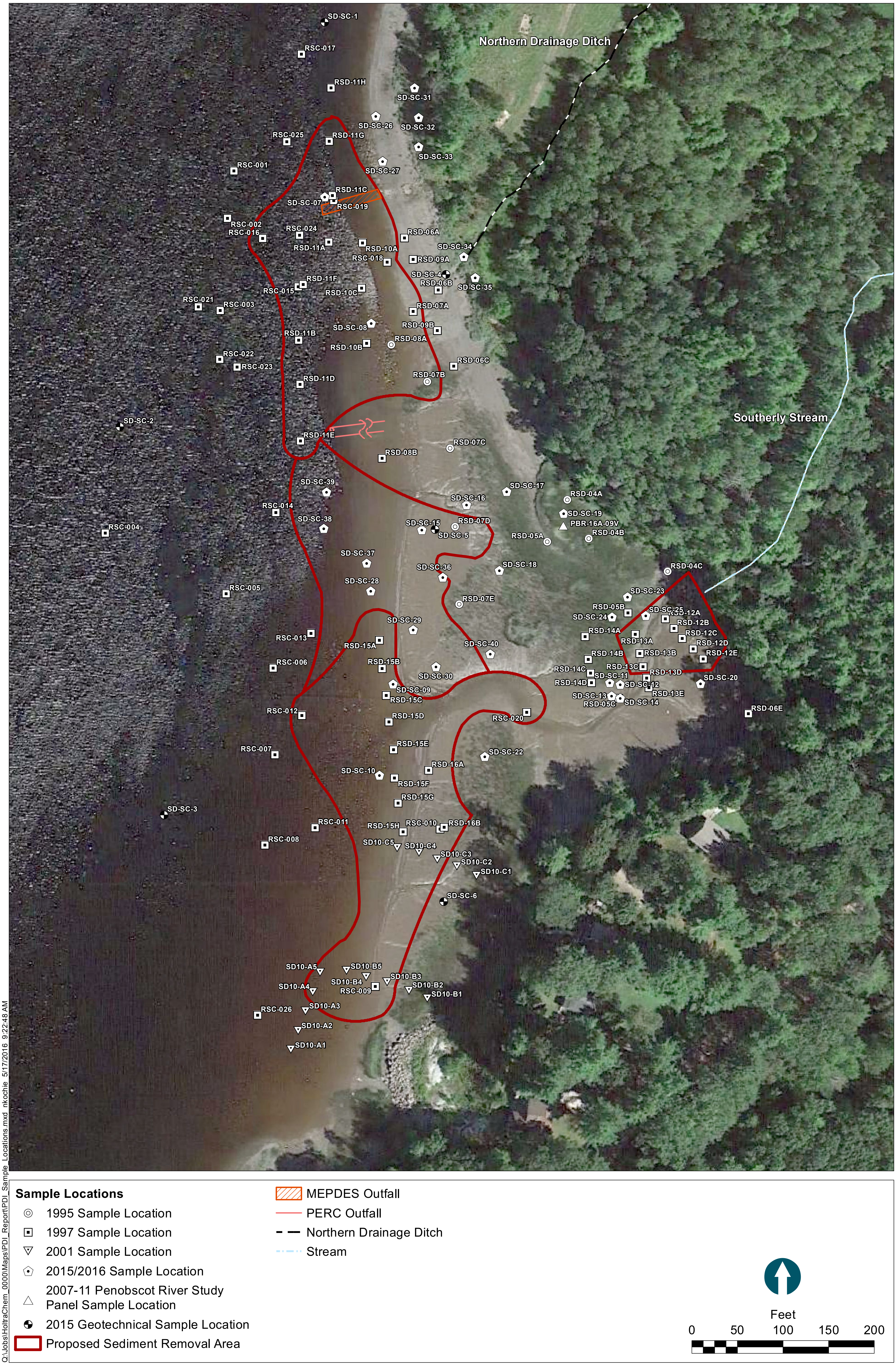
Maine BEP (State of Maine Board of Environmental Protection), 2010. Appeal of Designation of Uncontrolled Hazardous Substance Site and Order, Findings of Fact and Order on Appeal in the Matter of United States Surgical Corporation and Mallinckrodt LLC Concerning a Chlor-alkali Manufacturing Facility in Orrington, Penobscot County, Maine Proceeding Under 38 M.R.S.A. § 1365, Uncontrolled Hazardous Substance Sites Law; August 19, effective date April 3, 2014.

Maine DEP (Maine Department of Environmental Protection), 2008. Compliance Order: Designation of Uncontrolled Hazardous Substance Site and Order in the Matter of United States Surgical Corporation, Mallinckrodt LLC Concerning a Chloralkali Manufacturing Facility in Orrington, Penobscot County, Maine Formerly Owned and Operated by Mallinckrodt Inc., Proceeding Under 38 M.R.S.A. § 1365, Uncontrolled Hazardous Substance Sites Law; November 24.

Maine Natural Areas Program, 2015. Department of Agriculture, Conservation and Forestry. Elements of Diversity Rare, Threatened and Endangered Plants. September 2015.

PRMSP (Penobscot River Mercury Study Panel), 2013. Penobscot River Mercury Study Final Report. Mercury Contamination of the Penobscot River Estuary: Current Situation, Remediation Targets and Possible Remediation Procedures. Submitted to Judge John Woodcock Unites States District Court (District of Maine). April 2013.

# FIGURES



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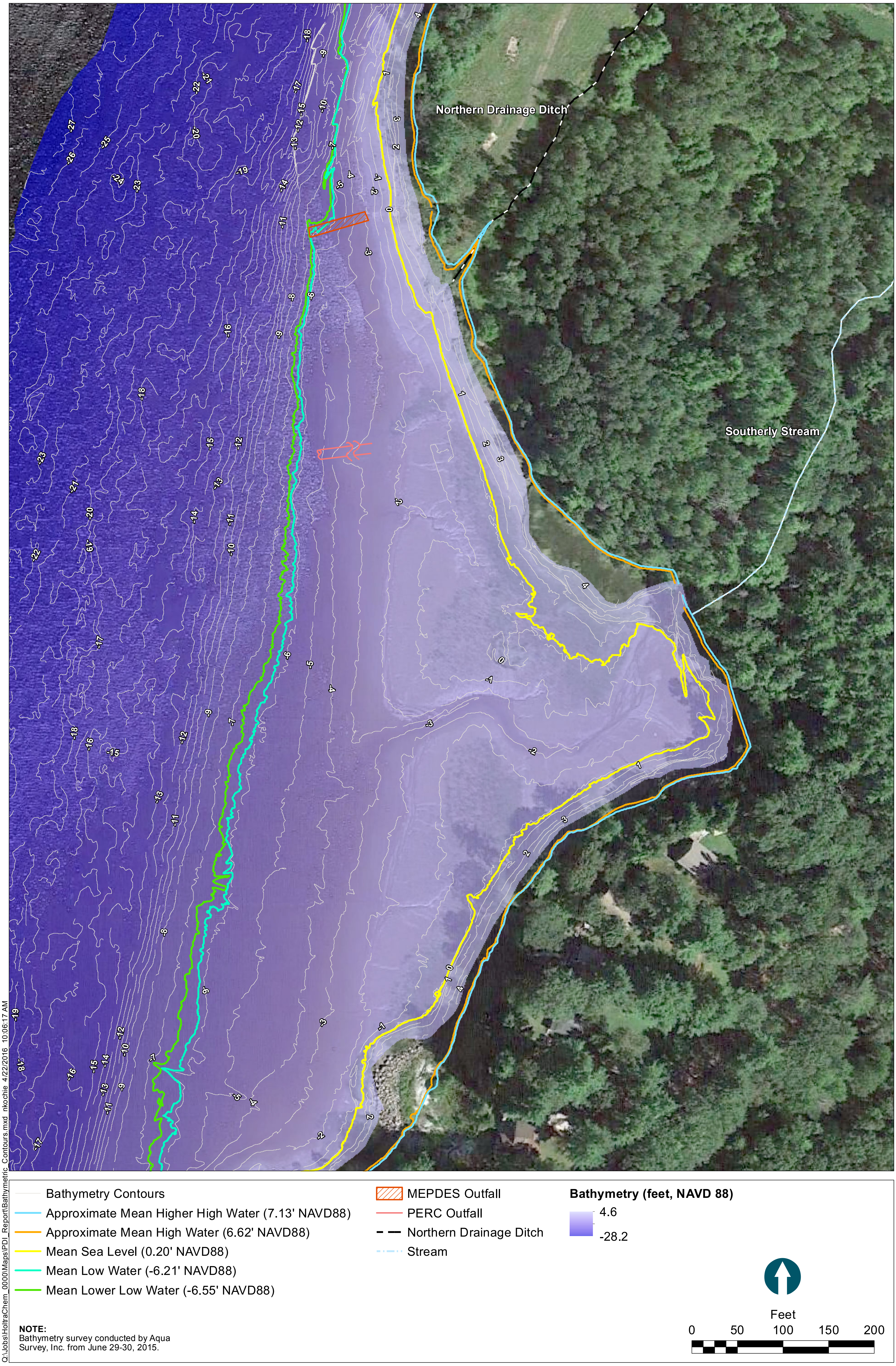
ANCHOR QEA

**Figure 1-1**
Sediment Sample Locations
Pre-design Activities Report
Southern Cove, Orrington Remediation Site



**NOTE:**
Bathymetry survey conducted by Aqua Survey, Inc. from June 29-30, 2015.

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**Figure 2-1**
Bathymetric Survey Results
Pre-design Activities Report
Southern Cove, Orrington Remediation Site

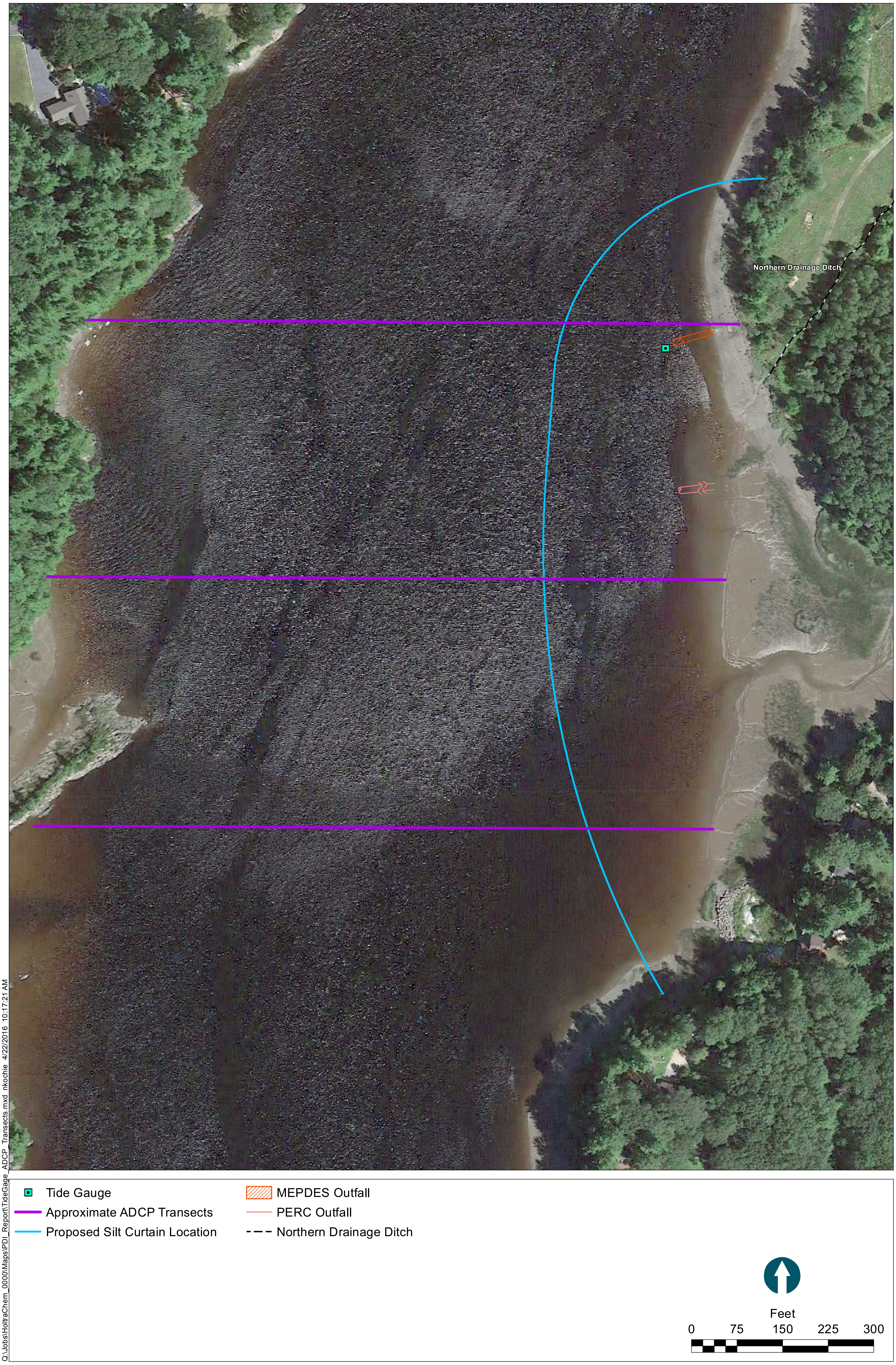

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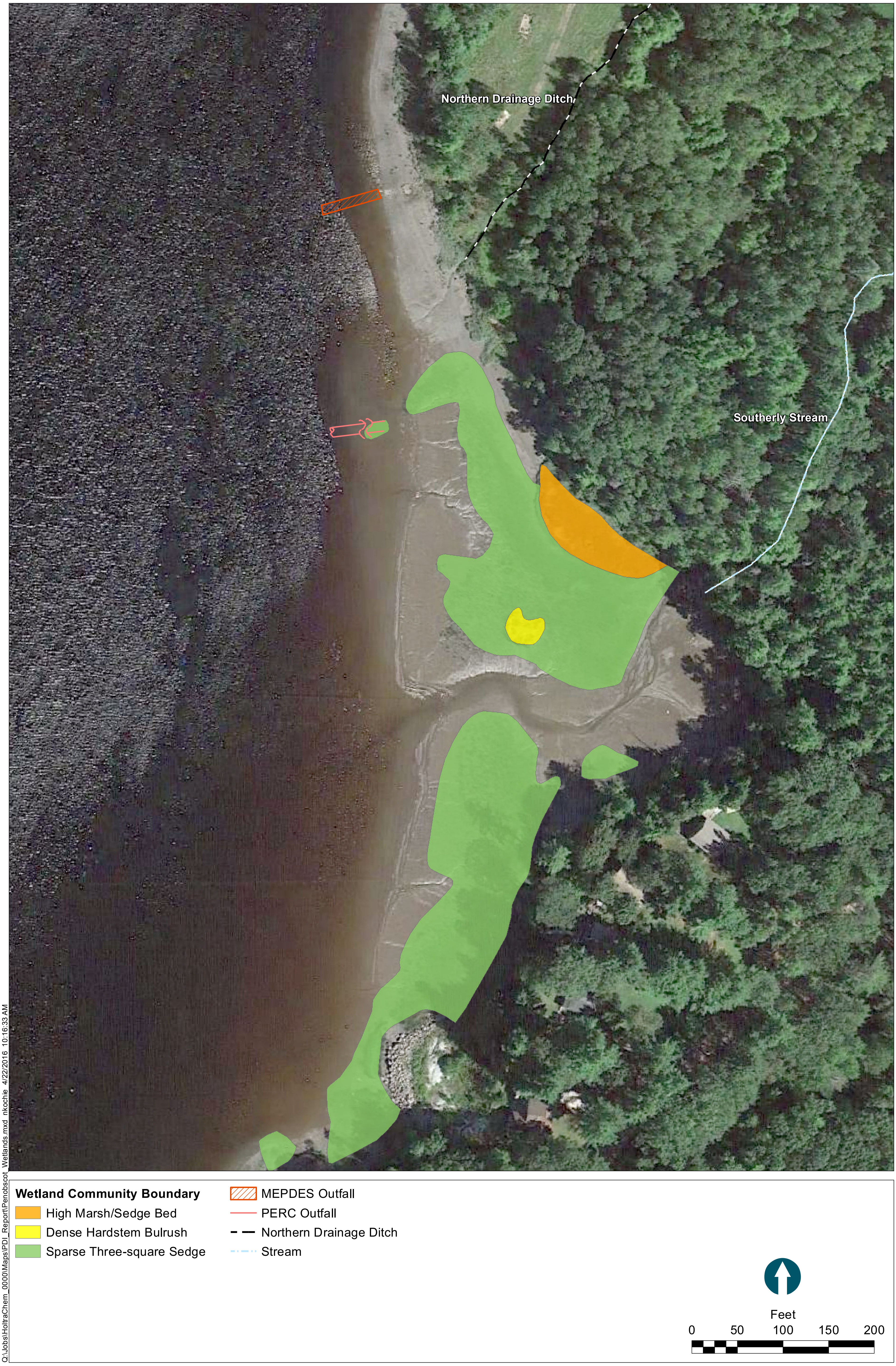
**Figure 3-1**
Tide Gage and ADCP Transect Locations
Pre-design Activities Report
Southern Cove, Orrington Remediation Site



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ANCHOR QEA

**Figure 8-1**
Wetland Extents
Pre-design Activities Report
Southern Cove, Orrington Remediation Site

# ATTACHMENTS

# A.1: Bathymetric Report (Aqua Survey 2015)

# Aqua Survey, Inc.'s Summary Bathymetric Final Report – Orrington Remediation Site,

## Penobscot River, Orrington, Maine

A multibeam bathymetric survey was conducted covering the specified project area along the Penobscot River in Orrington, Maine. The area surveyed is located on the eastern side of the river, extending for approximately 4700 feet along the river and about 2500 feet offshore towards the main channel from the furthest point in a cove located in the southern third of the survey area. The geophysical survey was conducted between 29 and 30 June, 2015. Technologies and techniques employed included real-time kinematic global positioning and a multibeam fathometer.

Project control was provided by a Trimble MS750 real-time kinematic global positioning system (RTK-GPS) with centimeter accuracy. RTK corrections were obtained using a virtual reference network of base stations via internet connection from KeyNetGPS VRS service. Prior to commencing the survey, the RTK system was checked against a benchmark which was supplied by the client at the project site to ensure positioning accuracy (described as control point #1). The RTK antenna was mounted directly above the multibeam transducer to eliminate offset errors. All results were produced in Maine -1801 East NAD 83 coordinate system with units in US survey feet horizontal datum and North American Vertical Datum 1988 (NAVD88) vertical datum. Anchor QEA after review of the data pointed out a distinct difference in elevation as they plotted their upland survey with the water based survey. ASI discovered that an antennae offset of 7.8 feet was accounted for twice. Apparently during the unsuccessful survey event in the middle of June the antennae offset was entered during the survey. This offset value was not removed during the RTK QC check on the following survey event and an additional offset was added in the project geodesy which erroneously compensated for the previous antennae height. The value was compensated for the final XYZ file in order to correct the error.

An R2Sonic 2022 multibeam system was used to collect the bathymetric data. System components include the integrated multibeam projector and receiver, an SMC-108 motion reference unit, Hemisphere VS-110 satellite compass, Castaway CTD, and an AML Micro-X sound velocity probe. A multibeam calibration was conducted following data acquisition. This is also known as a patch test and is used to solve for the alignment values between the motion sensor reference frame and the multibeam reference frame. Standard patch test calibration survey lines were run to resolve the latency, pitch, roll and yaw alignments.

Multibeam data was collected at variable line spacing based on water depth to produce a complete dataset over all accessible areas. Survey speeds were between 3-4 knots. Sound velocity of the water was monitored at the sonar head during the entire survey and sound velocity profiles of the water column were taken at the beginning of the survey. The water column was well mixed due to the river currents.

All raw data multibeam sonar was logged in Hypack and processed using HySweep multibeam editor. Data was reviewed for any potential issues, outliers, or data drop-outs with erroneous data points removed. Soundings were corrected for the heave, pitch, roll and heading of the vessel in real time during acquisition and correlated with position data. Sound velocity profiles measured in the field were applied to the sonar data on a nearest in time basis to correct each sonar beam's path through the water column. Real time sound velocity at the sonar head was measured and applied to the data using a sound velocity sensor.

Water level height, or tide values were generated by correcting the raw RTK GPS height for vessel heave, pitch, roll and draft. These corrections were then applied to reduce the sounding data to the project vertical datum.

Data quality was affected in some areas by the grasses growing in the tidal flats without appreciable degradation. In addition to the bathymetry generated from the data, the high data resolution and density allowed for detection of debris consisting almost entirely of rocks within the survey area.

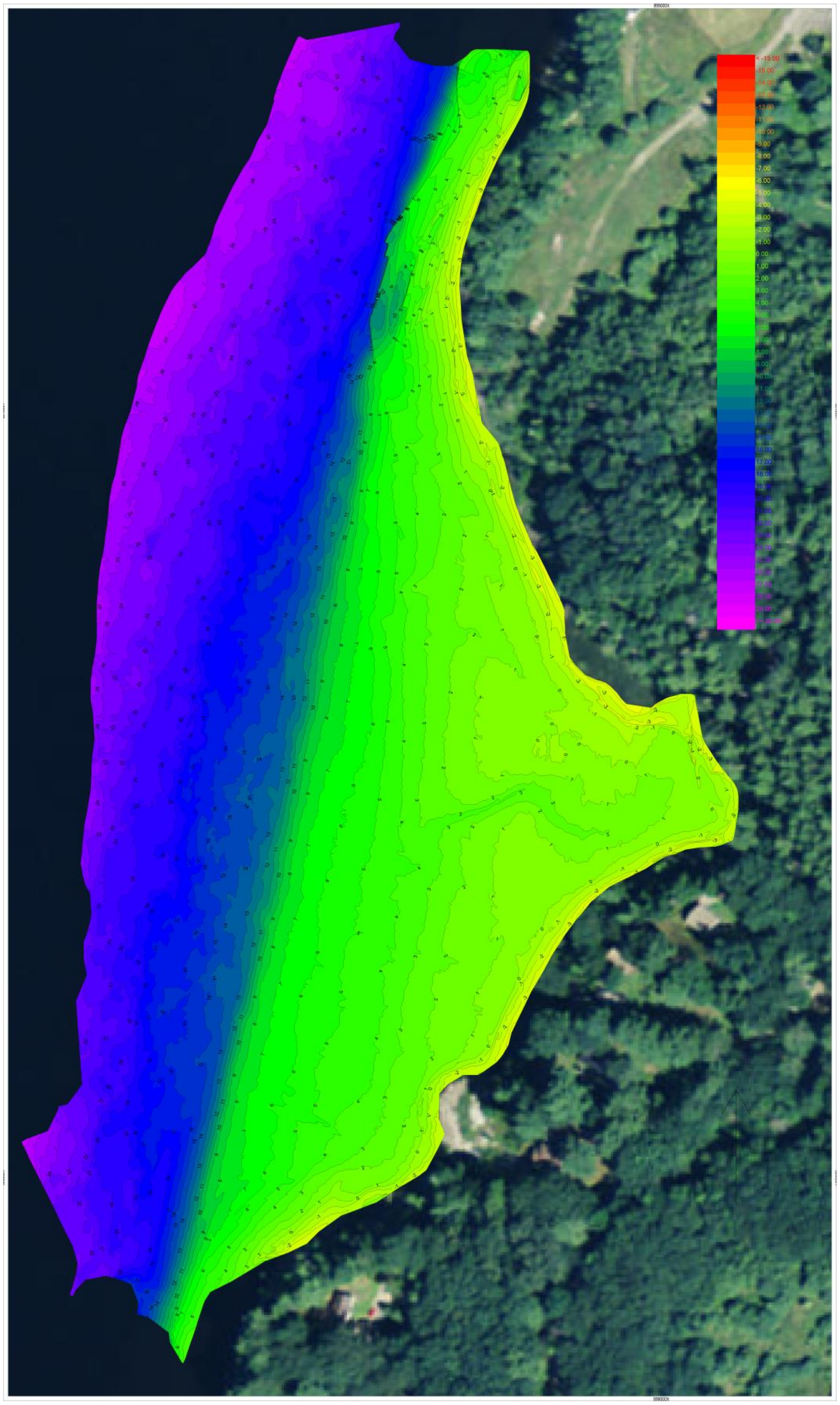


Figure 1. Image showing the bathymetric survey results. Contours are at 1 foot intervals.

# A.2: Acoustic Doppler Current Profiler Report (Aqua Survey 2015)

# Summary of Field Work for the ADCP Survey – Orrington, ME

Acoustic Doppler Current Profile (ADCP) survey field work was conducted covering the specified project area at the site near Orrington, ME (Figure 1). The project area was south along the Penobscot River from Bangor, ME and about 2.5 miles south of the boat ramp (Figure 2) that was used during the project. A boat mounted unit was deployed and profile surveys were conducted along three transects in the project area. The initial survey was conducted on 18 June 2015 but due to lack of bottom tracking during this work the survey had to be conducted again on 3 August 2015. Technologies and techniques employed during the project included; RTK differential global positioning (Real Time Kinematic GPS), small survey vessels, HYPACK software, and TRDI ADCPs with side mounting hardware.

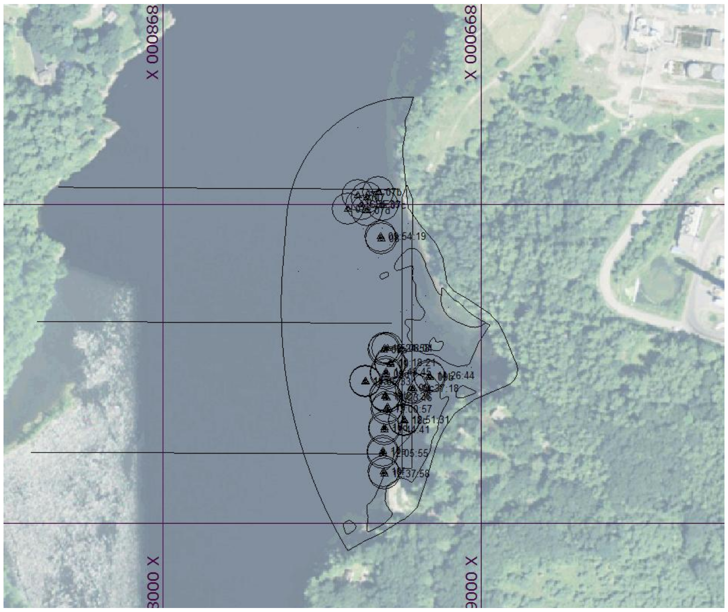


Figure 1. Project site near Orrington, ME

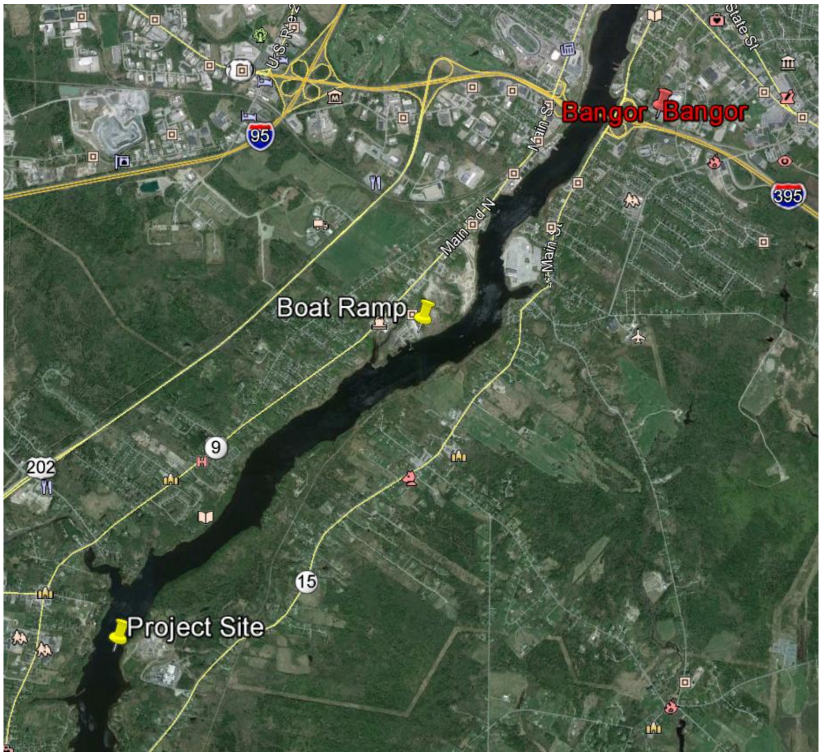


Figure 2. Project site with Boat ramp location

Project control monuments were provided by the client and presented in NAD83/NAVD88 horizontal and vertical datum. The project mapping projection was East ME state plane coordinates, NAD83. Trimble SPS-852 differential global positioning system (DGPS) with cm accuracy from RTK correction was used for location service during the survey. The DGPS antenna was mounted near the ADCP over the side mount (and near the sediment sampling point during sediment sampling) with positions corrected by HYPACK using measure offsets to make positioning more accurate. HYPACK 2015 software was used to record all ADCP profile data and other positioning during the project. ADCP survey data was downloaded, plotted and presented electronically under separate cover.

ADCP data collected on 18 June were present using HYPACK software in raw format (magnitude and direction not corrected for boat velocity). Field notes for 18th June are presented in Table 2 below in a Daily Progress Report (DPR) format and notes for 3 August in Table 1. Although not correct for boat motion the data collect on 18 June clearly documented that max velocities were well below 3 kts over the 12 hour collection period. The ADCP (TRDI Workhorse Sentinel) that was used had not been rented with the bottom track option included and HYPACK software could not correct ADCP velocities using the RTK GPS boat velocities recorded. ASI decided to re-collect the data during the Spring tides of the first week of August.

A Teledyne RDI Rio Grande 1200 kHz ADCPs was used for the resurvey. Prior to the start of data collection a compass calibration and true north alignment of the unit was performed to the manufacturer's specs. A moving bed test was collected during the day of the survey. The unit was then set to record data in 0.25 meter vertical bins. The ADCP was set in the boat mount which consisted of an aluminum frame with a clamp at the bottom for the ADCP and pipe work up top to mount to the gunnel. Three transects were surveyed as per Anchor QEA's scope of work. These transects were surveyed every hour for a 12 hour period.

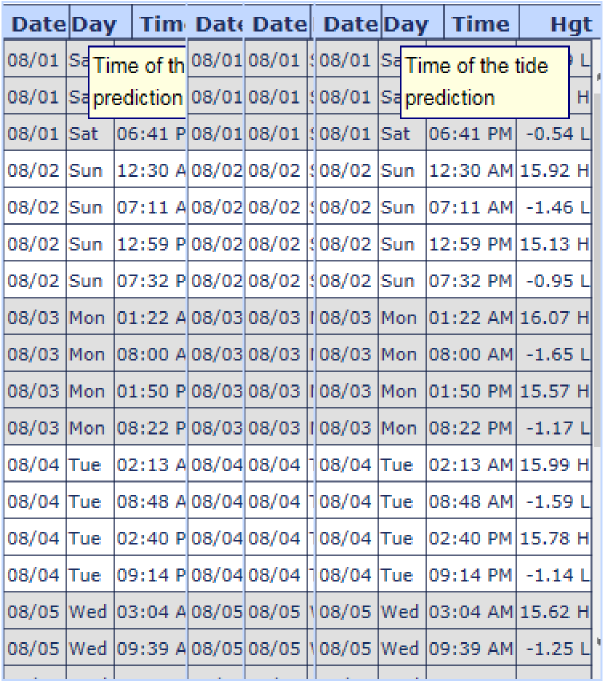
## DAILY PROGRESS REPORT

---

**Job: Orrington, Maine** **Date: 3 August 2015**

**Client: Anchor QEA**
**Crew: WS, AS**
**Boat: Carolina Skiff**

**Tides:**



| Date | Day | Tim | Dat | Date | Date | Day | Time | Hgt |
|---|---|---|---|---|---|---|---|---|
| 08/01 | Sa | Time of th | 08/01 | 08/01 | 08/01 | Sa | Time of the tide | L |
| 08/01 | Sa | prediction | 08/01 | 08/01 | 08/01 | Sa | prediction | H |
| 08/01 | Sat | 06:41 P | 08/01 | 08/01 | 08/01 | Sat | 06:41 PM | -0.54 L |
| 08/02 | Sun | 12:30 A | 08/02 | 08/02 | 08/02 | Sun | 12:30 AM | 15.92 H |
| 08/02 | Sun | 07:11 A | 08/02 | 08/02 | 08/02 | Sun | 07:11 AM | -1.46 L |
| 08/02 | Sun | 12:59 P | 08/02 | 08/02 | 08/02 | Sun | 12:59 PM | 15.13 H |
| 08/02 | Sun | 07:32 P | 08/02 | 08/02 | 08/02 | Sun | 07:32 PM | -0.95 L |
| 08/03 | Mon | 01:22 A | 08/03 | 08/03 | 08/03 | Mon | 01:22 AM | 16.07 H |
| 08/03 | Mon | 08:00 A | 08/03 | 08/03 | 08/03 | Mon | 08:00 AM | -1.65 L |
| 08/03 | Mon | 01:50 P | 08/03 | 08/03 | 08/03 | Mon | 01:50 PM | 15.57 H |
| 08/03 | Mon | 08:22 P | 08/03 | 08/03 | 08/03 | Mon | 08:22 PM | -1.17 L |
| 08/04 | Tue | 02:13 A | 08/04 | 08/04 | 08/04 | Tue | 02:13 AM | 15.99 H |
| 08/04 | Tue | 08:48 A | 08/04 | 08/04 | 08/04 | Tue | 08:48 AM | -1.59 L |
| 08/04 | Tue | 02:40 P | 08/04 | 08/04 | 08/04 | Tue | 02:40 PM | 15.78 H |
| 08/04 | Tue | 09:14 P | 08/04 | 08/04 | 08/04 | Tue | 09:14 PM | -1.14 L |
| 08/05 | Wed | 03:04 A | 08/05 | 08/05 | 08/05 | Wed | 03:04 AM | 15.62 H |
| 08/05 | Wed | 09:39 A | 08/05 | 08/05 | 08/05 | Wed | 09:39 AM | -1.25 L |

**General forecast:**

**Today**

Sunny, mainly before 1600.
Wind out of the South 10-15 kts

## Event Log for today (Time= Local)

| Item | **Start** | **End** | **Speed** | Comments |
|---|---|---|---|---|
| Travel | 0400 | | | Travel to dock |
| dockside | 0505 | | | Launching boat and mobbing dockside |
| Water | 0632 | | | Checking ADCP calibrations and transiting to site |
| Water | 0653 | | | Checked in with Dean Carter |
| Water | 0712 | | | Final pre-survey checks, bins good, compass good |
| water | 0714 | | | Start running ADCP lines (see table below) last line started at 1859 |
| dockside | 1954 | | | Demob of boat |
| Travel | 2100 | | | Back at hotel |
| | | | | |

Table 1

| | | Distance to water's edge | | |
|---|---|---|---|---|

| Line | Time | East side of river (ft) | West side of river (ft) | Nominal Boat Heading | Comments Transducer #3 facing bow |
|---|---|---|---|---|---|
| North line (N) | 0714 | | | | |
| Middle line (M) | | | 125 | | |
| South line (S) | 0742 | | | | |
| N | 0803 | 20 | 20 | West (W) | |
| M | 0815 | 20 | 50 | East (E) | |
| S | 0824 | 50 | 50 | W | |
| N | 0854 | 50 | 20 | W | Stop/start pinging |
| M | 0910 | 50 | 50 | E | |
| S | 0925 | 100 | 30 | W | |
| N | 0957 | 60 | 70 | W | did a movable bed test (all good) |

| | | | | | |
|---|---|---|---|---|---|
| M | 1010 | 100 | 100 | E | |
| S | 1016 | 200 | 100 | W | |
| N | 1053 | 100 | 120 | W | |
| M | 1104 | 120 | 200 | E | |
| S | 1114 | 230 | 80 | W | Emailed data set to TRDI for QC |
| N | 1158 | 50 | 50 | W | |
| M | 1205 | 50 | 250 | E | |
| S | 1214 | 50 | 50 | W | |
| N | 1255 | 50 | 20 | W | |
| M | 1302 | 20 | 100 | E | |
| M (repeat) | 1310 | 100 | 20 | W | |
| S | 1319 | 200 | 50 | E | |
| N | 1358 | 40 | 40 | E | |
| M | 1406 | 100 | 20 | W | |
| S | 1418 | 70 | 35 | E | |
| N | 1458 | 35 | 40 | E | |
| M | 1502 | 80 | 25 | W | Outgoing tide with south wind, choppy sea |
| S | 1511 | 100 | 60 | E | |
| N | 1553 | 40 | 60 | E | |
| M | 1601 | 110 | 20 | W | |
| S | 1612 | 60 | 90 | E | |
| N | 1653 | 55 | 40 | W | |
| M | 1700 | 30 | 110 | E | |
| S | 1707 | 100 | 50 | W | |
| N | 1754 | 70 | 60 | W | |
| M | 1800 | 60 | 100 | E | |
| S | 1807 | 120 | 70 | W | |
| N | 1859 | 70 | 40 | W | |
| M | 1904 | 60 | 120 | E | |
| S | 1910 | 120 | 10 | W | |

| **Job Plan for today** | **Today** | **Remaining** | **Comments** |
|---|---|---|---|
| **Collect ADCP data** | **About 39 transects** | **0** | **Choppy conditions on outgoing tide** |

## Man-Hours

| **Personnel** | | **Man-Hours Today Fieldwork +data processing** | **Total Man-Hours** |
|---|---|---|---|
| **Wayne** | 3 August | 17 | 17 |
| **Abby** | 3 August | 17 | 17 |
| **Total today** | | | **34** |
| | | | |

## Surveyor/ Captain (Wayne D. Spencer) Comments:

**Data:** Data is backed up: YES

**Projected Schedule**: travel back to office and demob

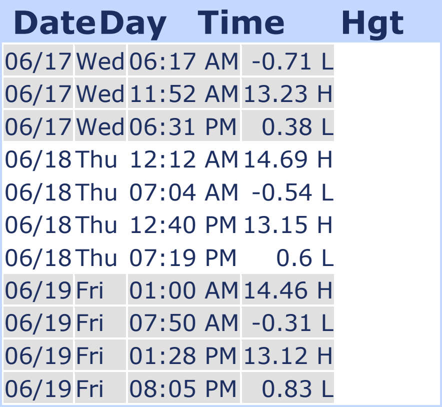
**Wayne D. Spencer**

## DAILY PROGRESS REPORT (previous trip)

---

**Job: Orrington, Maine** **Date: 18 June 2015**
**Client: Anchor QEA**
**Crew: WS, KS**
**Boat: RV Prattis**

**Tides:**



| Date | Day | Time | Hgt |
|---|---|---|---|
| 06/17 | Wed | 06:17 AM | -0.71 L |
| 06/17 | Wed | 11:52 AM | 13.23 H |
| 06/17 | Wed | 06:31 PM | 0.38 L |
| 06/18 | Thu | 12:12 AM | 14.69 H |
| 06/18 | Thu | 07:04 AM | -0.54 L |
| 06/18 | Thu | 12:40 PM | 13.15 H |
| 06/18 | Thu | 07:19 PM | 0.6 L |
| 06/19 | Fri | 01:00 AM | 14.46 H |
| 06/19 | Fri | 07:50 AM | -0.31 L |
| 06/19 | Fri | 01:28 PM | 13.12 H |
| 06/19 | Fri | 08:05 PM | 0.83 L |

**General forecast:**

**Today**

Showers likely, mainly before 9am. Cloudy through mid morning, then gradual clearing, with a high near 73. Light and variable wind becoming north 6 to 11 mph in the morning. Chance of precipitation is 60%. New precipitation amounts between a tenth and quarter of an inch possible.

### Event Log for today (Time= Local)

| Item | **Start** | **End** | **Speed** | Comments (speed, dir) |
|---|---|---|---|---|
| Travel | 0600 | | | Travel to dock |
| dockside | 0630 | | | Checking ADCP calibrations and transiting to site |
| water | 0720 | | | Running ADCP lines (see table below) last line started at 1909 |
| dockside | 1930 | | | Demob of boat |
| Travel | 2000 | | | Back at hotel |
| | | | | |

Table 2

| | | | | |
|---|---|---|---|---|
| | | Distance to water's edge | | |

| Line | Time | East side of river (ft) | West side of river (ft) | Nominal Boat Heading | Comments Transducer #3 facing bow |
|---|---|---|---|---|---|
| North line (N) | 0720 | 65 | 100 | West (W) | |
| Middle line (M) | 0740 | 150 | 125 | W | GPS froze at shore |
| South line (S) | 0746 | 200 | 100 | East (E) | Dist to shore estimated by sight |
| N | 0756 | 70 | 100 | W | |
| M | 0802 | 150 | 125 | E | |
| S | 0809 | 200 | 100 | W | Tested ADCP data using Winsc and sent data sample to HYPACK support for inspection |
| N | 0902 | 60 | 75 | W | |
| M | 0907 | 30 | 25 | E | |
| S | 0916 | 150 | 60 | W | |
| N | 0957 | 60 | 100 | W | |
| N | 1002 | 70 | 100 | E | ADCP compass heading looks good |
| M | 1008 | 150 | 75 | W | |
| M | 1012 | 150 | 75 | E | |
| S | 1017 | 200 | 60 | W | |
| S | 1023 | 175 | 75 | E | GPS froze had to restart the transect |
| N | 1102 | 30 | 50 | W | |
| M | 1112 | 200 | 75 | E | |
| S | 1118 | 150 | 30 | W | |
| N | 1203 | 30 | 20 | W | |

| | | | | | |
|---|---|---|---|---|---|
| N | 1207 | 40 | 30 | E | |
| M | 1213 | 200 | 20 | W | |
| M | 1218 | 200 | 60 | E | |
| S | 1223 | 75 | 100 | W | |
| S | 1228 | 60 | 100 | E | |
| N | 1258 | 30 | 20 | W | |
| M | 1305 | 200 | 20 | E | |
| S | 1312 | 80 | 100 | W | |
| N | 1402 | 30 | 20 | W | |
| M | 1408 | 200 | 15 | E | |
| S | 1415 | 80 | 120 | W | |
| N | 1500 | 30 | 40 | E | |
| M | 1505 | 225 | 50 | W | Gear over the side had to restart line (rough conditions) |
| M | 1514 | 200 | 40 | E | |
| S | 1520 | 100 | 25 | W | |
| N | 1558 | 40 | 60 | E | |
| M | 1604 | 225 | 50 | W | |
| S | 1610 | 125 | 30 | E | |
| N | 1700 | 50 | 75 | W | |
| M | 1706 | 150 | 75 | E | |
| S | 1711 | 150 | 30 | W | |
| N | 1800 | 75 | 60 | W | |
| M | 1805 | 100 | 90 | E | |
| S | 1811 | 125 | 40 | W | |
| S | 1859 | 100 | 40 | W | |
| M | 1903 | 80 | 50 | E | |
| N | 1909 | 60 | 30 | W | |

| **Job Plan for today** | **Today** | **Remaining** | **Comments** |
|---|---|---|---|
| **Collect ADCP data** | **About 39 transects** | **0** | |

## Man-Hours

| Personnel | | Man-Hours Today Fieldwork +data processing | Total Man-Hours |
|---|---|---|---|
| **Wayne** | 18 June | 14 | 14 |
| **Kevin** | 18 June | 14 | 14 |
| **Total today** | | | **28** |

## Captain/surveyor (Wayne D. Spencer) Comments:

**Data:** Data is backed up: YES

**Projected Schedule**: need to do more sediment sampling tomorrow

**Wayne D. Spencer**

# A.3: Boring Logs

**LOG OF**

**EXPLORATORY BORING**

CLIENT/PROJECT NAME **Orrington Remediation Site**

PROJECT NUMBER **140617-01.01**

GEOLOGIST/ENGINEER **Matt Carlino**

DRILLING CONTRACTOR **New England Boring**

DRILLING METHOD **Drive and wash**

HOLE DIAMETER **6"**

BORING # **SD-SC-01**

DATE BEGAN **6/17/2015**

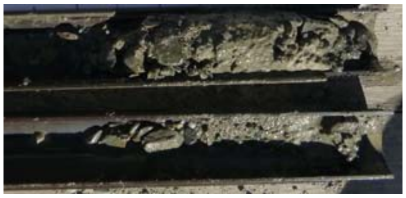
DATE COMPLETED **6/17/2015**

TOTAL DEPTH **15'**

SHEET **1** OF **1**

Field location of boring

| X: | Y: | Z: -6.07 |
|---|---|---|
| 898640.077960823 | 391223.256611146 | |

| Laboratory Sample (E = environmental, G= geotechnical) | SAMPLING DATA | | | | | | DEPTH IN FEET BELOW MUDLINE | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION | |
|---|---|---|---|---|---|---|---|---|---|---|
| | SAMPLING METHOD | Core Run | RECOVERY (feet) | DEPTH SAMPLED | SPT (2" SS and 140 lb. hammer unles noted) | N value | | | | Representative Photographs |
| G | Drive and wash, 2" split spoon, 140 lb. hammer | 1 | 0 | 0.5-2.5 | 7 | | 1 | GW | Drove gravel/cobbles |  |
| | | | | | 5 | | | | | |
| | | | | | 6 | 13 | 2 | | | |
| | | | | | 7 | | | | | |
| | | | | | | | 3 | | | |
| | | | | | | | | | | |
| G | | 2 | 0.4 | 3.5-5 | 20 | | 4 | SW-SM | Dense, wet, grey, fine gravel, coarse SAND |  |
| | | | | | 19 | 88 | | | | |
| | | | | | 69 | | 5 | | | |
| | | | | | | | | | | |
| | | | | | | | 6 | | | |
| G | | 3 | 0.5 | 6-7.5 | 39 | | | SW-SM | Very dense, wet, grey, fine gravel, coarse SAND |  |
| | | | | | 33 | 70 | 7 | | | |
| | | | | | 37 | | | | | |
| | | | | | | | 8 | | | |
| | | | | | | | | | | |
| | | | | | | | 9 | | | |
| G | | 4 | 0.3 | 9-10.5 | 9 | | | GW | Medium dense, wet, grey, coarse sand, fine GRAVEL |  |
| | | | | | 12 | 44 | 10 | | | |
| | | | | | 32 | | | | | |
| | | | | | | | 11 | | | |
| | | | | | | | | | | |
| | | | | | | | 12 | | |  |
| | | | | | | | | | | |
| | | | | | | | 13 | | | |
| | | | | | | | | | | |
| G | | 5 | 0.3 | 13.5-15 | 11 | | 14 | GW | Medium dense, wet, grey, coarse sand, fine GRAVEL | |
| | | | | | 20 | 39 | | | | |
| | | | | | 19 | | 15 | | | |
| *Bottom of boring* | | | | | | | | | | |
| | | | | | | | 16 | | | |
| | | | | | | | | | | |
| | | | | | | | 17 | | | |
| | | | | | | | | | | |
| | | | | | | | 18 | | | |
| | | | | | | | | | | |
| | | | | | | | 19 | | | |
| | | | | | | | | | | |
| | | | | | | | 20 | | | |

Remarks:

Horizontal coordinate system: Maine State East NAD 83 US Survey Feet

Vertical coordinate system: NAVD 88

**LOG OF EXPLORATORY BORING**

CLIENT/PROJECT NAME **Orrington Remediation Site**
PROJECT NUMBER **140617-01.01**
GEOLOGIST/ENGINEER **Matt Carlino**
DRILLING CONTRACTOR **New England Boring**
DRILLING METHOD **Drive and wash**
HOLE DIAMETER **6"**

BORING # **SD-SC-02**
DATE BEGAN **6/18/2015**
DATE COMPLETED **6/18/2015**
TOTAL DEPTH **16.4'**
SHEET **1** OF **1**

Field location of boring

| X: | Y: | Z: |
|---|---|---|
| 898415.89803391 | 390779.553597599 | -12.34 |

| Laboratory Sample (E = environmental, G= geotechnical) | SAMPLING DATA: SAMPLING METHOD | Core Run | RECOVERY (feet) | DEPTH SAMPLED | SPT (2" SS and 140 lb. hammer unles noted) | N value | DEPTH IN FEET BELOW MUDLINE | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION | Representative Photographs |
|---|---|---|---|---|---|---|---|---|---|---|
| | Drive and wash, 2" split spoon, 140 lb. hammer | 1 | 0.1 | 1-2.5 | 3<br>2<br>2 | 4 | 1<br>2<br>3 | SW | Loose, wet, grey, gravelly coarse SAND with wooden debris |  |
| | | 2 | 0 | 3.5-5 | 4<br>3<br>1 | 4 | 4<br>5<br>6 | SW? | Woody debris |  |
| | | 3 | 0.2 | 6-7.5 | 5<br>2<br>3 | 5 | 7<br>8 | SW | Loose, wet, grey coarse SAND with woody debris |  |
| | | 4 | 0 | 8.5-10 | 7<br>5<br>4 | 9 | 9<br>10<br>11 | SW? | Woody debris in shoe tip | no photograph |
| | | 5 | 0 | 11-12.5 | 5<br>2<br>2 | 4 | 12<br>13 | SW? | Woody debris in shoe tip | no photograph |
| | | 6 | 0.4 | 13.5-15 | 6<br>3<br>5 | 8 | 14<br>15<br>16 | SW | Loose, wet, grey, fine gravelly medium to coarse SAND |  |
| | | | | | | | *Bottom of boring* | | | |
| | | | | | | | 17<br>18<br>19<br>20 | | | |

Remarks:

Horizontal coordinate system: Maine State East NAD 83 US Survey Feet

Vertical coordinate system: NAVD 88

Refusal at 16.4' - possibly bedrock.

## LOG OF EXPLORATORY BORING

CLIENT/PROJECT NAME **Orrington Remediation Site**
BORING # **SD-SC-02B**
PROJECT NUMBER **140617-01.01**
DATE BEGAN **6/19/2015**
GEOLOGIST/ENGINEER **Matt Carlino**
DATE COMPLETED **6/19/2015**
DRILLING CONTRACTOR **New England Boring**
TOTAL DEPTH **22.5'**
DRILLING METHOD **Drive and wash**
SHEET **1** OF **2**
HOLE DIAMETER **6"**

Field location of boring

| X: | Y: | Z: |
|---|---|---|
| 898415.89803391 | 390779.553597599 | -12.34 |

| Laboratory Sample (E = environmental, G= geotechnical) | SAMPLING DATA<br>SAMPLING METHOD | Core Run | RECOVERY (feet) | DEPTH SAMPLED | SPT (2" SS and 140 lb. hammer unles noted) | N value | DEPTH IN FEET BELOW MUDLINE | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION | Representative Photographs |
|---|---|---|---|---|---|---|---|---|---|---|
| | Drive and wash, 2" split spoon, 140 lb. hammer | | | | | | | | | |
| | | | | | | | 1 | | | |
| | | 1 | 0.0 | 1-2.5 | 2 | | | | |  |
| | | | | | 1 | 2 | 2 | SW? | Woody debris | |
| | | | | | 1 | | | | | |
| | | | | | | | 3 | | | |
| | | | | | | | | | | |
| | | 2 | 0 | 3.5-5 | 3 | | 4 | | |  |
| | | | | | 3 | 4 | | SW? | Woody debris | |
| | | | | | 1 | | 5 | | | |
| | | | | | | | | | | |
| | | | | | | | 6 | | | |
| G | | 3 | 0.2 | 6-7.5 | 3 | | | | |  |
| | | | | | 2 | 5 | 7 | SW | Loose, wet, grey coarse SAND | |
| | | | | | 3 | | | | | |
| | | | | | | | 8 | | | |
| | | | | | | | | | | |
| G | | 5 | 0.6 | 8.5-10 | 5 | | 9 | | |  |
| | | | | | 5 | 9 | | SP | Loose, wet, grey, fine gravelly coarse SAND | |
| | | | | | 4 | | 10 | | | |
| | | | | | | | | | | |
| | | | | | | | 11 | | | |
| G | | 6 | 0.3 | 11-12.5 | 6 | | | | |  |
| | | | | | 4 | 11 | 12 | SP | Loose, wet, grey, fine gravelly coarse SAND, woody debris | |
| | | | | | 7 | | | | | |
| | | | | | | | 13 | | | |
| | | | | | | | | | | |
| G | | 7 | 0.3 | 13.5-15 | 6 | | 14 | | |  |
| | | | | | 6 | 14 | | SP | Medium dense, wet, grey, fine-coarse gravelly coarse SAND | |
| | | | | | 8 | | 15 | | | |
| | | | | | | | | | | |
| | | | | | | | 16 | | | |
| G | | 8 | 0.2 | 16-17.5 | 31 | | | | |  |
| | | | | | 31 | 53 | 17 | GP | Very dense, wet, grey, sandy GRAVEL, 3" cobble | |
| | | | | | 22 | | | | | |
| | | | | | | | 18 | | | |
| | | | | | | | | | | |
| G | | 9 | 0.2 | 18.5-20 | 22 | | 19 | | |  |
| | | | | | 22 | 48 | | GW | Very dense, wet, grey, GRAVEL, with cobbles and rock fragments | |
| | | | | | 26 | | 20 | | | |

Remarks:

Horizontal coordinate system: Maine State East NAD 83 US Survey Feet

Vertical coordinate system: NAVD 88

**LOG OF**

**EXPLORATORY BORING**

CLIENT/PROJECT NAME **Orrington Remediation Site**
PROJECT NUMBER **140617-01.01**
GEOLOGIST/ENGINEER **Matt Carlino**
DRILLING CONTRACTOR **New England Boring**
DRILLING METHOD **Drive and wash**
HOLE DIAMETER **6"**

BORING # **SD-SC-02B**
DATE BEGAN **6/19/2015**
DATE COMPLETED **6/19/2015**
TOTAL DEPTH **22.5'**
SHEET **2** OF **2**

Field location of boring

| X: | Y: | Z: -12.34 |
|---|---|---|
| 898415.89803391 | 390779.553597599 | |

| Laboratory Sample (E = environmental, G= geotechnical) | SAMPLING DATA: SAMPLING METHOD | Core Run | RECOVERY (feet) | DEPTH SAMPLED | SPT (2" SS and 140 lb. hammer unles noted) | N vlaue | DEPTH IN FEET BELOW MUDLINE | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION | Representative Photographs |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 21 | | | |
| G | Drive and wash, 2" split spoon, 140 lb. hammer | 10 | 0.2 | 21-22.5 | 42<br>18<br>17 | 35 | 22 | SM | Dense, moist, grey, silty, very gravelly, fine-coarse SAND, with some cobbles/rock |  |
| | | | | | | | *Bottom of boring* | | | |
| | | | | | | | 24 | | | |
| | | | | | | | 25 | | | |
| | | | | | | | 26 | | | |
| | | | | | | | 27 | | | |
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| | | | | | | | 32 | | | |
| | | | | | | | 33 | | | |
| | | | | | | | 34 | | | |
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| | | | | | | | 36 | | | |
| | | | | | | | 37 | | | |
| | | | | | | | 38 | | | |
| | | | | | | | 39 | | | |
| | | | | | | | 40 | | | |

| Remarks: | Horizontal coordinate system: Maine State East NAD 83 US Survey Feet | Vertical coordinate system: | | |
|---|---|---|---|---|

ANCHOR QEA

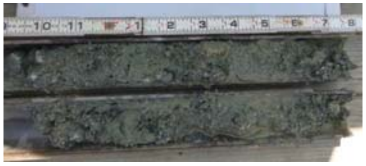
**LOG OF EXPLORATORY BORING**

CLIENT/PROJECT NAME **Orrington Remediation Site**
PROJECT NUMBER **140617-01.01**
GEOLOGIST/ENGINEER **Matt Carlino**
DRILLING CONTRACTOR **New England Boring**
DRILLING METHOD **Drive and wash**
HOLE DIAMETER **6"**

BORING # **SD-SC-03**
DATE BEGAN **6/17/2015**
DATE COMPLETED **6/17/2015**
TOTAL DEPTH **18'**
SHEET **1** OF **1**

Field location of boring

| X: | Y: | |
|---|---|---|
| 898464.259907093 | 390354.071197979 | Z: -4.99 |

| Laboratory Sample (E = environmental, G= geotechnical) | SAMPLING DATA: SAMPLING METHOD | Core Run | RECOVERY (feet) | DEPTH SAMPLED | SPT (2" SS and 140 lb. hammer unles noted) | N value | DEPTH IN FEET BELOW MUDLINE | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION | Representative Photographs |
|---|---|---|---|---|---|---|---|---|---|---|
| | Drive and wash, 2" split spoon, 140 lb. hammer | | | | | | 1 | | | |
| | | 1 | 0.0 | 1-2.5 | 3<br>2<br>1 | 3 | 2 | SW-SM? | no recovery | no photograph |
| | | | | | | | 3 | | | |
| | | 2 | 0 | 3.5-5 | 17<br>14<br>11 | 25 | 4<br>5 | SW-SM? | no recovery |  |
| | | | | | | | 6 | | | |
| G | | 3 | 0.3 | 6-7.5 | 8<br>6<br>6 | 12 | 7 | SW-SM | Medium dense, wet, grey, fine gravelly coarse SAND |  |
| | | | | | | | 8 | | | |
| G | | 4 | 0.6 | 8.5-10 | 7<br>10<br>9 | 19 | 9<br>10 | SW-SM | as above |  |
| | | | | | | | 11 | | | |
| G | | 5 | 0.3 | 11-12.5 | 11<br>7<br>8 | 15 | 12 | SW-SM | as above |  |
| | | | | | | | 13 | | | |
| G | | 6 | 0.2 | 13.5-15 | 20<br>14<br>18 | 32 | 14<br>15 | SW-SM | as above |  |
| | | | | | | | 16 | | | |
| G | | 7 | 0.2 | 16-17.5 | 20<br>20<br>22 | 42 | 17<br>18 | SM | as above, sandier zone at 17.6-18 in 3" spoon |  |
| | | | | | | | *Bottom of boring* | | | |
| | | | | | | | 19 | | | |
| | | | | | | | 20 | | | |

Remarks:

Horizontal coordinate system: Maine State East NAD 83 US Survey Feet

Vertical coordinate system: NAVD 88

3" spoon driven 16-18 after first 2" spoon in attempt to recover additional material

CLIENT/PROJECT NAME **Orrington Remediation Site**

BORING # **SD-SC-04**

PROJECT NUMBER **140617-01.01**

DATE BEGAN **6/19/2015**

GEOLOGIST/ENGINEER **Kevyn Bollinger**

DATE COMPLETED **6/19/2015**

DRILLING CONTRACTOR **ASI**

TOTAL DEPTH 1.5**'**

DRILLING METHOD Hand-auger

SHEET **1** OF **1**

**LOG OF EXPLORATORY BORING**

HOLE DIAMETER

Field location of boring

| X: | Y: | Z: 6.79 |
|---|---|---|
| 898770.781880394 | 390259.108578607 | |

| Laboratory Sample (E = environmental, G= geotechnical) | SAMPLING DATA<br>SAMPLING METHOD | Core Run | RECOVERY (feet) | DEPTH SAMPLED | SPT (2" SS and 140 lb. hammer unles noted) | N value | DEPTH IN FEET BELOW MUDLINE | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION | Representative Photographs |
|---|---|---|---|---|---|---|---|---|---|---|
| G | Vibracore | 1 | 1.0 | 0-1.5 | | | 1 | SP | Loose, wet, gray slightly gravelly, fine to coarse SAND | |
| | | | | | | | 2 | | | |
| *Bottom of boring* | | | | | | | | | | |
| | | | | | | | 3 | | | |
| | | | | | | | 4 | | | |
| | | | | | | | 5 | | | |
| | | | | | | | 6 | | | |
| | | | | | | | 7 | | | |
| | | | | | | | 8 | | | |
| | | | | | | | 9 | | | |
| | | | | | | | 10 | | | |
| | | | | | | | 11 | | | |
| | | | | | | | 12 | | | |
| | | | | | | | 13 | | | |
| | | | | | | | 14 | | | |
| | | | | | | | 15 | | | |
| | | | | | | | 16 | | | |
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Remarks:

Horizontal coordinate system: Maine State East NAD 83 US Survey Feet

Vertical coordinate system: NAVD 88

ANCHOR QEA

**LOG OF EXPLORATORY BORING**

CLIENT/PROJECT NAME **Orrington Remediation Site**
PROJECT NUMBER **140617-01.01**
GEOLOGIST/ENGINEER **Matt Carlino**
DRILLING CONTRACTOR **New England Boring**
DRILLING METHOD **Drive and wash**
HOLE DIAMETER **6"**

BORING # **SD-SC-05**
DATE BEGAN **6/19/2015**
DATE COMPLETED **6/19/2015**
TOTAL DEPTH 8'
SHEET **1** OF **1**

Field location of boring

| X: | Y: | Z: 6.66 |
|---|---|---|
| 898761.07<br>1776453 | 390666.98<br>1716245 | |

| Laboratory Sample (E = environmental, G= geotechnical) | SAMPLING DATA | | | | | | DEPTH IN FEET BELOW MUDLINE | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION | |
|---|---|---|---|---|---|---|---|---|---|---|
| | SAMPLING METHOD | Core Run | RECOVERY (feet) | DEPTH SAMPLED | SPT (2" SS and 140 lb. hammer unles noted) | N vlaue | | | | Representative Photographs |
| G | Drive and wash, 3" split spoon, 300 lb. hammer | 1 | 1 | 0-2 | WOH | | | MH | Very loose, wet, dark brown SILT |  |
| | | | | | WOH | | 1 | | | |
| | | | | | WOH | 2 | | | | |
| | | | | | 2 | | 2 | | | |
| | | 2 | 1 | 2-4 | 4 | | | | | |
| G | | | | | 6 | | 3 | SP | Loose, wet, grey gravelly coarse SAND |  |
| | | | | | 5 | 8 | | | | |
| G | | | | | 3 | | 4 | SM | Loose, saturated, light grey, silty SAND | |
| G | | 3 | 2 | 4-6 | 7 | | | | |  |
| | | | | | 5 | | 5 | | | |
| | | | | | 3 | 5 | | | | |
| | | | | | 2 | | 6 | | | |
| G | | 4 | 2 | 6-8 | 5 | | | CL | Medium stiff, olive grey CLAY |  |
| | | | | | 5 | | 7 | | | |
| | | | | | 5 | 7 | | | | |
| | | | | | 2 | | 8 | | | |
| *Bottom of boring* | | | | | | | | | | |
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Remarks:

Horizontal coordinate system: Maine State East NAD 83 US Survey Feet

Vertical coordinate system: NAVD 88

**LOG OF EXPLORATORY BORING**

CLIENT/PROJECT NAME **Orrington Remediation Site**
BORING # **SD-SC-06**
PROJECT NUMBER **140617-01.01**
DATE BEGAN **6/19/2015**
GEOLOGIST/ENGINEER **Kevyn Bollinger**
DATE COMPLETED **6/19/2015**
DRILLING CONTRACTOR **ASI**
TOTAL DEPTH **2'**
DRILLING METHOD **Vibracore**
SHEET **1** OF **1**
HOLE DIAMETER **4"**

Field location of boring

| X: 898770.781880394 | Y: 390259.108578607 | Z: 6.79 |
|---|---|---|

| Laboratory Sample (E = environmental, G= geotechnical) | SAMPLING DATA | | | | | | DEPTH IN FEET BELOW MUDLINE | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION | |
|---|---|---|---|---|---|---|---|---|---|---|
| | SAMPLING METHOD | Core Run | RECOVERY (feet) | DEPTH SAMPLED | SPT (2" SS and 140 lb. hammer unles noted) | N value | | | | |
| | | | | | | | | MH | Soft, brown, SILT | Representative Photographs |
| G | Vibracore | 1 | 1.0 | 0-2 | | | 1<br>2 | CL | Stiff, lean, grey, CLAY |  |
| *Bottom of boring* | | | | | | | | | | |
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Remarks:

Horizontal coordinate system: Maine State East NAD 83 US Survey Feet

Vertical coordinate system: NAVD 88

ANCHOR QEA

**LOG OF EXPLORATORY BORING**

CLIENT/PROJECT NAME **Orrington Remediation Site**
BORING # **SD-SC-07**
PROJECT NUMBER **140617-01.01**
DATE BEGAN **6/18/2015**
GEOLOGIST/ENGINEER **Matt Carlino**
DATE COMPLETED **6/18/2015**
DRILLING CONTRACTOR **New England Boring**
TOTAL DEPTH **3.3'**
DRILLING METHOD **Drive and wash**
SHEET **1** OF **1**
HOLE DIAMETER **6"**

Field location of boring

| X: | Y: | Z: 1.06 |
|---|---|---|
| 898640.286470369 | 391031.792136475 | |

| Laboratory Sample (E = environmental, G= geotechnical) | SAMPLING DATA | | | | | | DEPTH IN FEET BELOW MUDLINE | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION | |
|---|---|---|---|---|---|---|---|---|---|---|
| | SAMPLING METHOD | Core Run | RECOVERY (feet) | DEPTH SAMPLED | SPT (2" SS and 140 lb. hammer unles noted) | N value | | | | Representative Photographs |
| E | Drive and wash, 3" split spoon, 300 lb. hammer | 1 | 0.33 | 0-2 | 6 | | | SW | Dense, moist, grey, gravelly SAND with cobbles |  |
| | | | | | 32 | | 1 | | | |
| | | | | | 44 | 87 | | | | |
| | | | | | 43 | | 2 | | | |
| | | 2 | 1.5 | 2-3.3 | 38 | | | | Very dense, moist, grey, gravelly SAND (till-like) |  |
| | | | | | 85 | 177 | 3 | | | |
| E | | | | | 92 | | | | | |
| *Bottom of boring* | | | | | | | | | | |
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Remarks:

Horizontal coordinate system: Maine State East NAD 83 US Survey Feet

Vertical coordinate system: NAVD 88

**LOG OF**
**EXPLORATORY BORING**

CLIENT/PROJECT NAME **Orrington Remediation Site**
PROJECT NUMBER **140617-01.01**
GEOLOGIST/ENGINEER **Matt Carlino**
DRILLING CONTRACTOR **New England Boring**
DRILLING METHOD **Drive and wash**
HOLE DIAMETER **6"**

BORING # **SD-SC-07A**
DATE BEGAN **6/18/2015**
DATE COMPLETED **6/18/2015**
TOTAL DEPTH **1.8'**
SHEET **1** OF **1**

Field location of boring

| X: | Y: | Z: 0.92 |
|---|---|---|
| 898655.322272543 | 391089.120492212 | |

| Laboratory Sample (E = environmental, G= geotechnical) | SAMPLING DATA | | | | | | DEPTH IN FEET BELOW MUDLINE | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION | |
|---|---|---|---|---|---|---|---|---|---|---|
| | SAMPLING METHOD | Core Run | RECOVERY (feet) | DEPTH SAMPLED | SPT (2" SS and 140 lb. hammer unles noted) | N value | | | | |
| | Drive and wash, 3" split spoon, 300 lb. hammer | 1 | 1.83 | 0-2 | 14 | | | SP | Very dense, wet, grey, gravelly SAND, cobbles present at refusal | Representative Photographs |
| E | | | | | 40 | | 1 | | |  |
| | | | | | 85 | 235 | | | | |
| | | | | | 100/4" | | 2 | | | |
| *Bottom of boring* | | | | | | | | | | |
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Remarks:

Horizontal coordinate system: Maine State East NAD 83 US Survey Feet

Vertical coordinate system: NAVD 88

**LOG OF EXPLORATORY BORING**

CLIENT/PROJECT NAME **Orrington Remediation Site**
BORING # **SD-SC-07B**
PROJECT NUMBER **140617-01.01**
DATE BEGAN **6/18/2015**
GEOLOGIST/ENGINEER **Matt Carlino**
DATE COMPLETED **6/18/2015**
DRILLING CONTRACTOR **New England Boring**
TOTAL DEPTH **2'**
DRILLING METHOD **Drive and wash**
SHEET **1** OF **1**
HOLE DIAMETER **6"**

Field location of boring

| X: | Y: | Z: 3.46 |
|---|---|---|
| 898682.117799886 | 391050.310173415 | |

| Laboratory Sample (E = environmental, G= geotechnical) | SAMPLING DATA | | | | | | DEPTH IN FEET BELOW MUDLINE | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION | |
|---|---|---|---|---|---|---|---|---|---|---|
| | SAMPLING METHOD | Core Run | RECOVERY (feet) | DEPTH SAMPLED | SPT (2" SS and 140 lb. hammer unles noted) | N value | | | | Representative Photographs |
| | Drive and wash, 3" split spoon, 300 lb. hammer | 1 | 0.3 | 0-2 | 2 | | | SP | Loose, wet, grey-brown gravelly SAND |  |
| | | | | | 3 | | 1 | | | |
| E | | | | | 8 | 18 | | | | |
| | | | | | 10 | | 2 | | | |
| *Bottom of boring* | | | | | | | | | | |
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Remarks:

Horizontal coordinate system: Maine State East NAD 83 US Survey Feet

Vertical coordinate system: NAVD 88

ANCHOR QEA

CLIENT/PROJECT NAME **Orrington Remediation Site**
PROJECT NUMBER **140617-01.01**
GEOLOGIST/ENGINEER **Matt Carlino**
DRILLING CONTRACTOR **New England Boring**
DRILLING METHOD **Drive and wash**
HOLE DIAMETER **6"**

BORING # **SD-SC-07D**
DATE BEGAN **6/18/2015**
DATE COMPLETED **6/18/2015**
TOTAL DEPTH **2'**
SHEET **1** OF **1**

**LOG OF EXPLORATORY BORING**

Field location of boring

| X: | Y: | Z: 3.11 |
|---|---|---|
| 898654.422490273 | 390988.441395141 | |

| Laboratory Sample (E = environmental, G= geotechnical) | SAMPLING DATA | | | | | | DEPTH IN FEET BELOW MUDLINE | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION | |
|---|---|---|---|---|---|---|---|---|---|---|
| | SAMPLING METHOD | Core Run | RECOVERY (feet) | DEPTH SAMPLED | SPT (2" SS and 140 lb. hammer unles noted) | N value | | | | Representative Photographs |
| | Drive and wash, 3" split spoon, 300 lb. hammer | 1 | 0.3 | 0-2 | 5 | | 1 | SP | Loose, wet, grey, gravelly SAND |  |
| | | | | | 3 | | | | | |
| E | | | | | 1 | 9 | | | | |
| | | | | | 8 | | 2 | | | |
| *Bottom of boring* | | | | | | | | | | |
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Remarks:

Horizontal coordinate system: Maine State East NAD 83 US Survey Feet

Vertical coordinate system: NAVD 88

ANCHOR QEA

**LOG OF EXPLORATORY BORING**

CLIENT/PROJECT NAME **Orrington Remediation Site**
PROJECT NUMBER **140617-01.01**
GEOLOGIST/ENGINEER **Matt Carlino**
DRILLING CONTRACTOR **New England Boring**
DRILLING METHOD **Drive and wash**
HOLE DIAMETER **6"**

BORING # **SD-SC-07E**
DATE BEGAN **6/18/2015**
DATE COMPLETED **6/18/2015**
TOTAL DEPTH **2'**
SHEET **1** OF **1**

Field location of boring

| X: | Y: | Z: |
|---|---|---|
| 898588.849951163 | 390983.581520289 | -6.21 |

| Laboratory Sample (E = environmental, G= geotechnical) | SAMPLING DATA |  |  |  |  |  | DEPTH IN FEET BELOW MUDLINE | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION |  |
|---|---|---|---|---|---|---|---|---|---|---|
|  | SAMPLING METHOD | Core Run | RECOVERY (feet) | DEPTH SAMPLED | SPT (2" SS and 140 lb. hammer unles noted) | N value |  |  |  | Representative Photographs |
|  | Drive and wash, 3" split spoon, 300 lb. hammer | 1 | 1.2 | 0-2 | 14 |  | 1 | SP | Dense, wet, grey, gravelly SAND |  |
|  |  |  |  |  | 22 |  |  |  |  |  |
| E |  |  |  |  | 20 | 34 |  |  |  |  |
|  |  |  |  |  | 14 |  | 2 |  |  |  |
| *Bottom of boring* |  |  |  |  |  |  |  |  |  |  |
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Remarks:

Horizontal coordinate system: Maine State East NAD 83 US Survey Feet

Vertical coordinate system: NAVD 88

ANCHOR QEA

**LOG OF EXPLORATORY BORING**

CLIENT/PROJECT NAME **Orrington Remediation Site**
BORING # **SD-SC-08**
PROJECT NUMBER **140617-01.01**
DATE BEGAN **6/18/2015**
GEOLOGIST/ENGINEER **Matt Carlino**
DATE COMPLETED **6/18/2015**
DRILLING CONTRACTOR **New England Boring**
TOTAL DEPTH **4'**
DRILLING METHOD **Drive and wash**
SHEET **1** OF **1**
HOLE DIAMETER **6"**

Field location of boring

| X: | Y: | Z: 4.18 |
|---|---|---|
| 898691.386210173 | 390893.059818313 | |

| Laboratory Sample (E = environmental, G= geotechnical) | SAMPLING DATA | | | | | | DEPTH IN FEET BELOW MUDLINE | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION | |
|---|---|---|---|---|---|---|---|---|---|---|
| | SAMPLING METHOD | Core Run | RECOVERY (feet) | DEPTH SAMPLED | SPT (2" SS and 140 lb. hammer unles noted) | N value | | | | Representative Photographs |
| E | Drive and wash, 3" split spoon, 300 lb. hammer | 1 | 0.21 | 0-2 | 2 | | | SW | Medium dense, wet, grey, gravelly SAND |  |
| | | | | | 26 | | 1 | | | |
| | | | | | 39 | 53 | | | | |
| | | | | | 14 | | 2 | | | |
| | | 2 | 2 | 2-4 | 5 | | | MH | Dense, moist, grey-brown to grey clayey SILT |  |
| | | | | | 7 | | 3 | | | |
| | | | | | 8 | 17 | | | | |
| E | | | | | 9 | | 4 | SW | Medium dense, moist, grey, silty fine SAND | |
| *Bottom of boring* | | | | | | | | | | |
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Remarks:

Horizontal coordinate system: Maine State East NAD 83 US Survey Feet

Vertical coordinate system: NAVD 88

## LOG OF EXPLORATORY BORING

CLIENT/PROJECT NAME **Orrington Remediation Site**
PROJECT NUMBER **140617-01.01**
GEOLOGIST/ENGINEER **Matt Carlino**
DRILLING CONTRACTOR **New England Boring**
DRILLING METHOD **Drive and wash**
HOLE DIAMETER **6"**

BORING # **SD-SC-08A**
DATE BEGAN **6/18/2015**
DATE COMPLETED **6/18/2015**
TOTAL DEPTH **2'**
SHEET **1** OF **1**

Field location of boring

| X: | Y: | Z: |
|---|---|---|
| 898629.27 | 390931.25 | 🟨 |

| Laboratory Sample (E = environmental, G= geotechnical) | SAMPLING DATA<br>SAMPLING METHOD | Core Run | RECOVERY (feet) | DEPTH SAMPLED | SPT (2" SS and 140 lb. hammer unles noted) | N value | DEPTH IN FEET BELOW MUDLINE | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION | |
|---|---|---|---|---|---|---|---|---|---|---|
| 🟨 | Drive and wash, 3" split spoon, 300 lb. hammer | 1 | 1.25 | 0-2 | 1 | | | SW | Loose, wet, grey, gravelly SAND | Representative Photographs |
| 🟨 | | | | | 10 | | 1 | | |  |
| 🟨 | | | | | 36 | 161 | | SM | Very dense, moist, grey, silty SAND | |
| 🟨 | | | | | 125 | | 2 | | | |
| Bottom of boring | | | | | | | | | | |
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Remarks:

Horizontal coordinate system: Maine State East NAD 83 US Survey Feet

Vertical coordinate system: NAVD 88

**LOG OF**
**EXPLORATORY BORING**

CLIENT/PROJECT NAME **Orrington Remediation Site**
PROJECT NUMBER **140617-01.01**
GEOLOGIST/ENGINEER **Matt Carlino**
DRILLING CONTRACTOR **New England Boring**
DRILLING METHOD **Drive and wash**
HOLE DIAMETER **6"**

BORING # **SD-SC-08C**
DATE BEGAN **6/18/2015**
DATE COMPLETED **6/18/2015**
TOTAL DEPTH **2'**
SHEET **1** OF **1**

Field location of boring

| X: | Y: | Z: |
|---|---|---|
| 898707.43 | 390868.16 | |

| Laboratory Sample (E = environmental, G= geotechnical) | SAMPLING DATA<br>SAMPLING METHOD | Core Run | RECOVERY (feet) | DEPTH SAMPLED | SPT (2" SS and 140 lb. hammer unles noted) | N value | DEPTH IN FEET BELOW MUDLINE | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Drive and wash, 3" split spoon, 300 lb. hammer | 1 | 2 | 0-2 | 7 | | | | Loose, wet, grey, gravelly SAND | Representative Photographs |
| | | | | | 15 | | 1 | SP | Medium dense, wet, grey, gravelly SAND |  |
| | | | | | 11 | 19 | | | | |
| | | | | | 8 | | 2 | SM | Loose, wet, grey, silty SAND | |
| Bottom of boring | | | | | | | | | | |
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Remarks:

Horizontal coordinate system: Maine State East NAD 83 US Survey Feet

Vertical coordinate system: NAVD 88

**LOG OF EXPLORATORY BORING**

CLIENT/PROJECT NAME **Orrington Remediation Site**
BORING # **SD-SC-08F**
PROJECT NUMBER **140617-01.01**
DATE BEGAN **6/18/2015**
GEOLOGIST/ENGINEER **Matt Carlino**
DATE COMPLETED **6/18/2015**
DRILLING CONTRACTOR **New England Boring**
TOTAL DEPTH **2'**
DRILLING METHOD **Drive and wash**
SHEET **1** OF **1**
HOLE DIAMETER **6"**

Field location of boring

| X: | Y: | Z: |
|---|---|---|
| 898650.46 | 390873.57 | |

| Laboratory Sample (E = environmental, G= geotechnical) | SAMPLING DATA<br>SAMPLING METHOD | Core Run | RECOVERY (feet) | DEPTH SAMPLED | SPT (2" SS and 140 lb. hammer unles noted) | N value | DEPTH IN FEET BELOW MUDLINE | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION | Representative Photographs |
|---|---|---|---|---|---|---|---|---|---|---|
| | Drive and wash, 3" split spoon, 300 lb. hammer | 1 | 1 | 0-2 | 4 | | | SP | Loose, wet, brown, gravelly SAND |  |
| | | | | | 5 | | 1 | | | |
| | | | | | 14 | 32 | | | Medium dense, wet, grey, gravelly SAND | |
| | | | | | 18 | | 2 | | | |
| *Bottom of boring* | | | | | | | | | | |
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Remarks:

Horizontal coordinate system: Maine State East NAD 83 US Survey Feet

Vertical coordinate system: NAVD 88

ANCHOR QEA

**LOG OF EXPLORATORY BORING**

CLIENT/PROJECT NAME **Orrington Remediation Site**

PROJECT NUMBER **140617-01.01**

GEOLOGIST/ENGINEER **Kevyn Bollinger**

DRILLING CONTRACTOR **ASI**

DRILLING METHOD **Vibracore**

HOLE DIAMETER **4"**

BORING # **SD-SC-09**

DATE BEGAN **6/16/2015**

DATE COMPLETED **6/16/2015**

TOTAL DEPTH **2.5'**

SHEET **1** OF **1**

Field location of boring

| X: | Y: | Z: 5.64 |
|---|---|---|
| 898715.2704942 | 390497.777951352 | |

|  | SAMPLING DATA |  |  |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory Sample (E = environmental, G= geotechnical) | SAMPLING METHOD | Core Run | RECOVERY (feet) | DEPTH SAMPLED | SPT (2" SS and 140 lb. hammer unles noted) | N value | DEPTH IN FEET BELOW MUDLINE | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION | Representative Photographs |
| E | Vibracore | 1 | 2.75 | 0-2.75 | | | 1 | MH | Soft, brown, SILT | |
| | | | | | | | 2 | GP | Grey, silty/sandy, fine Gravel | |
| E | | | | | | | | | | |
| *Bottom of boring* | | | | | | | | | | |
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Remarks:

Horizontal coordinate system: Maine State East NAD 83 US Survey Feet

Vertical coordinate system: NAVD 88

**LOG OF**

**EXPLORATORY BORING**

CLIENT/PROJECT NAME **Orrington Remediation Site**

PROJECT NUMBER **140617-01.01**

GEOLOGIST/ENGINEER **Kevyn Bollinger**

DRILLING CONTRACTOR **ASI**

DRILLING METHOD **Vibracore**

HOLE DIAMETER **4"**

BORING # **SD-SC-09A**

DATE BEGAN **6/16/2015**

DATE COMPLETED **6/16/2015**

TOTAL DEPTH 1**.5'**

SHEET **1** OF **1**

Field location of boring

| X: | Y: | Z: 5.18 |
|---|---|---|
| 898701.091427855 | 390545.958461203 | |

| Laboratory Sample (E = environmental, G= geotechnical) | SAMPLING DATA: SAMPLING METHOD | Core Run | RECOVERY (feet) | DEPTH SAMPLED | SPT (2" SS and 140 lb. hammer unles noted) | N value | DEPTH IN FEET BELOW MUDLINE | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION | Representative Photographs |
|---|---|---|---|---|---|---|---|---|---|---|
| | Vibracore | 1 | 1.5 | 0-1.5 | | | 1 | OL | Soft to medium stiff, borwn, SILT | |
| *Bottom of boring* | | | | | | | | | | |
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| Remarks: | Horizontal coordinate system: Maine State East NAD 83 US Survey Feet | Vertical coordinate system: NAVD 88 | |
|---|---|---|---|

**LOG OF**

**EXPLORATORY BORING**

CLIENT/PROJECT NAME **Orrington Remediation Site**

BORING # **SD-SC-09B**

PROJECT NUMBER **140617-01.01**

DATE BEGAN **6/16/2015**

GEOLOGIST/ENGINEER **Kevyn Bollinger**

DATE COMPLETED **6/16/2015**

DRILLING CONTRACTOR **ASI**

TOTAL DEPTH **2'**

DRILLING METHOD **Vibracore**

SHEET **1** OF **1**

HOLE DIAMETER **4"**

Field location of boring

| X: | Y: | Z: 7.05 |
|---|---|---|
| 898823.60<br>4418084 | 390457.69<br>573085 | |

| Laboratory Sample (E = environmental, G= geotechnical) | SAMPLING DATA | | | | | | DEPTH IN FEET BELOW MUDLINE | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION | |
|---|---|---|---|---|---|---|---|---|---|---|
| | SAMPLING METHOD | Core Run | RECOVERY (feet) | DEPTH SAMPLED | SPT (2" SS and 140 lb. hammer unles noted) | N value | | | | Representative Photographs |
| | Vibracore | 1 | 2.0 | 0-2 | | | 1<br>2 | OL | Soft to stiff, brown, SILT | |
| *Bottom of boring* | | | | | | | | | | |
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Remarks:

Horizontal coordinate system: Maine State East NAD 83 US Survey Feet

Vertical coordinate system: NAVD 88

**LOG OF**

**EXPLORATORY BORING**

CLIENT/PROJECT NAME **Orrington Remediation Site**

BORING # **SD-SC-09C**

PROJECT NUMBER **140617-01.01**

DATE BEGAN **6/16/2015**

GEOLOGIST/ENGINEER **Kevyn Bollinger**

DATE COMPLETED **6/16/2015**

DRILLING CONTRACTOR **ASI**

TOTAL DEPTH **2'**

DRILLING METHOD **Vibracore**

SHEET **1** OF **1**

HOLE DIAMETER **4"**

Field location of boring

| X: | Y: | Z: 6.84 |
|---|---|---|
| 898781.599997871 | 390418.457331955 | |

| Laboratory Sample (E = environmental, G= geotechnical) | SAMPLING DATA | | | | | | DEPTH IN FEET BELOW MUDLINE | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION | |
|---|---|---|---|---|---|---|---|---|---|---|
| | SAMPLING METHOD | Core Run | RECOVERY (feet) | DEPTH SAMPLED | SPT (2" SS and 140 lb. hammer unles noted) | N value | | | | Representative Photographs |
| | Vibracore | 1 | 2.0 | 0-2 | | | 1<br>2 | | | |
| *Bottom of boring* | | | | | | | | | | |
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| Remarks: | Horizontal coordinate system: Maine State East NAD 83 US Survey Feet | Vertical coordinate system: NAVD 88 | |
|---|---|---|---|

**LOG OF**

**EXPLORATORY BORING**

CLIENT/PROJECT NAME **Orrington Remediation Site**

BORING # **SD-SC-09D**

PROJECT NUMBER **140617-01.01**

DATE BEGAN **6/16/2015**

GEOLOGIST/ENGINEER **Kevyn Bollinger**

DATE COMPLETED **6/16/2015**

DRILLING CONTRACTOR **ASI**

TOTAL DEPTH **2'**

DRILLING METHOD **Vibracore**

SHEET **1** OF **1**

HOLE DIAMETER **4"**

Field location of boring

| X: | Y: | Z: 5.06 |
|---|---|---|
| 898700.332446303 | 390471.843817241 | |

## LITHOLOGIC DESCRIPTION

| Laboratory Sample (E = environmental, G= geotechnical) | SAMPLING DATA<br>SAMPLING METHOD | Core Run | RECOVERY (feet) | DEPTH SAMPLED | SPT (2" SS and 140 lb. hammer unles noted) | N value | DEPTH IN FEET BELOW MUDLINE | SOIL GROUP SYMBOL (USCS) | | Representative Photographs |
|---|---|---|---|---|---|---|---|---|---|---|
| | Vibracore | 1 | 4.0 | 0-4 | | | 1<br>2 | OL | Soft to still, brown, SILT, coarse gravel at 1.8' to 1.9' | |
| | | | | | | | 3<br>4 | GP | Grey, silty/sandy, fine Gravel | |
| *Bottom of boring* | | | | | | | | | | |
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Remarks:

Horizontal coordinate system: Maine State East NAD 83 US Survey Feet

Vertical coordinate system: NAVD 88

**LOG OF**

**EXPLORATORY BORING**

CLIENT/PROJECT NAME **Orrington Remediation Site**

BORING # **SD-SC-10**

PROJECT NUMBER **140617-01.01**

DATE BEGAN **6/19/2015**

GEOLOGIST/ENGINEER **Kevyn Bollinger**

DATE COMPLETED **6/19/2015**

DRILLING CONTRACTOR **ASI**

TOTAL DEPTH **2'**

DRILLING METHOD **Vibracore**

SHEET **1** OF **1**

HOLE DIAMETER **4"**

Field location of boring

| | | |
|---|---|---|
| X: 898700.40866733 | Y: 390397.676373698 | Z: 4.59 |

| Laboratory Sample (E = environmental, G= geotechnical) | SAMPLING DATA | | | | | | DEPTH IN FEET BELOW MUDLINE | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION | |
|---|---|---|---|---|---|---|---|---|---|---|
| | SAMPLING METHOD | Core Run | RECOVERY (feet) | DEPTH SAMPLED | SPT (2" SS and 140 lb. hammer unles noted) | N value | | | | |
| E | Vibracore | 1 | 2.0 | 0-2 | | | 1 | MH | Soft, brown, SILT<br>Stiff, black, sandy, gravelly, fine to coarse SILT | Representative Photographs |
| | | | | | | | 2 | SP | Grey, gravelly SAND | |
| *Bottom of boring* | | | | | | | | | | |
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Remarks:

Horizontal coordinate system: Maine State East NAD 83 US Survey Feet

Vertical coordinate system: NAVD 88

CLIENT/PROJECT NAME **Orrington Remediation Site**

BORING # **SD-SC-10A**

PROJECT NUMBER **140617-01.01**

DATE BEGAN **6/19/2015**

GEOLOGIST/ENGINEER **Kevyn Bollinger**

DATE COMPLETED **6/19/2015**

DRILLING CONTRACTOR **ASI**

TOTAL DEPTH **2.75'**

**LOG OF EXPLORATORY BORING**

DRILLING METHOD **Vibracore**

SHEET **1** OF **1**

HOLE DIAMETER **4"**

Field location of boring

| X: | Y: | Z: 2.97 |
|---|---|---|
| 898630.471672799 | 390452.935790099 | |

| Laboratory Sample (E = environmental, G= geotechnical) | SAMPLING DATA | | | | | | DEPTH IN FEET BELOW MUDLINE | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION | |
|---|---|---|---|---|---|---|---|---|---|---|
| | SAMPLING METHOD | Core Run | RECOVERY (feet) | DEPTH SAMPLED | SPT (2" SS and 140 lb. hammer unles noted) | N value | | | | |
| | | | | | | | | OL | Soft, brown, SILT | Representative Photographs |
| | Vibracore | 1 | 2.75 | 0-2.75 | | | 1 | SP | Grey, gravelly SAND | |
| | | | | | | | 2 | | | |
| *Bottom of boring* | | | | | | | | | | |
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Remarks:

Horizontal coordinate system: Maine State East NAD 83 US Survey Feet

Vertical coordinate system: NAVD 88

**LOG OF EXPLORATORY BORING**

CLIENT/PROJECT NAME **Orrington Remediation Site**
BORING # **SD-SC-10B**
PROJECT NUMBER **140617-01.01**
DATE BEGAN **6/19/2015**
GEOLOGIST/ENGINEER **Kevyn Bollinger**
DATE COMPLETED **6/19/2015**
DRILLING CONTRACTOR **ASI**
TOTAL DEPTH **1'**
DRILLING METHOD **Vibracore**
SHEET **1** OF **1**
HOLE DIAMETER **4"**

Field location of boring

| X: | Y: | Z: 4.49 |
|---|---|---|
| 898696.510973834 | 390412.49523028 | |

| Laboratory Sample (E = environmental, G= geotechnical) | SAMPLING DATA<br>SAMPLING METHOD | Core Run | RECOVERY (feet) | DEPTH SAMPLED | SPT (2" SS and 140 lb. hammer unles noted) | N value | DEPTH IN FEET BELOW MUDLINE | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Vibracore | 1 | 1 | 0-1 | | | | OL | Soft, brown, SILT | Representative Photographs |
| | | | | | | | 1 | SP | Grey, gravelly SAND | |
| *Bottom of boring* | | | | | | | | | | |
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Remarks:

Horizontal coordinate system: Maine State East NAD 83 US Survey Feet

Vertical coordinate system: NAVD 88

ANCHOR QEA

**LOG OF**

**EXPLORATORY BORING**

CLIENT/PROJECT NAME **Orrington Remediation Site**

PROJECT NUMBER **140617-01.01**

GEOLOGIST/ENGINEER **Kevyn Bollinger**

DRILLING CONTRACTOR **ASI**

DRILLING METHOD **Vibracore**

HOLE DIAMETER **4"**

BORING # **SD-SC-10C**

DATE BEGAN **6/19/2015**

DATE COMPLETED **6/19/2015**

TOTAL DEPTH **1'**

SHEET **1** OF **1**

Field location of boring

| X: | Y: | Z: 6.54 |
|---|---|---|
| 898760.316199999 | 390331.070216909 | |

| Laboratory Sample (E = environmental, G= geotechnical) | SAMPLING DATA | | | | | | DEPTH IN FEET BELOW MUDLINE | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION | |
|---|---|---|---|---|---|---|---|---|---|---|
| | SAMPLING METHOD | Core Run | RECOVERY (feet) | DEPTH SAMPLED | SPT (2" SS and 140 lb. hammer unles noted) | N value | | | | |
| | Vibracore | 1 | 1 | 0-1 | | | 1 | OL | Soft, brown, SILT | Representative Photographs |
| *Bottom of boring* | | | | | | | | | | |
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Remarks:

Horizontal coordinate system: Maine State East NAD 83 US Survey Feet

Vertical coordinate system: NAVD 88

**LOG OF EXPLORATORY BORING**

CLIENT/PROJECT NAME **Orrington Remediation Site**
PROJECT NUMBER **140617-01.01**
GEOLOGIST/ENGINEER **Kevyn Bollinger**
DRILLING CONTRACTOR **ASI**
DRILLING METHOD **Vibracore**
HOLE DIAMETER **4"**

BORING # **SD-SC-10D**
DATE BEGAN **6/19/2015**
DATE COMPLETED **6/19/2015**
TOTAL DEPTH **2'**
SHEET **1** OF **1**

Field location of boring

| X: | Y: | Z: 5.37 |
|---|---|---|
| 898696.328292072 | 390304.15905311 | |

| Laboratory Sample (E = environmental, G= geotechnical) | SAMPLING DATA | | | | | | DEPTH IN FEET BELOW MUDLINE | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION | |
|---|---|---|---|---|---|---|---|---|---|---|
| | SAMPLING METHOD | Core Run | RECOVERY (feet) | DEPTH SAMPLED | SPT (2" SS and 140 lb. hammer unles noted) | N value | | | | Representative Photographs |
| | Vibracore | 1 | 2 | 0-2 | | | 1 | OL | Soft, brown, SILT | |
| | | | | | | | 2 | | Medium stiff, brown, fine to medium gravelly SILT | |
| *Bottom of boring* | | | | | | | | | | |
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Remarks:

Horizontal coordinate system: Maine State East NAD 83 US Survey Feet

Vertical coordinate system: NAVD 88

ANCHOR QEA

**LOG OF EXPLORATORY BORING**

CLIENT/PROJECT NAME **Orrington Remediation Site**
PROJECT NUMBER **140617-01.01**
GEOLOGIST/ENGINEER **Kevyn Bollinger**
DRILLING CONTRACTOR **ASI**
DRILLING METHOD **Vibracore**
HOLE DIAMETER **4"**

BORING # **SD-SC-10E**
DATE BEGAN **6/19/2015**
DATE COMPLETED **6/19/2015**
TOTAL DEPTH **2'**
SHEET **1** OF **1**

Field location of boring

| X: | Y: | Z: 5.67 |
|---|---|---|
| 898694.289626949 | 390228.009214342 | |

| Laboratory Sample (E = environmental, G= geotechnical) | SAMPLING DATA<br>SAMPLING METHOD | Core Run | RECOVERY (feet) | DEPTH SAMPLED | SPT (2" SS and 140 lb. hammer unles noted) | N value | DEPTH IN FEET BELOW MUDLINE | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION | Representative Photographs |
|---|---|---|---|---|---|---|---|---|---|---|
| | Vibracore | 1 | 2 | 0-2 | | | 1 | OL | Soft, brown, SILT | |
| | | | | | | | | OH | Medium stiff, brown, silty, cobbly CLAY | |
| | | | | | | | 2 | CH | Stiff, grey, lean CLAY | |
| *Bottom of boring* | | | | | | | | | | |
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Remarks:

Horizontal coordinate system: Maine State East NAD 83 US Survey Feet

Vertical coordinate system: NAVD 88

ANCHOR QEA

**LOG OF**

**EXPLORATORY BORING**

CLIENT/PROJECT NAME **Orrington Remediation Site**

PROJECT NUMBER **140617-01.01**

GEOLOGIST/ENGINEER **Kevyn Bollinger**

DRILLING CONTRACTOR **ASI**

DRILLING METHOD **Vibracore**

HOLE DIAMETER **4"**

BORING # **SD-SC-10F**

DATE BEGAN **6/19/2015**

DATE COMPLETED **6/19/2015**

TOTAL DEPTH **1'**

SHEET **1** OF **1**

Field location of boring

X:

Y:

Z:

| Laboratory Sample (E = environmental, G= geotechnical) | SAMPLING DATA |  |  |  |  |  | DEPTH IN FEET BELOW MUDLINE | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION |  |
|---|---|---|---|---|---|---|---|---|---|---|
|  | SAMPLING METHOD | Core Run | RECOVERY (feet) | DEPTH SAMPLED | SPT (2" SS and 140 lb. hammer unles noted) | N value |  |  |  |  |
|  | Vibracore | 1 | 1 | 0-1 |  |  | 1 | OL | Soft, brown, SILT | Representative Photographs |
|  |  |  |  |  |  |  |  |  | Medium stiff, brown, fine gravelly SILT |  |
| *Bottom of boring* |  |  |  |  |  |  |  |  |  |  |
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Remarks:

Horizontal coordinate system: Maine State East NAD 83 US Survey Feet

Vertical coordinate system: NAVD 88

**LOG OF**

**EXPLORATORY BORING**

CLIENT/PROJECT NAME **Orrington Remediation Site**

BORING # **SD-SC-10B**

PROJECT NUMBER **140617-01.01**

DATE BEGAN **6/19/2015**

GEOLOGIST/ENGINEER **Kevyn Bollinger**

DATE COMPLETED **6/19/2015**

DRILLING CONTRACTOR **ASI**

TOTAL DEPTH **1'**

DRILLING METHOD **Vibracore**

SHEET **1** OF **1**

HOLE DIAMETER **4"**

Field location of boring

| X: | Y: | Z: 4.49 |
|---|---|---|
| 898696.51<br>0973834 | 390412.49<br>523028 | |

| Laboratory Sample (E = environmental, G= geotechnical) | SAMPLING DATA: SAMPLING METHOD | Core Run | RECOVERY (feet) | DEPTH SAMPLED | SPT (2" SS and 140 lb. hammer unles noted) | N value | DEPTH IN FEET BELOW MUDLINE | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Vibracore | 1 | 1 | 0-1 | | | | OL | Soft, brown, SILT | Representative Photographs |
| | | | | | | | 1 | SP | Grey, gravelly SAND | |
| *Bottom of boring* | | | | | | | | | | |
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Remarks:

Horizontal coordinate system: Maine State East NAD 83 US Survey Feet

Vertical coordinate system: NAVD 88

**LOG OF**

**EXPLORATORY BORING**

CLIENT/PROJECT NAME **Orrington Remediation Site**
PROJECT NUMBER **140617-01.01**
GEOLOGIST/ENGINEER **Kevyn Bollinger**
DRILLING CONTRACTOR **Anchor QEA**
DRILLING METHOD Stainless Steel Spoon
HOLE DIAMETER **3"**

BORING # **SD-SC-20**
DATE BEGAN 9**/22/2015**
DATE COMPLETED 9**/22/2015**
TOTAL DEPTH 0.2**'**
SHEET **1** OF **1**

Field location of boring

| X: 899052.3 | Y: 390498.2 | Z: -0.43997 |
|---|---|---|

| Laboratory Sample (E = environmental, G= geotechnical) | SAMPLING DATA |  |  |  |  |  | DEPTH IN FEET BELOW MUDLINE | SOIL GROUP SYMBOL (USCS) | **LITHOLOGIC DESCRIPTION** |  |
|---|---|---|---|---|---|---|---|---|---|---|
|  | SAMPLING METHOD | Core Run | RECOVERY (feet) | DEPTH SAMPLED | SPT (2" SS and 140 lb. hammer unles noted) | N value |  |  |  |  |
| 0-0.2 | SS Spoon | 1 | 0.2 | 0-0.2 |  |  |  | OL | Soft, brown, SILT 0-0.1, very fine grey sand and silt 0.1-0.2 | Representative Photographs |
| *Bottom of boring* |  |  |  |  |  |  |  |  |  |  |
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|---|---|---|---|
| Remarks: | Horizontal coordinate system: Maine State East NAD 83 US Survey Feet | Vertical coordinate system: NAVD 88 |  |

**LOG OF**

**EXPLORATORY BORING**

CLIENT/PROJECT NAME **Orrington Remediation Site**

PROJECT NUMBER **140617-01.01**

GEOLOGIST/ENGINEER **Kevyn Bollinger**

DRILLING CONTRACTOR **Anchor QEA**

DRILLING METHOD Stainless Steel Spoon

HOLE DIAMETER **3"**

BORING # **SD-SC-21**

DATE BEGAN 9**/22/2015**

DATE COMPLETED 9**/22/2015**

TOTAL DEPTH 0.5

SHEET **1** OF **1**

Field location of boring

| X: 899018.4 | Y: 390536 | Z: -0.475 |
|---|---|---|

**LITHOLOGIC DESCRIPTION**

| Laboratory Sample (E = environmental, G= geotechnical) | SAMPLING DATA<br>SAMPLING METHOD | Core Run | RECOVERY (feet) | DEPTH SAMPLED | SPT (2" SS and 140 lb. hammer unles noted) | N value | DEPTH IN FEET BELOW MUDLINE | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION | |
|---|---|---|---|---|---|---|---|---|---|---|
| 0-0.5 | SS Spoon | 1 | 0.5 | 0-0.5 | | | | OL | Soft, brown SILT | Representative Photographs |

*Bottom of boring*

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| Remarks: | | Horizontal coordinate system: Maine State East NAD 83 US Survey Feet | | | Vertical coordinate system: NAVD 88 | | | | | | | | | |

ANCHOR QEA

**LOG OF**

**EXPLORATORY BORING**

CLIENT/PROJECT NAME **Orrington Remediation Site**

PROJECT NUMBER **140617-01.01**

GEOLOGIST/ENGINEER **Kevyn Bollinger**

DRILLING CONTRACTOR **Anchor QEA**

DRILLING METHOD Hand-driven Lexan tube

HOLE DIAMETER **3"**

BORING # **SD-SC-22**

DATE BEGAN 9**/22/2015**

DATE COMPLETED 9**/22/2015**

TOTAL DEPTH 1.0**'**

SHEET **1** OF **1**

Field location of boring

| X: 898815.6 | Y: 390418.4 | Z: -0.53 |
|---|---|---|

| Laboratory Sample (E = environmental, G= geotechnical) | SAMPLING DATA | | | | | | DEPTH IN FEET BELOW MUDLINE | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| | SAMPLING METHOD | Core Run | RECOVERY (feet) | DEPTH SAMPLED | SPT (2" SS and 140 lb. hammer unles noted) | N value | | | |
| 0-0.2 | Lexan tube | 1 | 0.5 | 0-0.5 | | | | OL | Soft, brown SILT |
| 0.8-1 | | | 0.5 | 0.5-1 | | | 1 | PT | Dark brown PEAT |
| | | | | | | | Bottom of boring | | |
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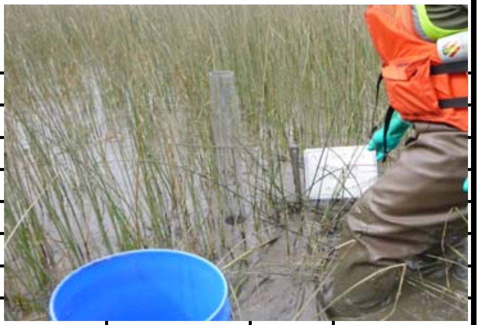
| | | | | | | | 18 | | |

Representative Photographs



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| | | | | | | | 20 | | | | | | | |
| Remarks: | | Horizontal coordinate system: Maine State East NAD 83 US Survey Feet | | | Vertical coordinate system: NAVD 88 | | | | | | | | | |

**LOG OF**

**EXPLORATORY BORING**

CLIENT/PROJECT NAME **Orrington Remediation Site**

PROJECT NUMBER **140617-01.01**

GEOLOGIST/ENGINEER **Kevyn Bollinger**

DRILLING CONTRACTOR **Anchor QEA**

DRILLING METHOD Stainless Steel Spoon

HOLE DIAMETER **3"**

BORING # **SD-SC-23**

DATE BEGAN 9**/22/2015**

DATE COMPLETED 9**/22/2015**

TOTAL DEPTH 1.5**'**

SHEET **1** OF **1**

Field location of boring

| X: 898972 | Y: 390593.3 | Z: 3.504977 |
|---|---|---|

| Laboratory Sample (E = environmental, G= geotechnical) | SAMPLING DATA | | | | | | DEPTH IN FEET BELOW MUDLINE | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| | SAMPLING METHOD | Core Run | RECOVERY (feet) | DEPTH SAMPLED | SPT (2" SS and 140 lb. hammer unles noted) | N value | | | |
| | SS Spoon | 1 | 0.5 | 0-0.5 | | | 1 | CL | Dark grey CLAY and SILT |
| 0.8-1 | | | 0.5 | 0.5-1 | | | | | |
| 1-1.5 | | | 0.5 | 1-1.5 | | | | SP | Dark grey SAND |
| | | | | | | | *Bottom of boring* | | |
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Representative Photographs

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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|  |  |  |  |  |  |  | 18 |  |  |  |  |  |  |  |
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| Remarks: |  | Horizontal coordinate system: Maine State East NAD 83 US Survey Feet |  |  | Vertical coordinate system: NAVD 88 |  |  |  |  |  |  |  |  |  |

**LOG OF**

**EXPLORATORY BORING**

CLIENT/PROJECT NAME **Orrington Remediation Site**
PROJECT NUMBER **140617-01.01**
GEOLOGIST/ENGINEER **Kevyn Bollinger**
DRILLING CONTRACTOR **Anchor QEA**
DRILLING METHOD Stainless Steel Spoon
HOLE DIAMETER **3"**

BORING # **SD-SC-24**
DATE BEGAN 9**/22/2015**
DATE COMPLETED 9**/22/2015**
TOTAL DEPTH 1.5'
SHEET **1** OF **1**

Field location of boring

| X: 898955.1 | Y: 390571.3 | Z: 1.09 |
|---|---|---|

| Laboratory Sample (E = environmental, G= geotechnical) | SAMPLING DATA | | | | | | DEPTH IN FEET BELOW MUDLINE | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION | Representative Photographs |
|---|---|---|---|---|---|---|---|---|---|---|
| | SAMPLING METHOD | Core Run | RECOVERY (feet) | DEPTH SAMPLED | SPT (2" SS and 140 lb. hammer unles noted) | N value | | | | |
| | SS Spoon | 1 | 0.5 | 0-0.5 | | | 1 | CL | Brown CLAY and SILT | |
| 0.8-1 | | | 0.5 | 0.5-1 | | | | | | |
| 1-1.5 | | | 0.5 | 1-1.5 | | | | | | |
| *Bottom of boring* | | | | | | | | | | |
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| | | | | | | | 20 | | | | | | | |
| Remarks: | | Horizontal coordinate system: Maine State East NAD 83 US Survey Feet | | | Vertical coordinate system: NAVD 88 | | | | | | | | | |

**LOG OF**
**EXPLORATORY BORING**

CLIENT/PROJECT NAME **Orrington Remediation Site**

PROJECT NUMBER **140617-01.01**

GEOLOGIST/ENGINEER **Kevyn Bollinger**

DRILLING CONTRACTOR **Anchor QEA**

DRILLING METHOD Stainless Steel Spoon

HOLE DIAMETER **3"**

BORING # **SD-SC-25**

DATE BEGAN 9**/22/2015**

DATE COMPLETED 9**/22/2015**

TOTAL DEPTH 1.5**'**

SHEET **1** OF **1**

Field location of boring

| X: 898992.1 | Y: 390572.8 | Z: -0.06001 |
|---|---|---|

| Laboratory Sample (E = environmental, G= geotechnical) | SAMPLING DATA | | | | | | DEPTH IN FEET BELOW MUDLINE | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| | SAMPLING METHOD | Core Run | RECOVERY (feet) | DEPTH SAMPLED | SPT (2" SS and 140 lb. hammer unles noted) | N value | | | |
| | SS Spoon | 1 | 0.5 | 0-0.5 | | | | GP | Dark grey GRAVEL |
| 0.8-1 | | | 0.5 | 0.5-1 | | | 1 | | |
| 1-1.5 | | | 0.5 | 1-1.5 | | | | SP | Light grey SAND |
| *Bottom of boring* | | | | | | | | | |
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Representative Photographs

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 18 | | | | | | | |
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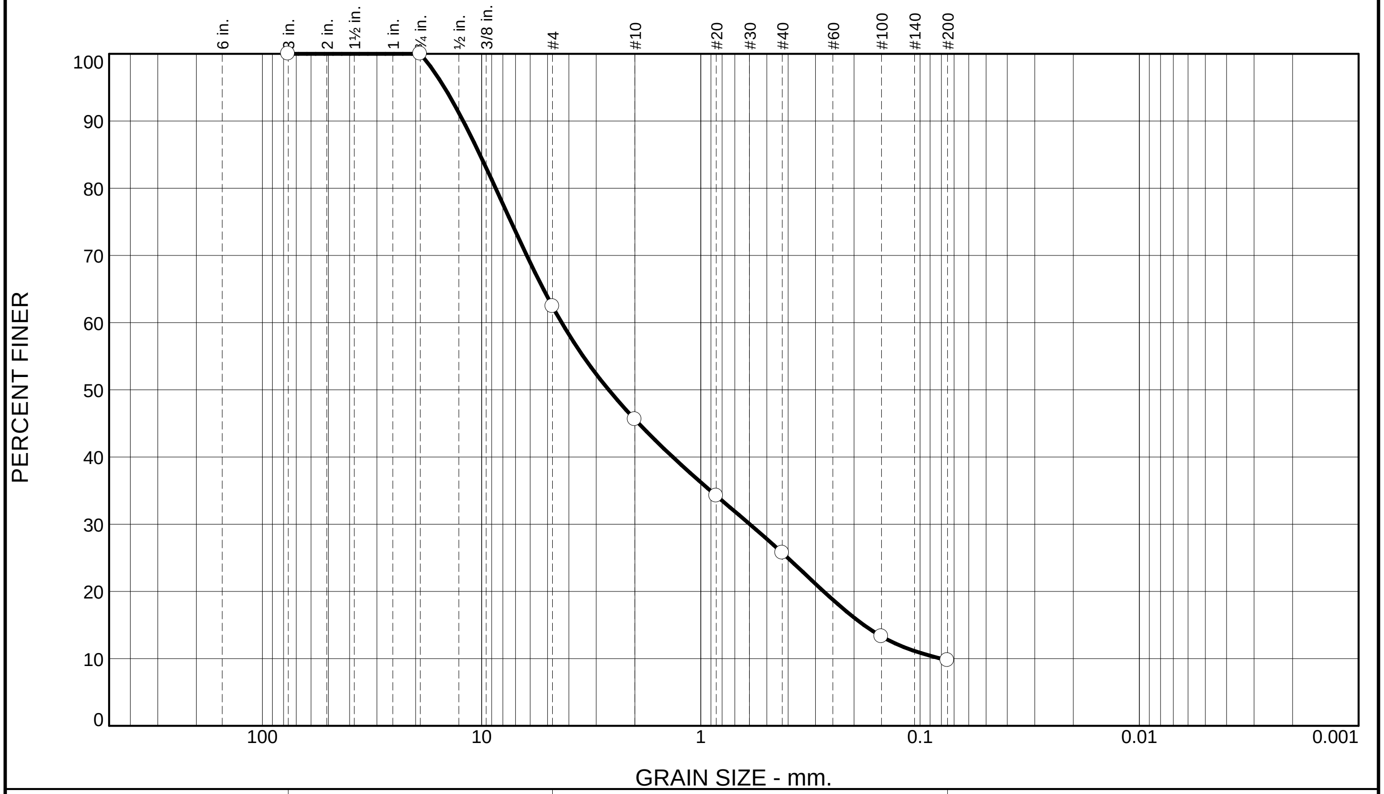
| Remarks: | | Horizontal coordinate system: Maine State East NAD 83 US Survey Feet | | | Vertical coordinate system: NAVD 88 | | | | | | | | | |

# A.4: Geotechnical Data

# Particle Size Distribution Report



| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 37.6 | 16.8 | 19.9 | 16.0 | 9.7 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 62.4 | | |
| #10 | 45.6 | | |
| #20 | 34.2 | | |
| #40 | 25.7 | | |
| #100 | 13.3 | | |
| #200 | 9.7 | | |

* (no specification provided)

**Material Description**

Well-graded sand with silt and gravel

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

| | | |
|---|---|---|
| $D_{90}$= 12.1346 | $D_{85}$= 10.1830 | $D_{60}$= 4.3114 |
| $D_{50}$= 2.6333 | $D_{30}$= 0.5981 | $D_{15}$= 0.1804 |
| $D_{10}$= 0.0804 | $C_u$= 53.59 | $C_c$= 1.03 |

**Classification**

USCS= SW-SM AASHTO=

**Remarks**

As received moisture content=13.5%
Fines classification and description based on
Visual Manual Procedure ASTM D2488

**Source of Sample:** SD-SC-01 **Depth:** 3.5-5

**Date:** 6/17/2015

**CDM Smith**

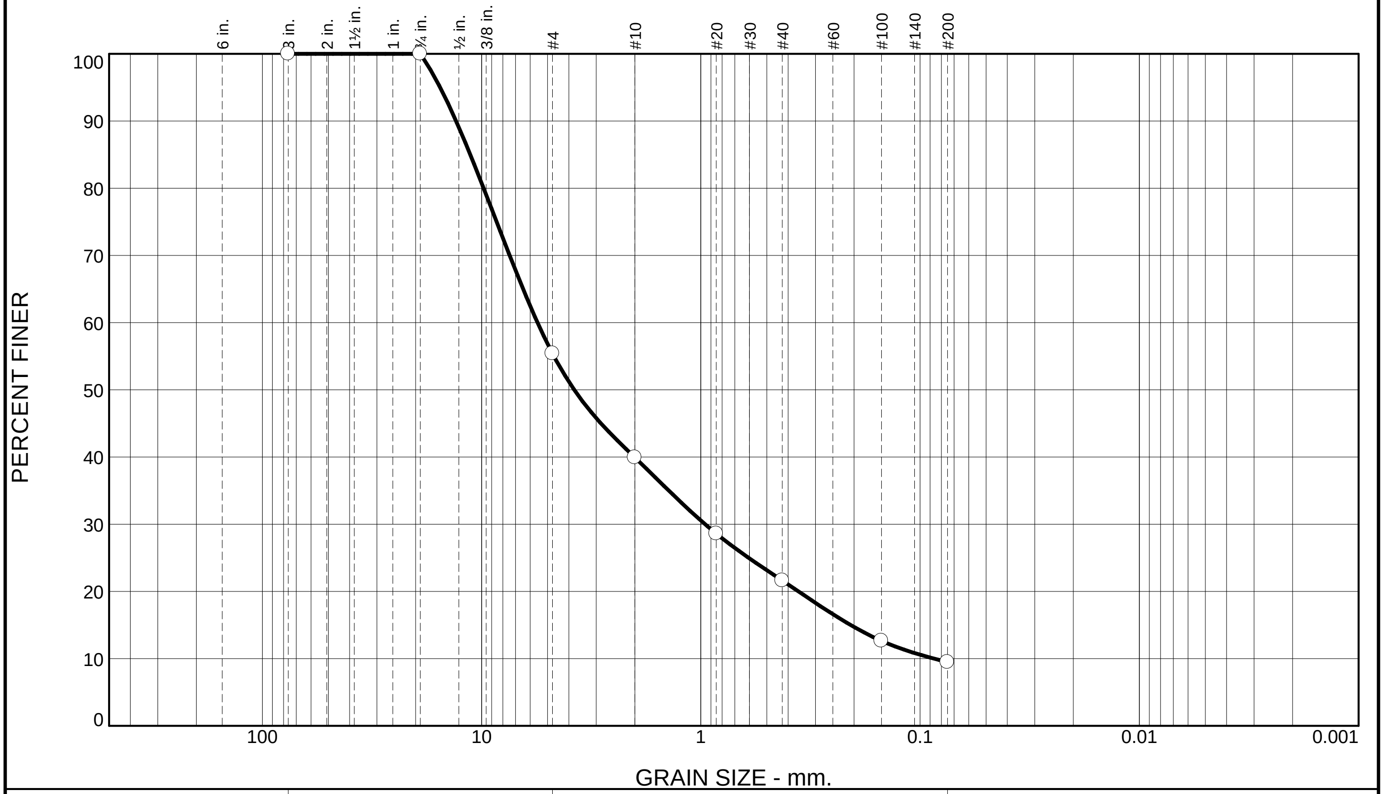
**Boston, Massachusetts**

**Client:** Anchor QEA
**Project:** Orrington Remediation Site. Orrington, ME

**Project No:** 140617-01.01 **Figure**

**Tested By:** JB **Checked By:** JC

# Particle Size Distribution Report



| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 44.6 | 15.5 | 18.3 | 12.1 | 9.5 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 55.4 | | |
| #10 | 39.9 | | |
| #20 | 28.6 | | |
| #40 | 21.6 | | |
| #100 | 12.6 | | |
| #200 | 9.5 | | |

* (no specification provided)

**Material Description**

Well-graded sand with silt and gravel

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

| | | |
|---|---|---|
| $D_{90}$= 13.0763 | $D_{85}$= 11.2657 | $D_{60}$= 5.5571 |
| $D_{50}$= 3.7794 | $D_{30}$= 0.9567 | $D_{15}$= 0.2073 |
| $D_{10}$= 0.0863 | $C_u$= 64.36 | $C_c$= 1.91 |

**Classification**

USCS= SW-SM AASHTO=

**Remarks**

As received moisture content=10.6%
Fines classification and description based on
Visual Manual Procedure ASTM D2488

**Source of Sample:** SD-SC-01 **Depth:** 6-7.5

**Date:** 6/17/2015

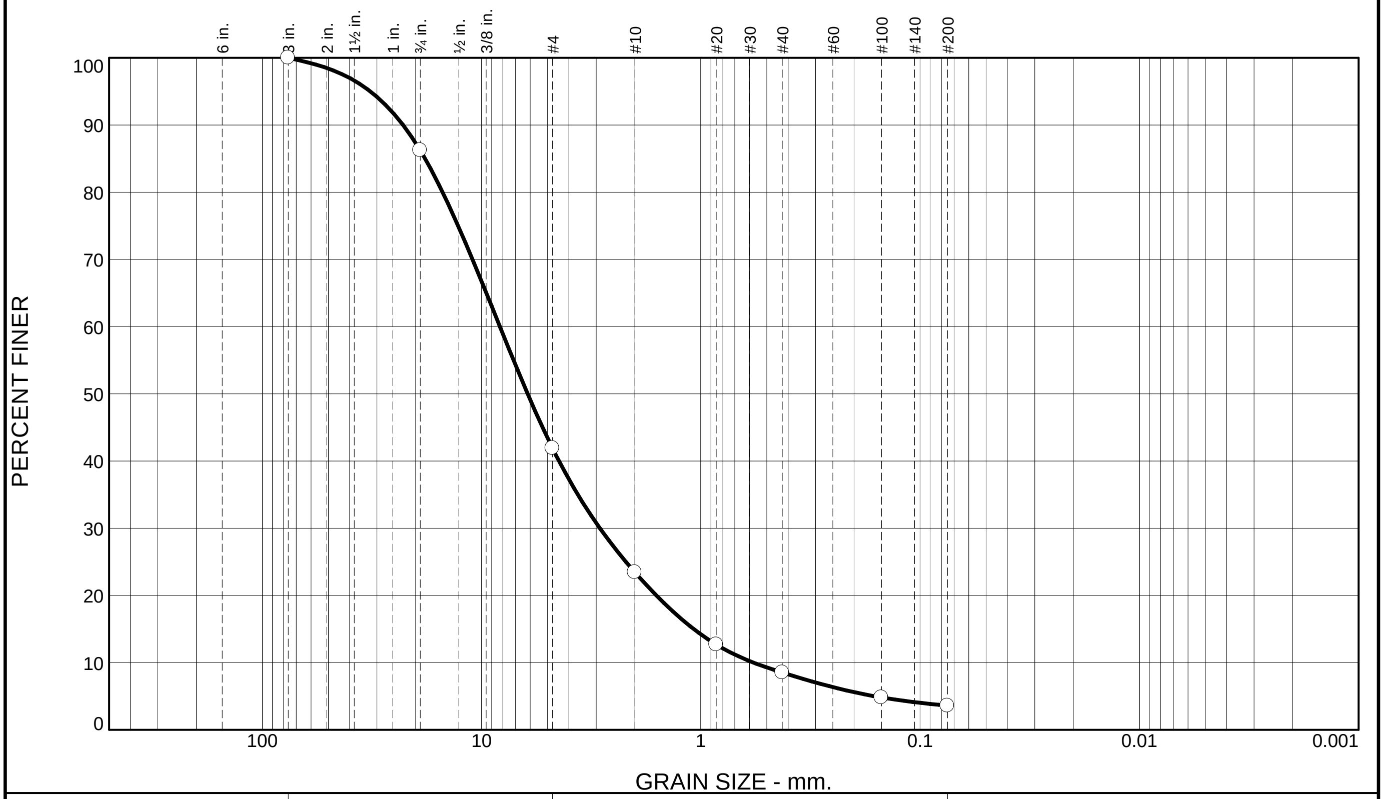
**CDM Smith**

**Boston, Massachusetts**

**Client:** Anchor QEA
**Project:** Orrington Remediation Site. Orrington, ME
**Project No:** 140617-01.01 **Figure**

**Tested By:** JB **Checked By:** JC

# Particle Size Distribution Report



| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 13.8 | 44.3 | 18.4 | 15.0 | 4.9 | 3.6 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 86.2 | | |
| #4 | 41.9 | | |
| #10 | 23.5 | | |
| #20 | 12.7 | | |
| #40 | 8.5 | | |
| #100 | 4.8 | | |
| #200 | 3.6 | | |

* (no specification provided)

**Material Description**

Well-graded gravel with sand

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= 22.8187 $D_{85}$= 18.1051 $D_{60}$= 8.2513
$D_{50}$= 6.1636 $D_{30}$= 2.8870 $D_{15}$= 1.0776
$D_{10}$= 0.5754 $C_u$= 14.34 $C_c$= 1.76

**Classification**

USCS= GW AASHTO=

**Remarks**

As received moisture content=11.5%
Fines classification and description based on
Visual Manual Procedure ASTM D2488

**Source of Sample:** SD-SC-01 **Depth:** 9-10.5

**Date:** 6/17/2015

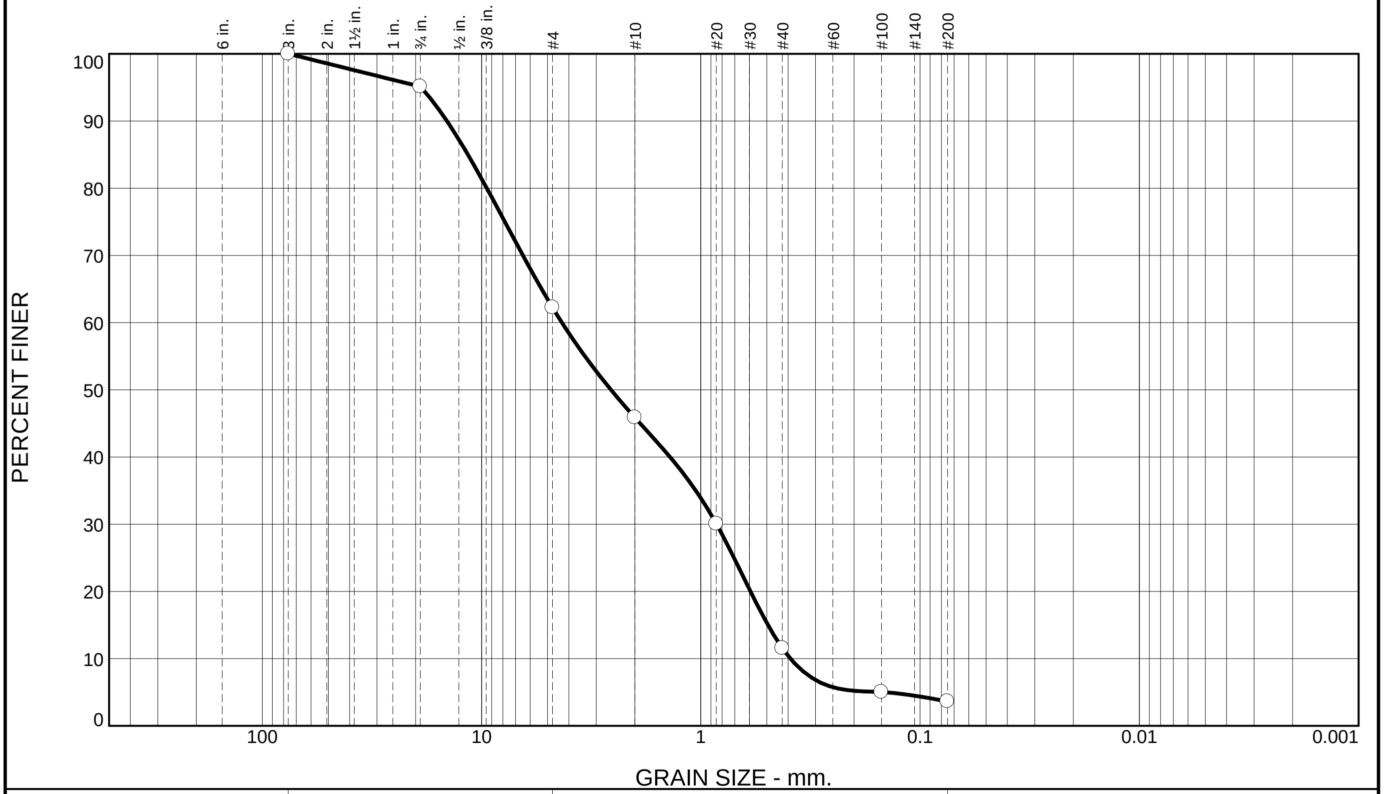
**CDM Smith**

**Boston, Massachusetts**

**Client:** Anchor QEA
**Project:** Orrington Remediation Site. Orrington, ME
**Project No:** 140617-01.01 **Figure**

**Tested By:** JB **Checked By:** JC

# Particle Size Distribution Report



| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 4.9 | 32.9 | 16.3 | 34.3 | 8.0 | 3.6 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 95.1 | | |
| #4 | 62.2 | | |
| #10 | 45.9 | | |
| #20 | 30.1 | | |
| #40 | 11.6 | | |
| #100 | 5.0 | | |
| #200 | 3.6 | | |

* (no specification provided)

## Material Description

Poorly graded sand with gravel

## Atterberg Limits

PL= LL= PI=

## Coefficients

$D_{90}$= 14.3928 $D_{85}$= 11.5536 $D_{60}$= 4.3025
$D_{50}$= 2.5700 $D_{30}$= 0.8476 $D_{15}$= 0.4943
$D_{10}$= 0.3904 $C_u$= 11.02 $C_c$= 0.43

## Classification

USCS= SP AASHTO=

## Remarks

As received moisture content=12.4%
Fines classification and description based on
Visual Manual Procedure ASTM D2488

**Source of Sample:** SD-SC-02 **Depth:** 8.5-10

**Date:** 6/20/2015

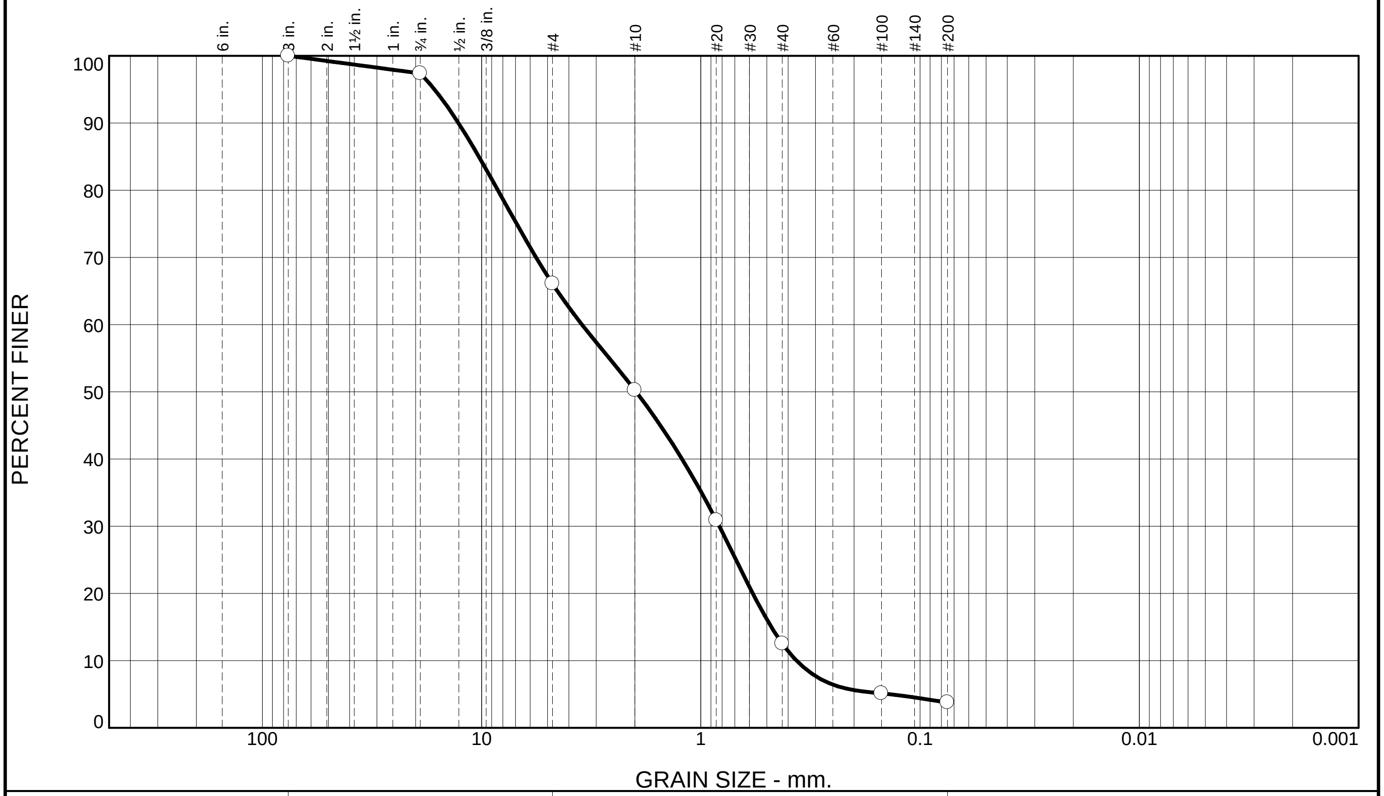
**CDM Smith**

**Boston, Massachusetts**

**Client:** Anchor QEA
**Project:** Orrington Remediation Site. Orrington, ME
**Project No:** 140617-01.01 **Figure**

**Tested By:** JB **Checked By:** JC

# Particle Size Distribution Report



| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 2.6 | 31.3 | 15.9 | 37.7 | 8.7 | 3.8 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 97.4 | | |
| #4 | 66.1 | | |
| #10 | 50.2 | | |
| #20 | 30.9 | | |
| #40 | 12.5 | | |
| #100 | 5.1 | | |
| #200 | 3.8 | | |

* (no specification provided)

**Material Description**

Poorly graded sand with gravel

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= 12.7565 $D_{85}$= 10.2956 $D_{60}$= 3.4828
$D_{50}$= 1.9737 $D_{30}$= 0.8237 $D_{15}$= 0.4770
$D_{10}$= 0.3662 $C_u$= 9.51 $C_c$= 0.53

**Classification**

USCS= SP AASHTO=

**Remarks**

As received moisture content=13.4%
Fines classification and description based on
Visual Manual Procedure ASTM D2488

**Source of Sample:** SD-SC-02 **Depth:** 13.5-15

**Date:** 6/20/2015

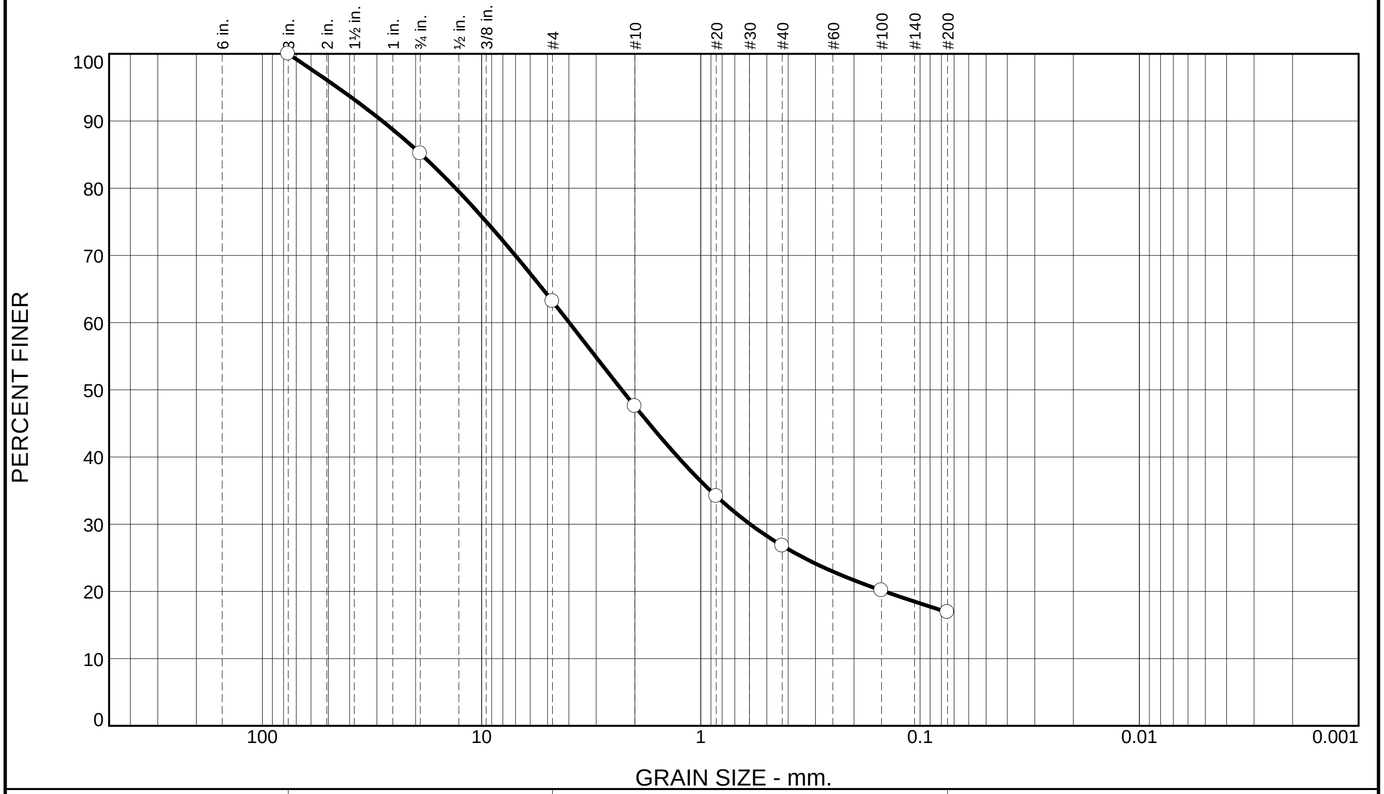
**CDM Smith**

**Boston, Massachusetts**

**Client:** Anchor QEA
**Project:** Orrington Remediation Site. Orrington, ME
**Project No:** 140617-01.01 **Figure**

**Tested By:** JB **Checked By:** JC

# Particle Size Distribution Report



| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 14.8 | 22.0 | 15.6 | 20.8 | 9.9 | 16.9 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 85.2 | | |
| #4 | 63.2 | | |
| #10 | 47.6 | | |
| #20 | 34.2 | | |
| #40 | 26.8 | | |
| #100 | 20.1 | | |
| #200 | 16.9 | | |

* (no specification provided)

**Material Description**

Silty sand with gravel

**Atterberg Limits**

PL= NP LL= NV PI= NP

**Coefficients**

$D_{90}$= 28.3769 $D_{85}$= 18.8102 $D_{60}$= 3.9838
$D_{50}$= 2.2953 $D_{30}$= 0.5959 $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= SM AASHTO= A-1-b

**Remarks**

As received moisture content=10.4%

**Source of Sample:** SD-SC-02 **Depth:** 21-22.5

**Date:** 6/20/15

**CDM Smith**

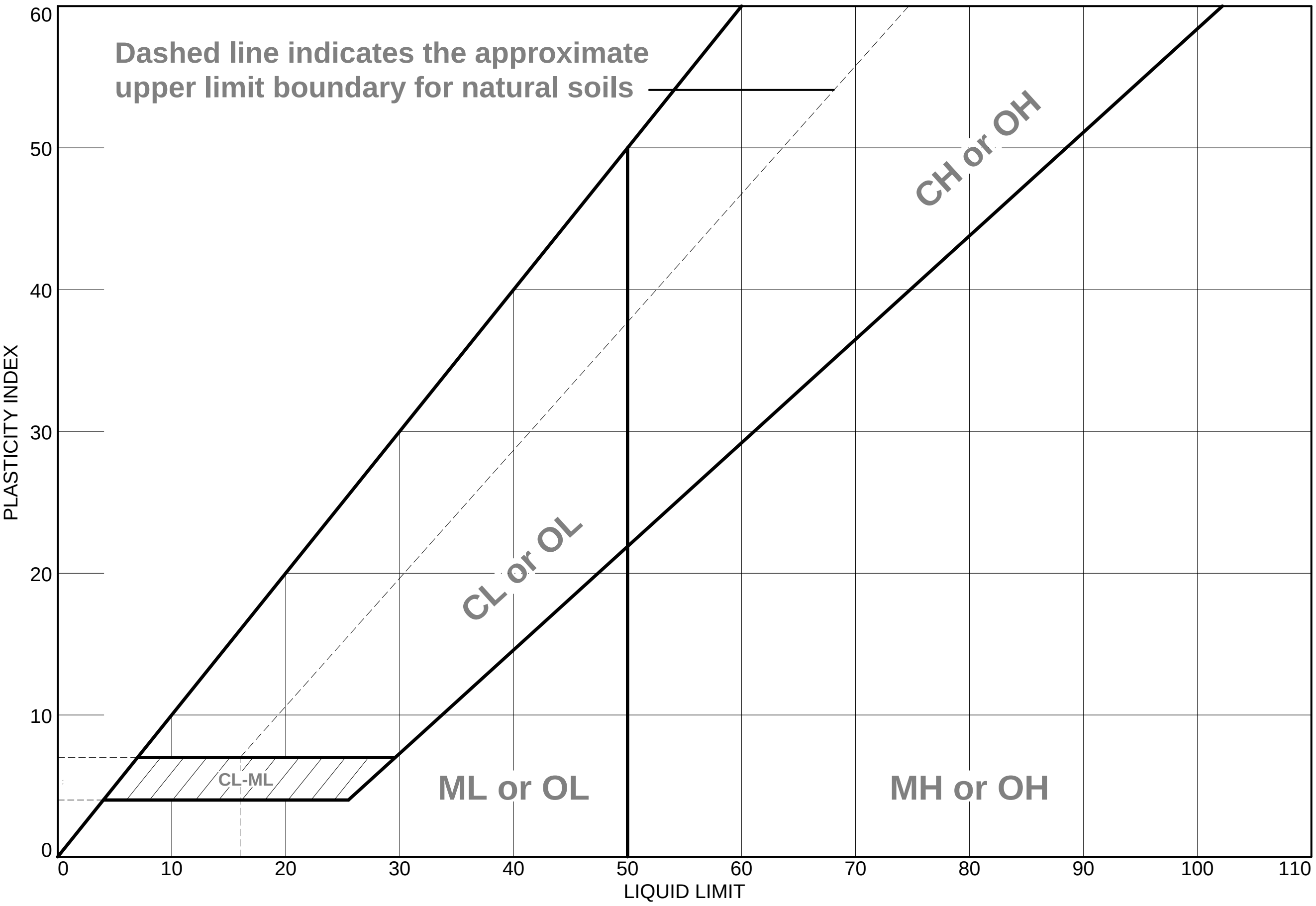
**Boston, Massachusetts**

**Client:** Anchor QEA
**Project:** Orrington Remediation Site. Orrington, ME

**Project No:** 140617-01.01 **Figure**

**Tested By:** JB **Checked By:** JC

# LIQUID AND PLASTIC LIMITS TEST REPORT



| | MATERIAL DESCRIPTION | LL | PL | PI | %<#40 | %<#200 | USCS |
|---|---|---|---|---|---|---|---|
| ● | Silty sand with gravel | NV | NP | NP | 26.8 | 16.9 | SM |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

**Project No.** 140617-01.01 **Client:** Anchor QEA

**Project:** Orrington Remediation Site. Orrington, ME

●**Source of Sample:** SD-SC-02 **Depth:** 21-22.5

**Remarks:**

●As received moisture content=10.4%

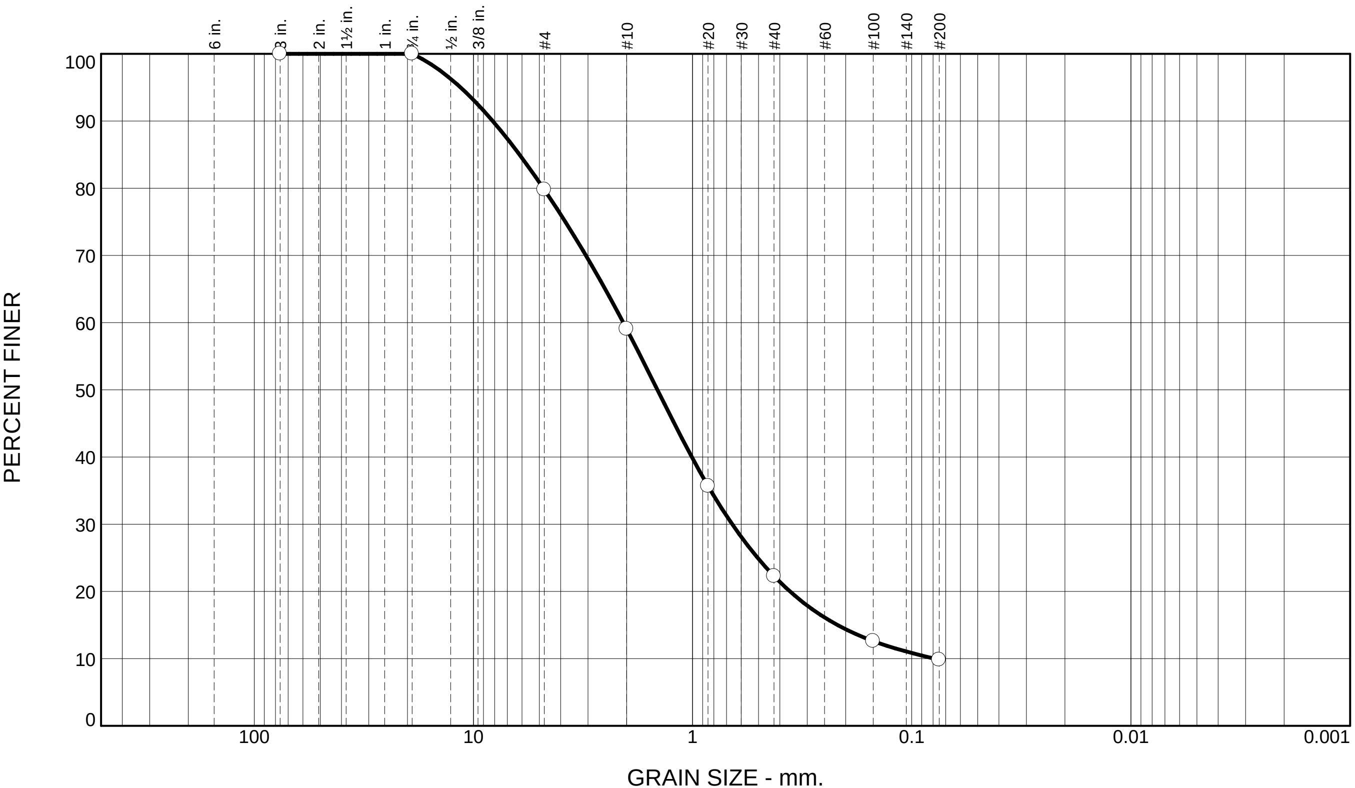
**CDM Smith**

**Boston, Massachusetts**

**Figure**

**Tested By:** JC **Checked By:** BFM

# Particle Size Distribution Report



| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 20.2 | 20.7 | 36.8 | 12.5 | 9.8 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 79.8 | | |
| #10 | 59.1 | | |
| #20 | 35.7 | | |
| #40 | 22.3 | | |
| #100 | 12.6 | | |
| #200 | 9.8 | | |

* (no specification provided)

**Material Description**

Well-graded sand with silt and gravel

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

| | | |
|---|---|---|
| $D_{90}$= 8.1670 | $D_{85}$= 6.1642 | $D_{60}$= 2.0710 |
| $D_{50}$= 1.4473 | $D_{30}$= 0.6596 | $D_{15}$= 0.2183 |
| $D_{10}$= 0.0788 | $C_u$= 26.29 | $C_c$= 2.67 |

**Classification**

USCS= SW-SM AASHTO=

**Remarks**

As received moisture content=14.5%
Fines classification and description based on
Visual Manual Procedure ASTM D2488

**Source of Sample:** SD-SC-03 **Depth:** 6-7.5

**Date:** 6/20/2015

**CDM Smith**

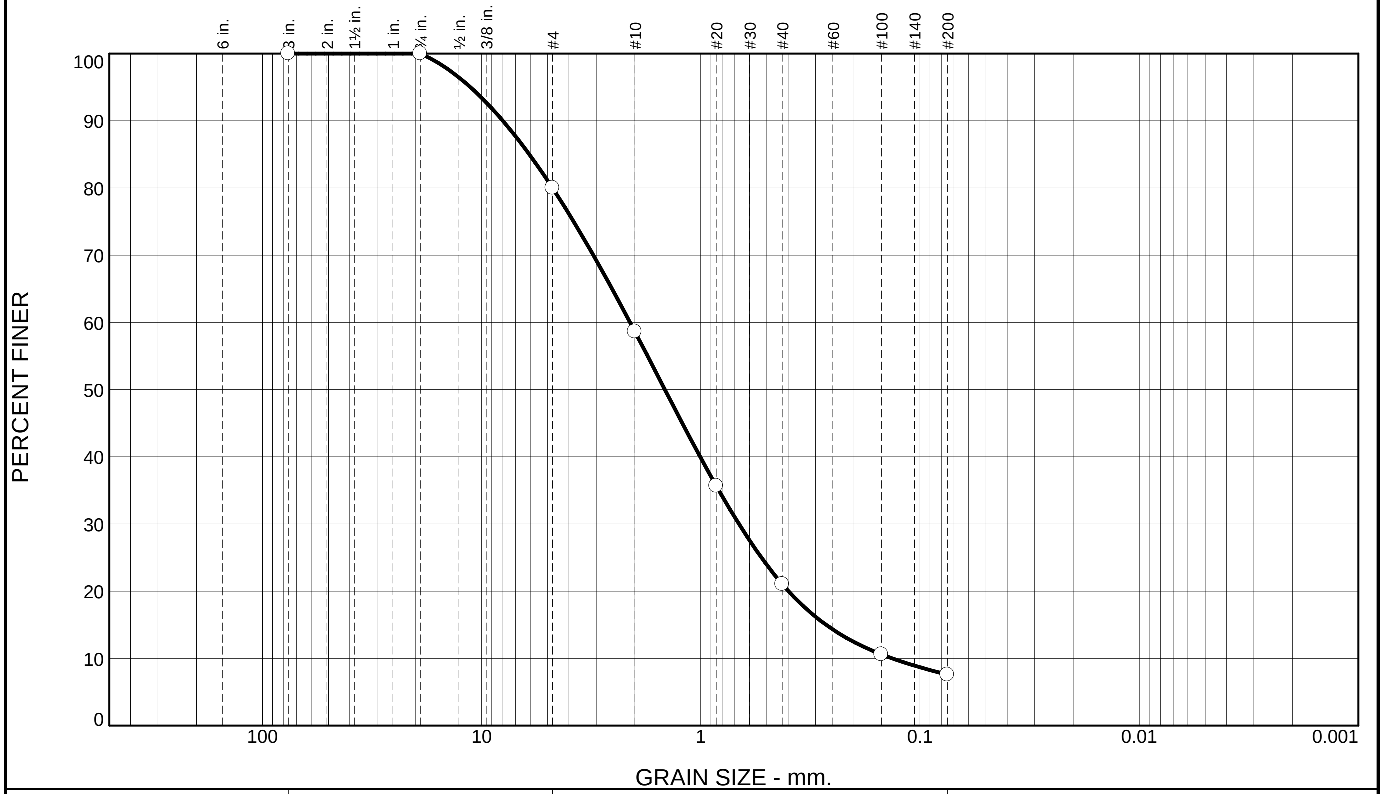
**Boston, Massachusetts**

**Client:** Anchor QEA
**Project:** Orrington Remediation Site. Orrington, ME

**Project No:** 140617-01.01 **Figure**

**Tested By:** JB **Checked By:** JC

# Particle Size Distribution Report



| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 20.0 | 21.4 | 37.6 | 13.4 | 7.6 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 80.0 | | |
| #10 | 58.6 | | |
| #20 | 35.7 | | |
| #40 | 21.0 | | |
| #100 | 10.6 | | |
| #200 | 7.6 | | |

* (no specification provided)

**Material Description**

Well-graded sand with silt and gravel

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= 8.0082 $D_{85}$= 6.0618 $D_{60}$= 2.1049

$D_{50}$= 1.4595 $D_{30}$= 0.6702 $D_{15}$= 0.2684

$D_{10}$= 0.1341 $C_u$= 15.70 $C_c$= 1.59

**Classification**

USCS= SW-SM AASHTO=

**Remarks**

As received moisture content=13.7%
Fines classification and description based on
Visual Manual Procedure ASTM D2488

**Source of Sample:** SD-SC-03 **Depth:** 8.5-10

**Date:** 6/20/2015

**CDM Smith**

**Boston, Massachusetts**

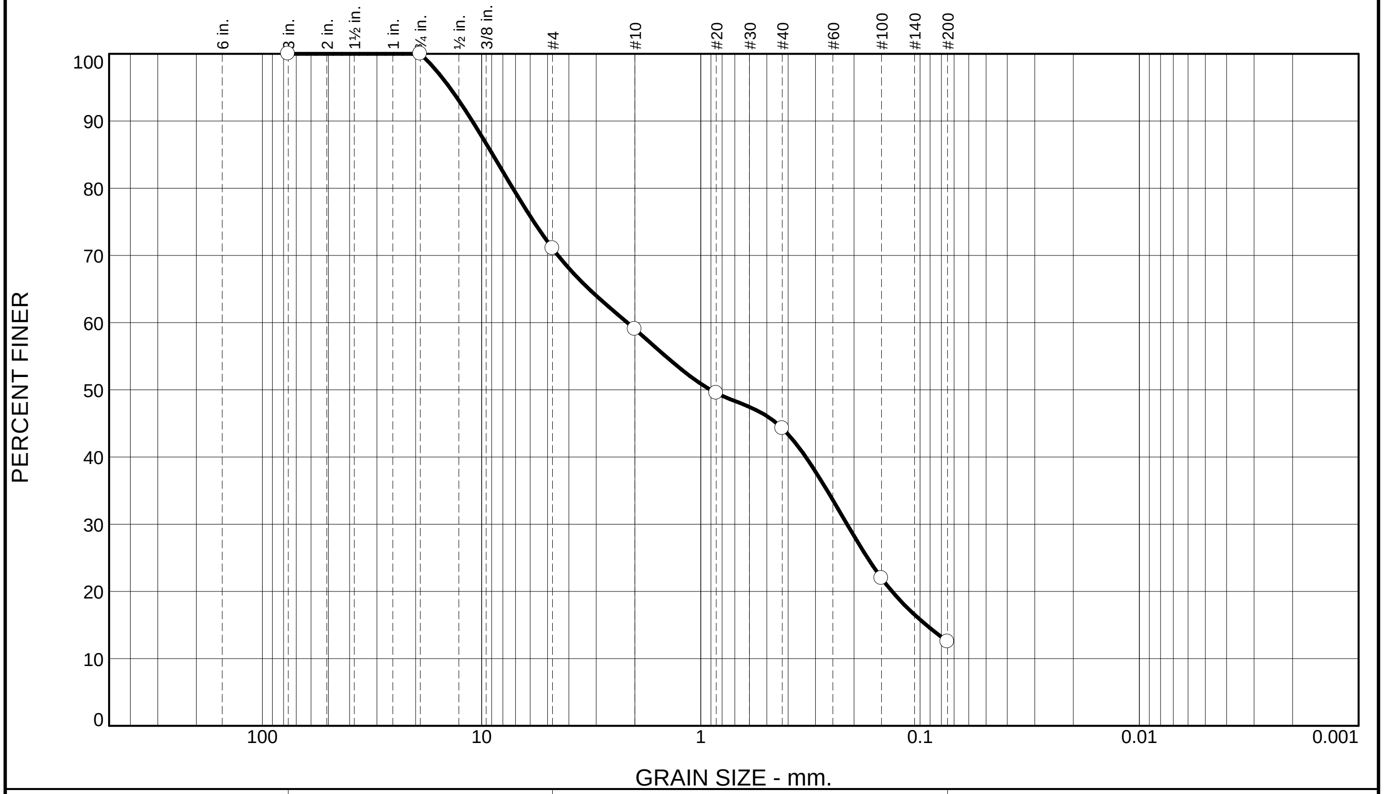
**Client:** Anchor QEA

**Project:** Orrington Remediation Site. Orrington, ME

**Project No:** 140617-01.01 **Figure**

**Tested By:** JB **Checked By:** JC

# Particle Size Distribution Report



| % +3" | % Gravel |  | % Sand |  |  | % Fines |  |
|---|---|---|---|---|---|---|---|
|  | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 29.0 | 12.0 | 14.7 | 31.8 | 12.5 |  |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 |  |  |
| 3/4 | 100.0 |  |  |
| #4 | 71.0 |  |  |
| #10 | 59.0 |  |  |
| #20 | 49.5 |  |  |
| #40 | 44.3 |  |  |
| #100 | 22.0 |  |  |
| #200 | 12.5 |  |  |

* (no specification provided)

**Material Description**

Silty sand with gravel

**Atterberg Limits**

PL=
LL=
PI=

**Coefficients**

$D_{90}$= 11.0341
$D_{85}$= 8.8956
$D_{60}$= 2.1646
$D_{50}$= 0.9039
$D_{30}$= 0.2153
$D_{15}$= 0.0936
$D_{10}$=
$C_u$=
$C_c$=

**Classification**

USCS= SM
AASHTO=

**Remarks**

As received moisture content=15.2%
Fines classification and description based on Visual Manual Procedure ASTM D2488

**Source of Sample:** SD-SC-03 **Depth:** 16-18

**Date:** 6/20/2015

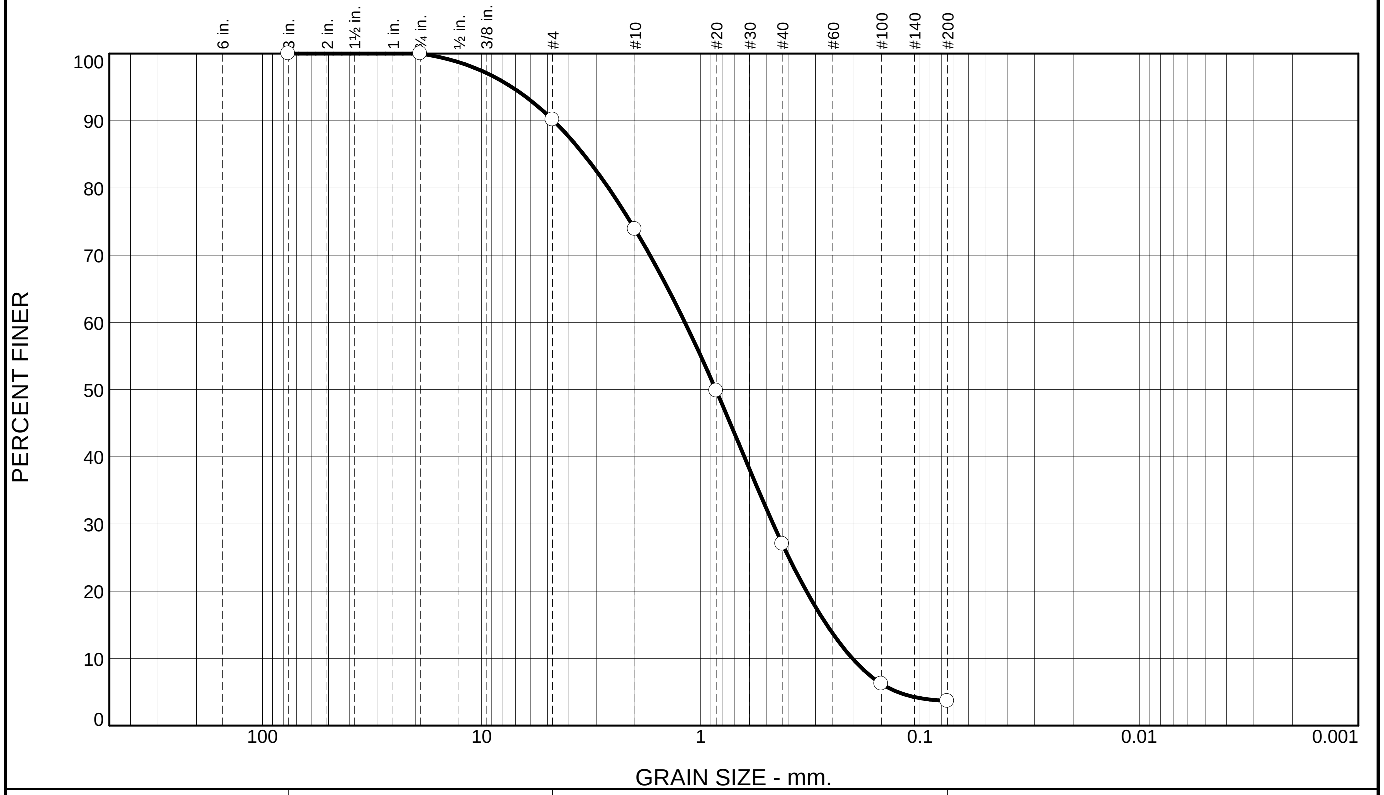
**CDM Smith**

**Boston, Massachusetts**

**Client:** Anchor QEA
**Project:** Orrington Remediation Site. Orrington, ME
**Project No:** 140617-01.01 **Figure**

**Tested By:** JB **Checked By:** JC

# Particle Size Distribution Report



| % +3" | % Gravel |  | % Sand |  |  | % Fines |  |
|---|---|---|---|---|---|---|---|
|  | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 9.8 | 16.3 | 46.9 | 23.4 | 3.6 |  |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 |  |  |
| 3/4 | 100.0 |  |  |
| #4 | 90.2 |  |  |
| #10 | 73.9 |  |  |
| #20 | 49.8 |  |  |
| #40 | 27.0 |  |  |
| #100 | 6.2 |  |  |
| #200 | 3.6 |  |  |

* (no specification provided)

## Material Description

Poorly graded sand

## Atterberg Limits

PL= LL= PI=

## Coefficients

$D_{90}$= 4.6975 $D_{85}$= 3.4246 $D_{60}$= 1.1823
$D_{50}$= 0.8546 $D_{30}$= 0.4680 $D_{15}$= 0.2665
$D_{10}$= 0.2036 $C_u$= 5.81 $C_c$= 0.91

## Classification

USCS= SP AASHTO=

## Remarks

As received moisture content=23.1%
Fines classification and description based on
Visual Manual Procedure ASTM D2488

**Source of Sample:** SD-SC-04 **Depth:** 1-1.5

**Date:** 6/17/2015

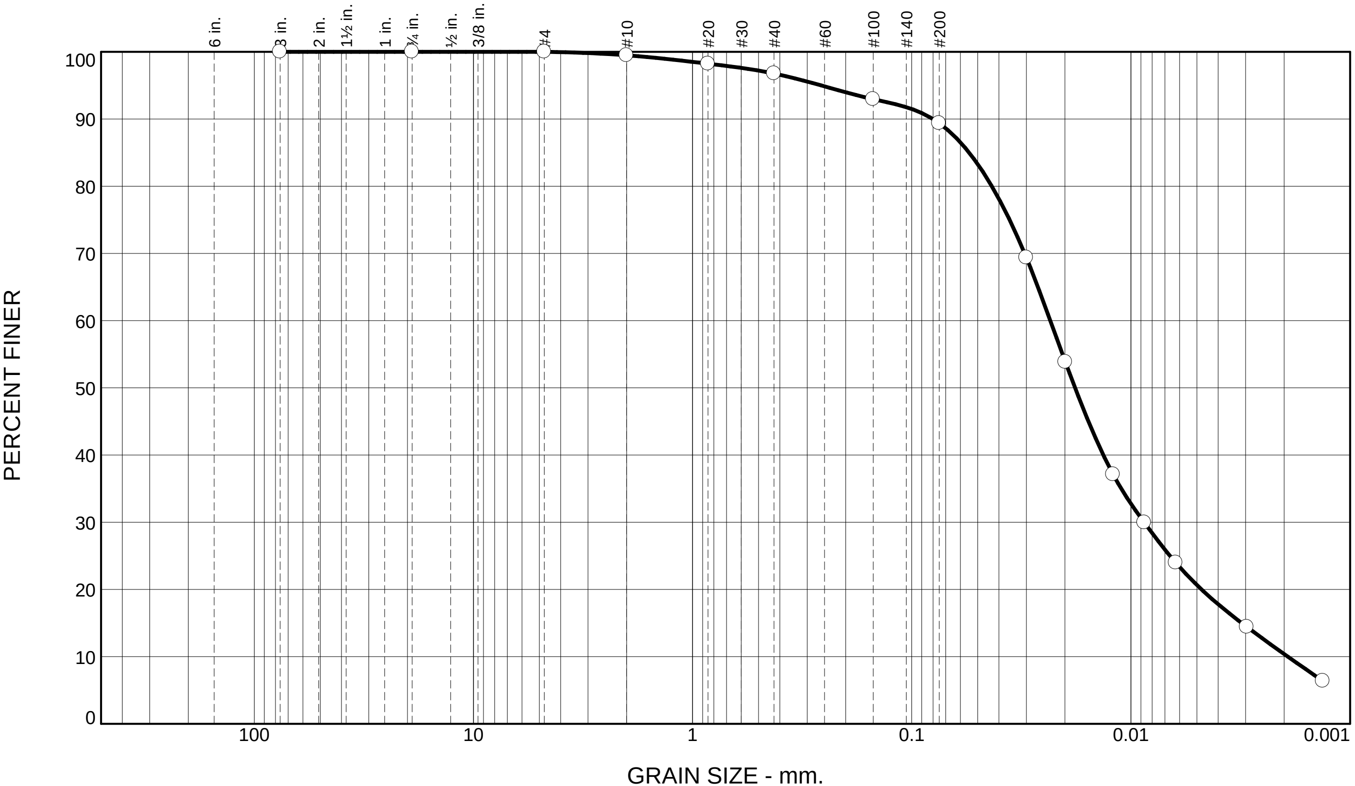
**CDM Smith**

**Boston, Massachusetts**

**Client:** Anchor QEA
**Project:** Orrington Remediation Site. Orrington, ME
**Project No:** 140617-01.01 **Figure**

**Tested By:** JB **Checked By:** JC

# Particle Size Distribution Report



| % +3" | % Gravel |  | % Sand |  |  | % Fines |  |
|---|---|---|---|---|---|---|---|
|  | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 0.0 | 0.5 | 2.7 | 7.4 | 68.7 | 20.7 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 |  |  |
| 3/4 | 100.0 |  |  |
| #4 | 100.0 |  |  |
| #10 | 99.5 |  |  |
| #20 | 98.2 |  |  |
| #40 | 96.8 |  |  |
| #100 | 92.9 |  |  |
| #200 | 89.4 |  |  |

* (no specification provided)

**Material Description**

Elastic silt

**Atterberg Limits**

PL= 69 LL= 139 PI= 70

**Coefficients**

$D_{90}$= 0.0801 $D_{85}$= 0.0548 $D_{60}$= 0.0233
$D_{50}$= 0.0180 $D_{30}$= 0.0087 $D_{15}$= 0.0031
$D_{10}$= 0.0019 $C_u$= 12.13 $C_c$= 1.69

**Classification**

USCS= MH AASHTO= A-7-5(82)

**Remarks**

As received moisture content=130.1%

**Source of Sample:** SD-SC-05 **Depth:** 0-2

**Date:** 6/20/15

**CDM Smith**

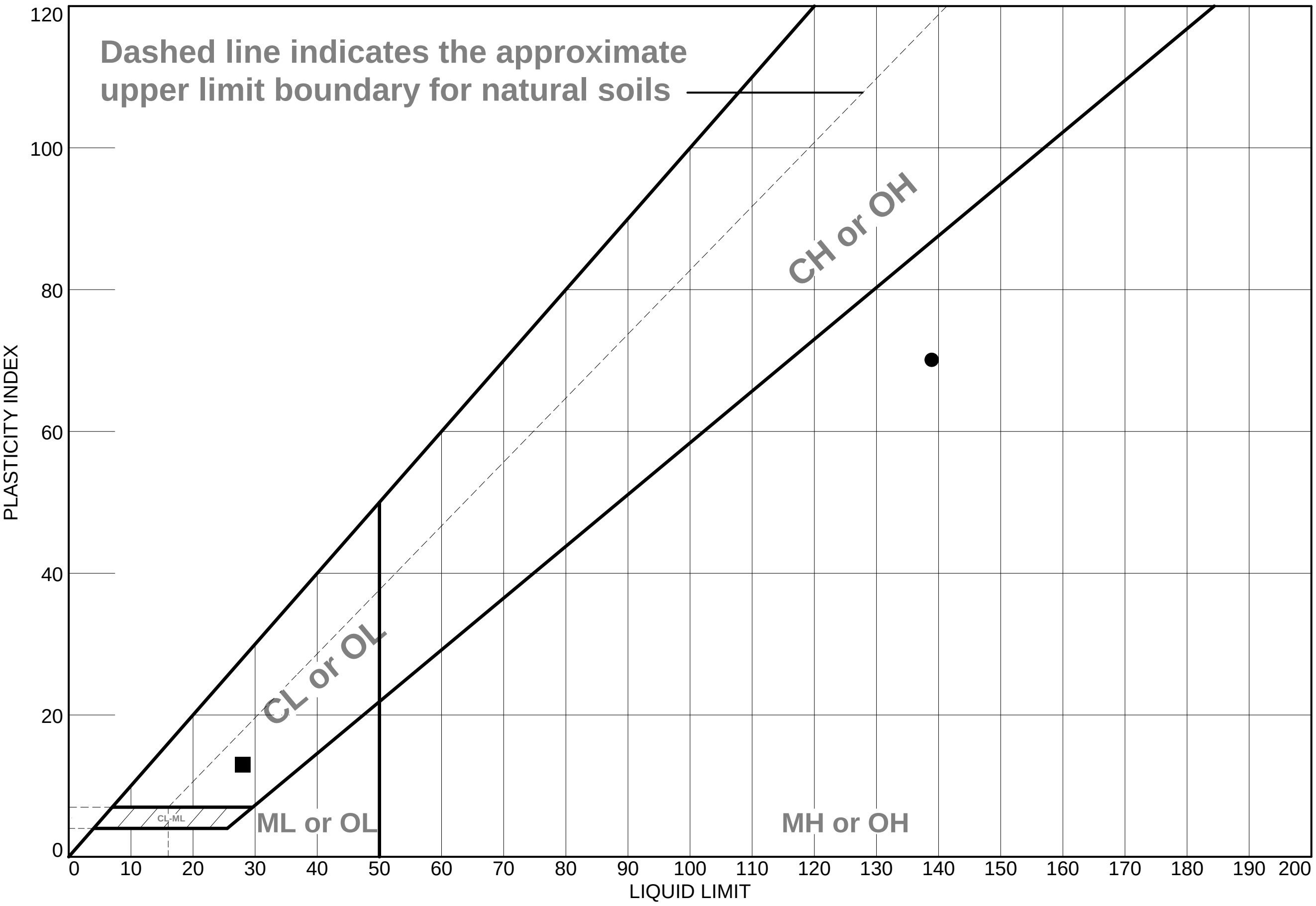
**Boston, Massachusetts**

**Client:** Anchor QEA
**Project:** Orrington Remediation Site. Orrington, ME

**Project No:** 140617-01.01 **Figure**

**Tested By:** JB **Checked By:** JC

# LIQUID AND PLASTIC LIMITS TEST REPORT



| | MATERIAL DESCRIPTION | LL | PL | PI | %<#40 | %<#200 | USCS |
|---|---|---|---|---|---|---|---|
| ● | Elastic silt | 139 | 69 | 70 | 96.8 | 89.4 | MH |
| ■ | Sandy lean clay | 28 | 15 | 13 | 99.6 | 67.8 | CL |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

**Project No.** 140617-01.01 **Client:** Anchor QEA

**Project:** Orrington Remediation Site. Orrington, ME

●**Source of Sample:** SD-SC-05 **Depth:** 0-2
■**Source of Sample:** SD-SC-05 **Depth:** 6-8

**Remarks:**
●As received moisture content= 130.1%
■As received moisture content=20.2%

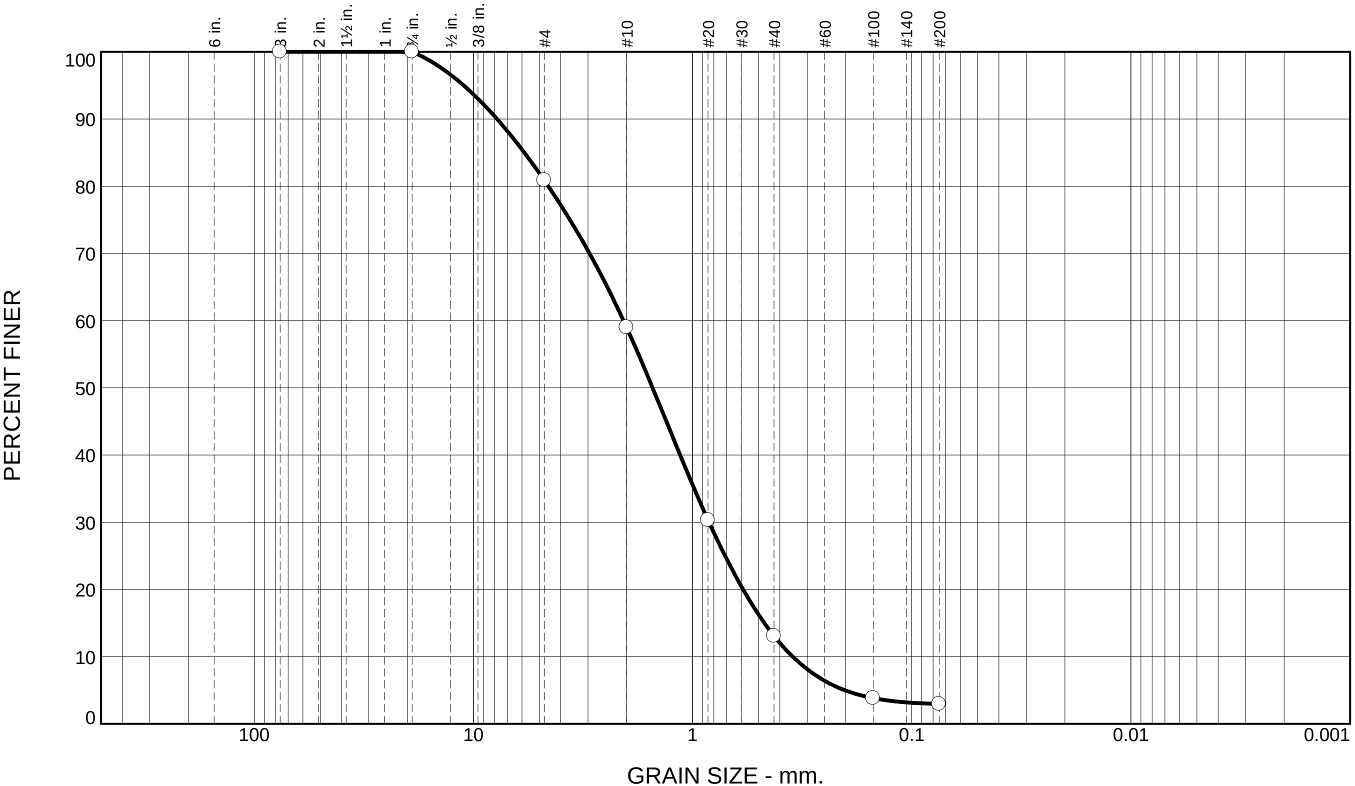
**CDM Smith**

**Boston, Massachusetts**

**Figure**

**Tested By:** ○ JC ☐ JB **Checked By:** BFM

# Particle Size Distribution Report



| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 19.1 | 21.9 | 45.9 | 10.2 | 2.9 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 80.9 | | |
| #10 | 59.0 | | |
| #20 | 30.3 | | |
| #40 | 13.1 | | |
| #100 | 3.8 | | |
| #200 | 2.9 | | |

* (no specification provided)

## Material Description

Poorly graded sand with gravel

## Atterberg Limits

PL= LL= PI=

## Coefficients

$D_{90}$= 7.8013 $D_{85}$= 5.8559 $D_{60}$= 2.0664
$D_{50}$= 1.5224 $D_{30}$= 0.8418 $D_{15}$= 0.4707
$D_{10}$= 0.3496 $C_u$= 5.91 $C_c$= 0.98

## Classification

USCS= SP AASHTO=

## Remarks

As received moisture content=16.8%
Fines classification and description based on
Visual Manual Procedure ASTM D2488

**Source of Sample:** SD-SC-05 **Depth:** 2.5-3.5

**Date:** 6/20/2015

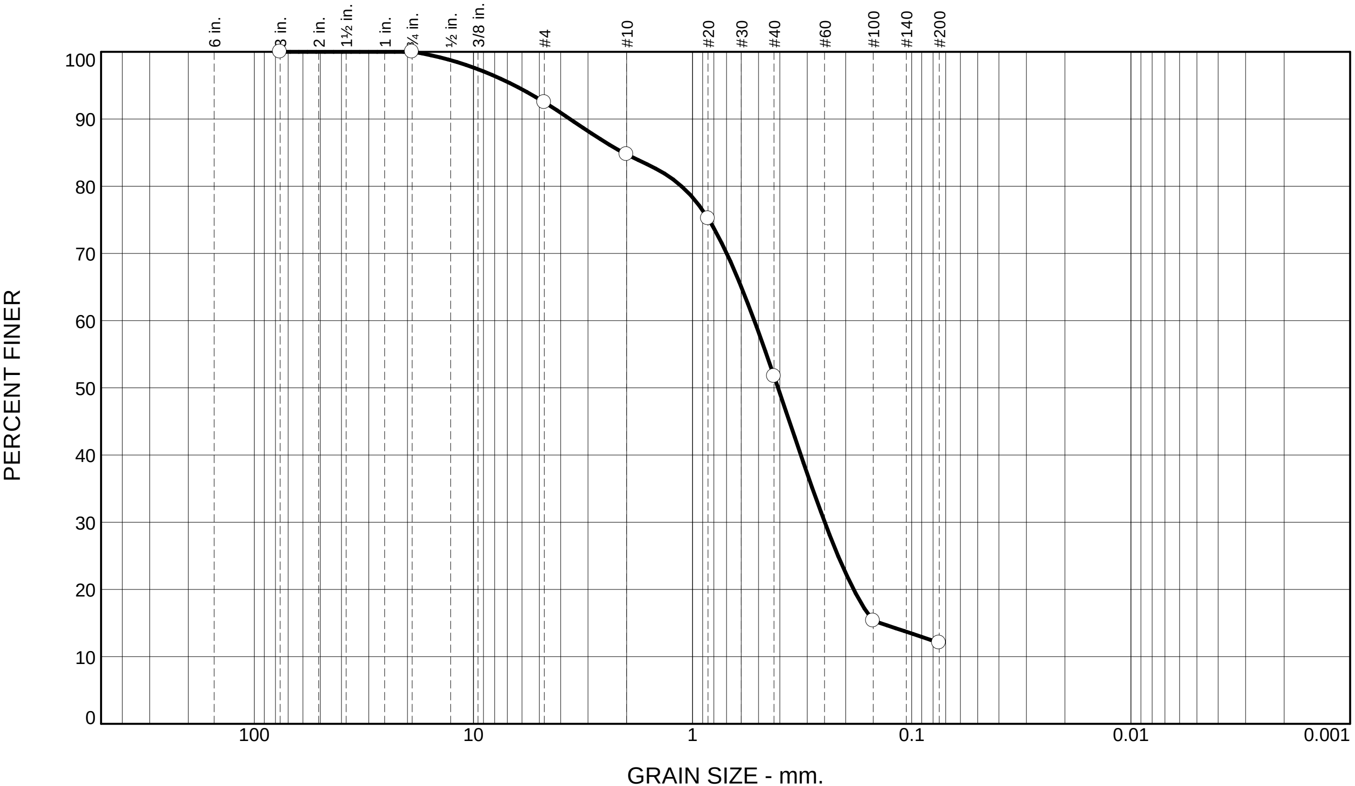
**CDM Smith**

**Boston, Massachusetts**

**Client:** Anchor QEA
**Project:** Orrington Remediation Site. Orrington, ME
**Project No:** 140617-01.01 **Figure**

**Tested By:** JB **Checked By:** JC

# Particle Size Distribution Report



| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 7.5 | 7.8 | 33.0 | 39.6 | 12.1 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 92.5 | | |
| #10 | 84.7 | | |
| #20 | 75.2 | | |
| #40 | 51.7 | | |
| #100 | 15.3 | | |
| #200 | 12.1 | | |

* (no specification provided)

**Material Description**

Silty sand

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= 3.6263 $D_{85}$= 2.0716 $D_{60}$= 0.5230
$D_{50}$= 0.4076 $D_{30}$= 0.2495 $D_{15}$= 0.1395
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= SM AASHTO=

**Remarks**

As received moisture content=22.4%
Fines classification and description based on Visual Manual Procedure ASTM D2488

**Source of Sample:** SD-SC-05 **Depth:** 3.5-4

**Date:** 6/20/2015

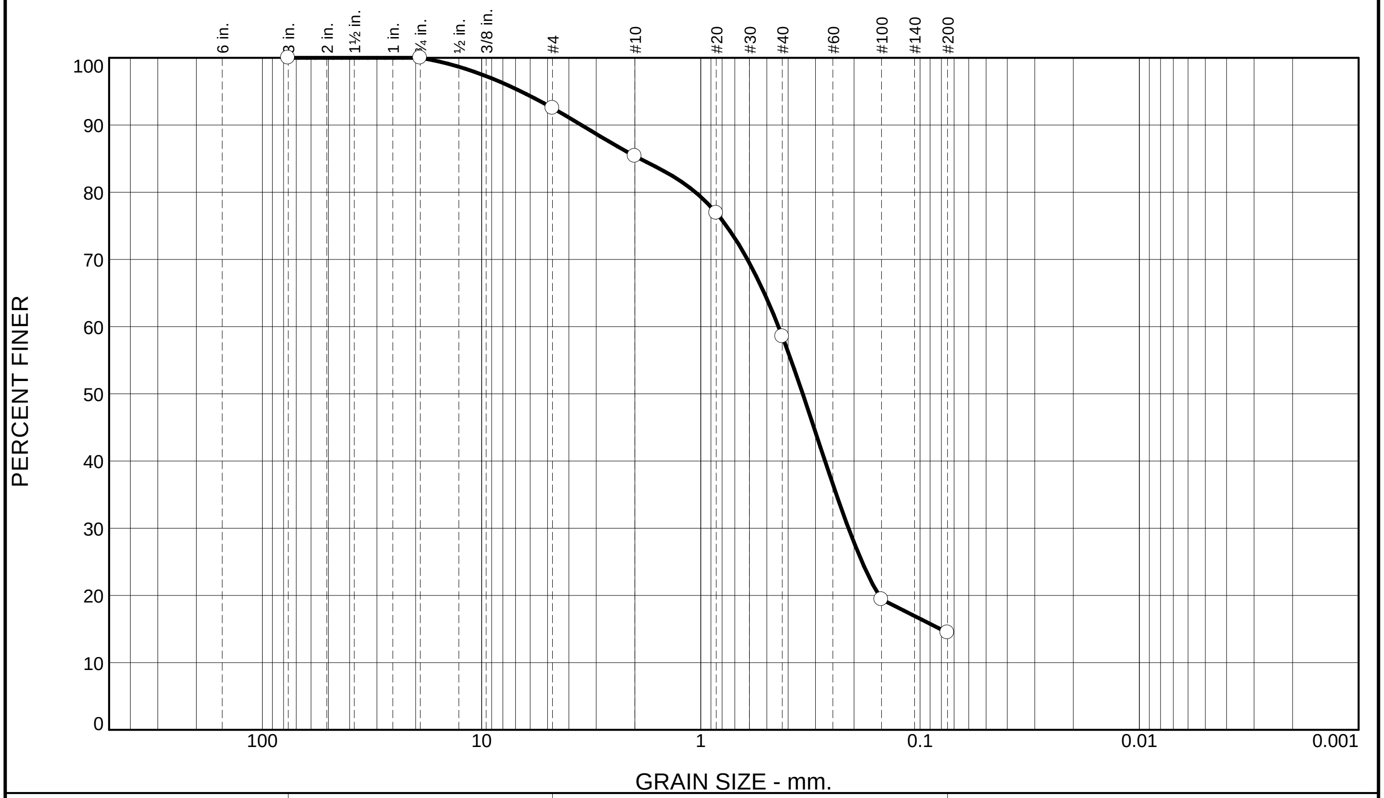
**CDM Smith**

**Boston, Massachusetts**

**Client:** Anchor QEA
**Project:** Orrington Remediation Site. Orrington, ME
**Project No:** 140617-01.01 **Figure**

**Tested By:** JB **Checked By:** JC

# Particle Size Distribution Report



| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 7.5 | 7.1 | 26.9 | 44.0 | 14.5 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 92.5 | | |
| #10 | 85.4 | | |
| #20 | 76.9 | | |
| #40 | 58.5 | | |
| #100 | 19.4 | | |
| #200 | 14.5 | | |

* (no specification provided)

**Material Description**

Silty sand

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= 3.5060 $D_{85}$= 1.8987 $D_{60}$= 0.4424
$D_{50}$= 0.3431 $D_{30}$= 0.2121 $D_{15}$= 0.0809
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= SM AASHTO=

**Remarks**

As received moisture content=16.8%
Fines classification and description based on
Visual Manual Procedure ASTM D2488

**Source of Sample:** SD-SC-05 **Depth:** 4-6

**Date:** 6/20/2015

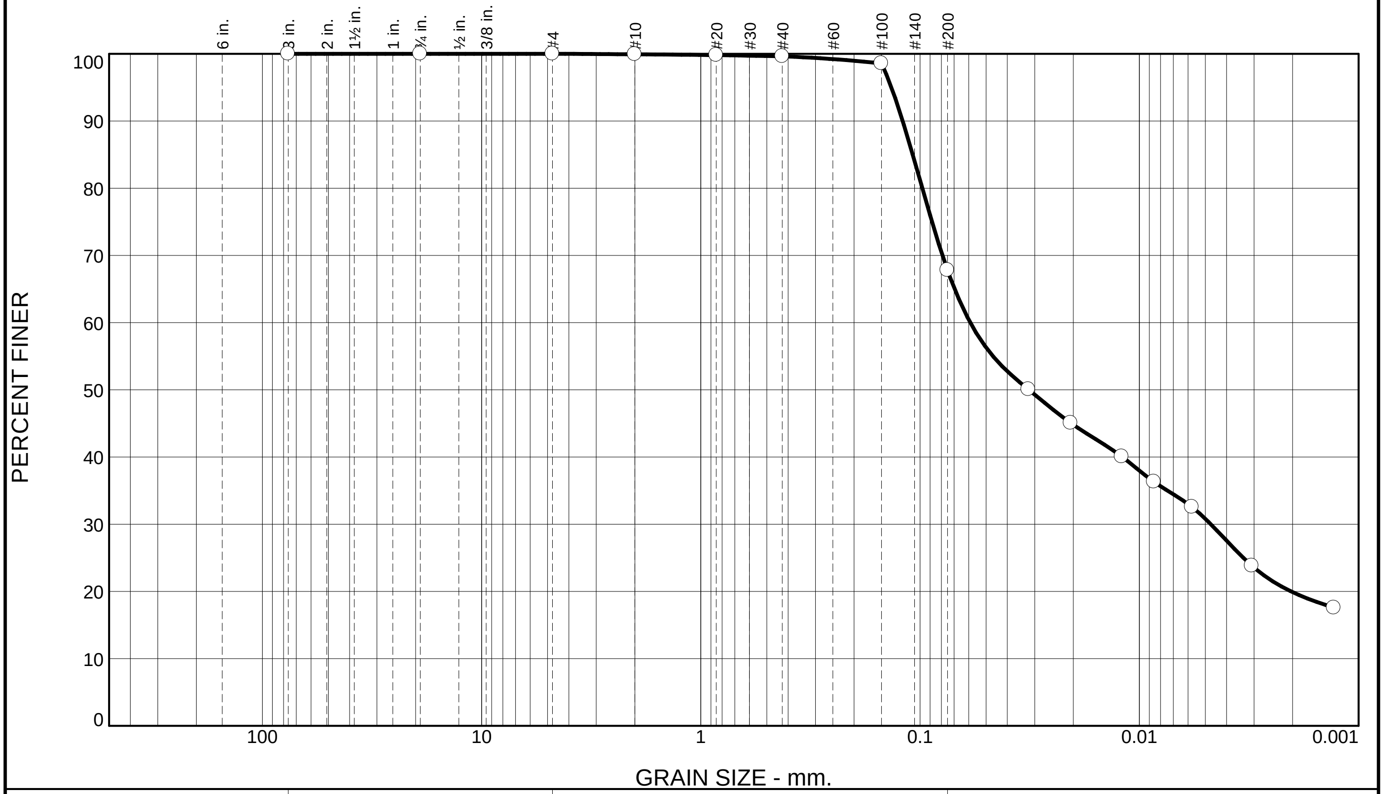
**CDM Smith**

**Boston, Massachusetts**

**Client:** Anchor QEA
**Project:** Orrington Remediation Site. Orrington, ME
**Project No:** 140617-01.01 **Figure**

**Tested By:** JB **Checked By:** JC

# Particle Size Distribution Report



| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 0.0 | 0.1 | 0.3 | 31.8 | 37.0 | 30.8 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 100.0 | | |
| #10 | 99.9 | | |
| #20 | 99.8 | | |
| #40 | 99.6 | | |
| #100 | 98.6 | | |
| #200 | 67.8 | | |

* (no specification provided)

**Material Description**

Sandy lean clay

**Atterberg Limits**

PL= 15 LL= 28 PI= 13

**Coefficients**

$D_{90}$= 0.1201 $D_{85}$= 0.1081 $D_{60}$= 0.0590

$D_{50}$= 0.0319 $D_{30}$= 0.0047 $D_{15}$=

$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= CL AASHTO= A-6(6)

**Remarks**

As received moisture content=20.2%

**Source of Sample:** SD-SC-05 **Depth:** 6-8

**Date:** 6/20/15

**CDM Smith**

**Boston, Massachusetts**

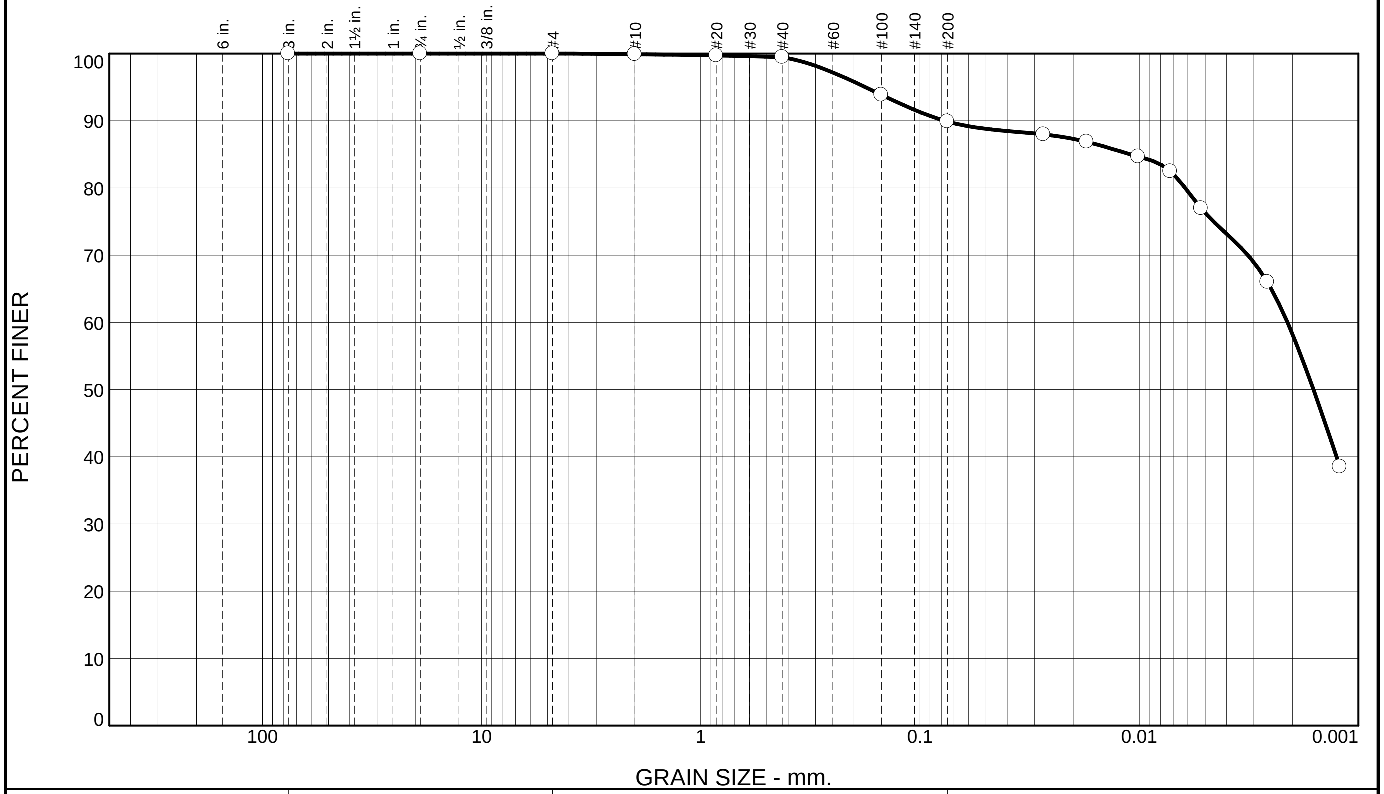
**Client:** Anchor QEA

**Project:** Orrington Remediation Site. Orrington, ME

**Project No:** 140617-01.01 **Figure**

**Tested By:** JB **Checked By:** JC

# Particle Size Distribution Report



| % +3" | % Gravel |  | % Sand |  |  | % Fines |  |
|---|---|---|---|---|---|---|---|
|  | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 0.0 | 0.1 | 0.4 | 9.6 | 13.6 | 76.3 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 |  |  |
| 3/4 | 100.0 |  |  |
| #4 | 100.0 |  |  |
| #10 | 99.9 |  |  |
| #20 | 99.7 |  |  |
| #40 | 99.5 |  |  |
| #100 | 93.9 |  |  |
| #200 | 89.9 |  |  |

* (no specification provided)

## Material Description

Lean clay

### Atterberg Limits

PL= 19 LL= 38 PI= 19

### Coefficients

$D_{90}$= 0.0772 $D_{85}$= 0.0110 $D_{60}$= 0.0021
$D_{50}$= 0.0016 $D_{30}$= $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

### Classification

USCS= CL AASHTO= A-6(17)

### Remarks

As received moisture content=31.5%

**Source of Sample:** SD-SC-06 **Depth:** 6-23 depth in inches, not feet

**Date:** 6/20/15

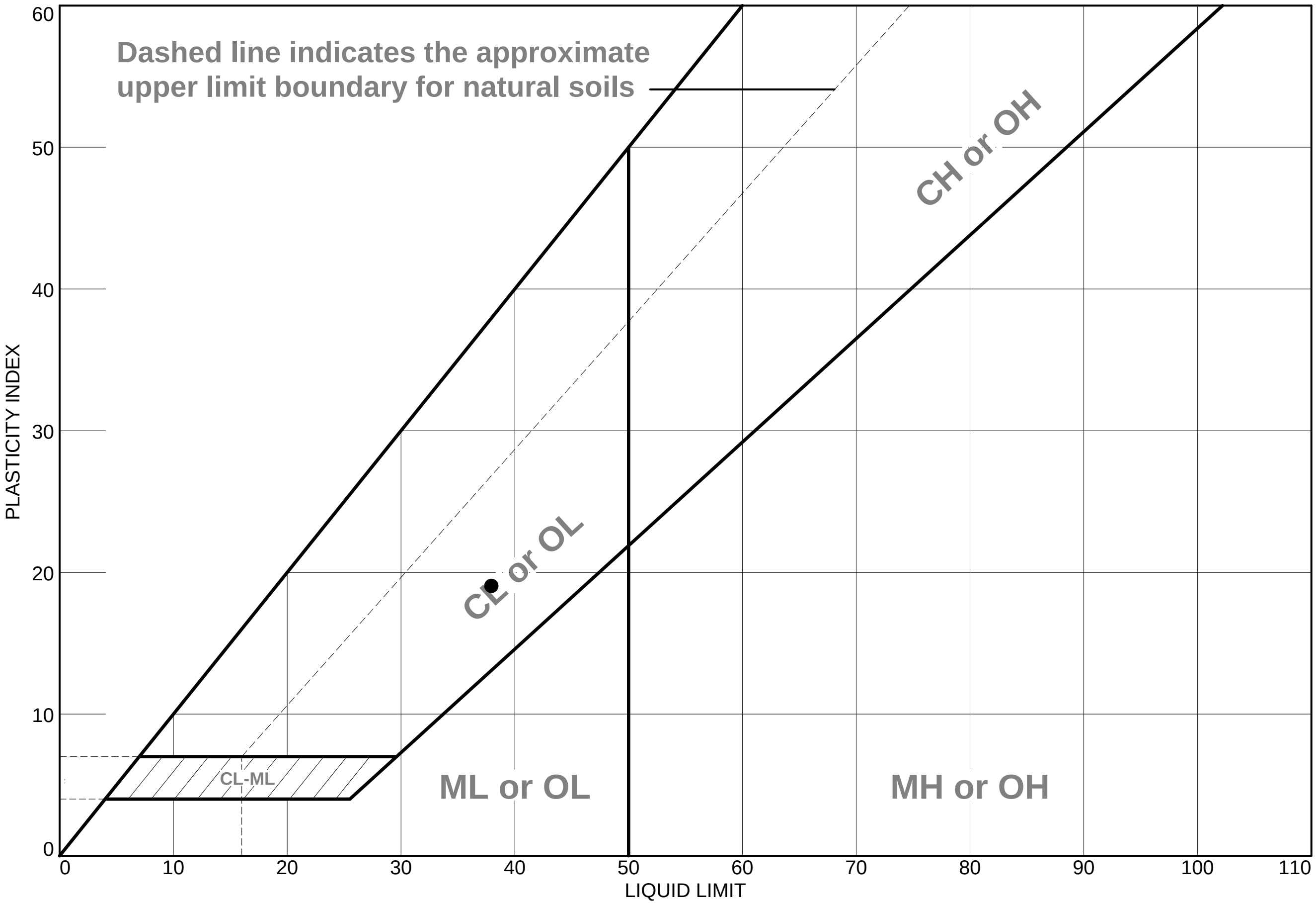
**CDM Smith**

**Boston, Massachusetts**

**Client:** Anchor QEA
**Project:** Orrington Remediation Site. Orrington, ME
**Project No:** 140617-01.01 **Figure**

**Tested By:** JB **Checked By:** JC

# LIQUID AND PLASTIC LIMITS TEST REPORT



| | MATERIAL DESCRIPTION | LL | PL | PI | %<#40 | %<#200 | USCS |
|---|---|---|---|---|---|---|---|
| ● | Lean clay | 38 | 19 | 19 | 99.5 | 89.9 | CL |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

**Project No.** 140617-01.01 **Client:** Anchor QEA

**Project:** Orrington Remediation Site. Orrington, ME

●**Source of Sample:** SD-SC-06 **Depth:** 6-23

depth in inches, not feet

**Remarks:**

●As received moisture content=31.5%

**CDM Smith**

**Boston, Massachusetts**

**Figure**

**Tested By:** AW **Checked By:** JC

# A.5: Treatability Report (CDM 2015)

# GEOTECHNICAL REPORT

## Mallinckrodt Remediation Project

### Treatability Testing
### Southern Cove Sediment Remediation

**Contract Title and No.:**
Orrington Remediation Site

**ICA No.:** Orrington No. 11

December 4, 2015

CDM Smith

cdmsmith.com

# Table of Contents

## Appendices

# List of Figures

# List of Tables

# Section 1

# Introduction

This report presents the findings of the treatability study conducted in support of the remediation of sediments within the Southern Cove Area of the Orrington Remediation Site in Orrington, Maine.

Sediments in the Southern Cove Area were identified to have levels of mercury higher than permissible in the media protection standard (MPS). Site remediation objectives are summarized in the Work Plan, prepared by Anchor QEA and CDM Smith (June 2015), and in the Maine Department of Protection Compliance Order (MEDEP, 2008). Remediation is being conducted to: remove sediments with mercury levels above the MPS, and to reduce the risk to the public health and safety and the environment.

This report summarizes the results of the treatability study, and presents recommendations for implementation of dewatering and solidification/stabilization (S/S) mixing during remediation as follows:

- A summary of field sampling program;
- A summary of the S/S mixing and testing program;
- A summary of any deviations from the Work Plan, as applicable;
- A summary of the test findings; and
- Conclusions and Recommendations for field implementation of dewatering and S/S programs.

## 1.1 Purpose and Scope

The scope of the treatability study was to evaluate potential sediment dewatering methods, and various dewatering/bulking reagents. The scope of work includes:

- Review results of previous analytical testing, geotechnical investigations and testing, and bathymetric mapping of designated soil removal areas to identify and group similar materials;
- Conduct geotechnical laboratory tests on sediment samples to assist with classification and estimate the engineering properties of the sediment;
- Evaluate the effectiveness of passive dewatering methods, such as gravity drainage and need for dewatering polymers;
- Evaluate the need for and quantity of various drying agents;
- Evaluate the need for and effectiveness of various solidification/stabilization reagents using the paint filter test method.

- Develop geotechnical engineering recommendations for dewatering and bulking of dredge sediments; and
- Prepare this summary of findings and recommendations report.

## 1.2 Treatability Study Objectives

The treatability study was conducted to evaluate the effectiveness of passive dewatering methods and need for drying or bulking agents for off-site disposal of dredge sediments.

### 1.2.1 Dewatering Test

Dewatering tests were conducted to evaluate the effectiveness of gravity drainage dewatering methods, and the need for dewatering polymers.  Two dewatering tests were conducted using sediments collected from four individual locations.  Dewatering test tube construction and test methods are further described in the following report Sections.

In addition to dewatering testing, analytical analysis of the effluent waters collected during the dewatering tests were conducted to evaluate water treatment requirements.

### 1.2.2 Solidification/Stabilization Test

Solidification/Stabilization tests were conducted to evaluate the type and quantity of drying reagent needed to transport the dewatered sediments to an off-site disposal facility.  Drying reagents considered for this test were; Portland cement, lime kiln dust, rock crusher dust, sawdust, wood chips, wood ash, and on-site soils.  Selection criteria are further described in the following report Sections.

# Section 2

# Sediment Classification and Treatability Study Methods

CDM Smith was onsite from June 15 to June 19, 2015 to receive sediment samples from Anchor QEA and conduct the dewatering test program. Field activities were conducted in general accordance with the Work Plan.

## 2.1 Sediment Sample Collection and Classification

### 2.1.1 Sediment Sample Collection

On June 15 and 16, 2015, Anchor QEA provided CDM Smith with sediment samples identified as SD-SC-07, SD-SC-08, SD-SC-09, and SD-SC-10; approximate sample locations are presented in Figure 3-2 from the Work Plan, and included in **Appendix A**. Anchor QEA field staff identified the sampling at each SD-SC location was conducted from a boat or barge using a Ponar grab sampler, and each SD-SC sample was collected from a depth range of 0 to 6-inches below mud line. Several grab samples were collected from each SD-SC location to obtain sufficient quantity to fill a 5-gallon bucket.

In addition to the four samples collected for the Treatability Study; Anchor QEA identified an additional location to be evaluated for potential dredging. Anchor QEA collected one sample from location SD-SC-21 on September 22, 2015. The sample was collected with the same methods as the previous samples; however, the sample depth range was from 0 to 0.5 feet below mud line. This sample was not utilized for the Treatability Study.

### 2.1.2 Field Classifications

Upon receipt of each SD-SC composite, the sediments in each bucket were thoroughly homogenized, sample classification and material descriptions recorded, and a sample collected in a sealed bag for later geotechnical index testing.

Field classifications identified two sediment types:

- Sediment SD-SC-07 and SD-SC-21 was classified as a coarse grained material; sand with silt and gravel; and
- Sediment samples SD-SC-08, SD-SC-09, and SD-SC-10 were classified as fine grained soils with moderate to high organic content; organic silt with sand.

Geotechnical index testing was conducted by the CDM Smith Geotechnical Laboratory in Somerville, MA to confirm field classifications on each sediment source and composite samples. Testing included grain size distribution, moisture content, Atterberg limits and organic content. Geotechnical test results are summarized in **Table 2-1**, and included in **Appendix B**.

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## Covidien-Orrington Remediation
## Orrington, Maine

### Table 2-1
### Summary of Geotechnical Lab Testing

| Sample | USCS Classification[1] | Moisture Content (%)[2] | Organic Content (%)[3] | Grain Size Analysis[4] | | | | | | | Atterberg Limits[5] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | % Gravel | | % Sand | | | % Fines | | | | |
| | | | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay | LL | PL | PI |
| **As-Received Sediments** | | | | | | | | | | | | | |
| SD-SC-07 | SP-SM | 25.1 | 3.8 | 0.0 | 26.1 | 18.3 | 20.9 | 24.9 | 7.2 | 2.6 | NP | NV | NP |
| SD-SC-08 | SM | 47.5 | 4.5 | 0.0 | 8.8 | 9.4 | 23.2 | 32.6 | 23.6 | 2.4 | NP | NV | NP |
| SD-SC-09 | ML | 220.4 | 21.8 | 0.0 | 0.0 | 0.3 | 2.4 | 13.5 | 65.4 | 18.4 | NP | NV | NP |
| SD-SC-10 | ML | 226.7 | 15.4 | 0.0 | 0.0 | 0.9 | 2.0 | 13.2 | 58.5 | 25.4 | NP | NV | NP |
| SD-SC-08, -09, -10 Composite | SW-SM | 136.6 | 11.4 | 0.0 | 7.0 | 6.4 | 16.0 | 25.0 | 36.4 | 9.2 | - | - | - |
| | | | | | | | | | | | | | |
| SD-SC-21 | SM | 34.0 | - | 0.0 | 23.1 | 17.9 | 28.6 | 18.3 | 11.5 | 0.6 | 46 | 36 | 10 |
| | | | | | | | | | | | | | |
| **Site Soils** | | | | | | | | | | | | | |
| TP-SMY-1 Fill | SM | 10.9 | 1.4 | 10.2 | 15.2 | 9.8 | 24.3 | 24.2 | 13.1 | 3.2 | NP | NV | NP |
| TP-SMY-2 Fill | SM | 14.6 | 2.3 | 6.9 | 13.3 | 7.5 | 14.8 | 22.4 | 28.4 | 6.7 | NP | NV | NP |
| Fill Composite | SM | 11.5 | 1.6 | 0.0 | 17.5 | 11.3 | 27.3 | 26.5 | 13.9 | 3.5 | NP | NV | NP |
| TP-SMY-1 Peat | PT | 166.2 | 43.5 | 0.0 | 27.2 | 25.3 | 19.7 | 11.1 | 13.9 | 2.8 | - | - | - |
| TP-SMY-2 Peat | PT | 204.4 | 45.8 | 0.0 | 11.3 | 12.6 | 21.7 | 22.2 | 25.5 | 6.7 | - | - | - |
| Peat Composite | PT | 220.9 | 49.5 | 0.0 | 13.2 | 23.0 | 25.4 | 16.9 | 17.5 | 4.0 | - | - | - |

**Notes:**

1: USCS classification was performed in accordance with ASTM D-2488.

2: Moisture content analysis was performed in accordance with ASTM D-2216.

3: Organic content analysis was performed in accordance with ASTM D-2974.

4: Grain size analysis was performed in accordance with ASTM D-422.

5: Atterberg limit tests were performed in accordance with ASTM D-4318.

**Abbreviations:**

NP - Non-Plastic

NV - Non-Viscous

- Test Not Conducted

## 2.2 Treatability Study

As identified in the Work Plan, the treatability study was conducted to evaluate passive dewatering methods and evaluate the need/quantity of dewatering polymer or drying agents.

CDM Smith proposed using a dewatering tube to evaluate the rate of dewatering of stockpiled sediments. The proposed dewatering test consists of placing sediment in a rigid vertical tube, and monitoring the quantity and rate of effluent collected during the test.

At the completion of the dewatering study, a solidification and stabilization study was conducted to evaluate the presence of free water remaining in the sediment after dewatering. Dewatered sediments were evaluated using the Paint Filter Test (PFT); various percentages of reagents were added to dewatered sediments to evaluate the minimum reagent required to pass the PFT.

### 2.2.1 Dewatering Tube Construction

CDM Smith constructed two dewatering tubes to simulate the dewatering of sediments by stockpiling. The tubes consisted of a 4 foot long, 6 inch diameter clear PVC pipe, a socket female to threaded male adapter was bolted on to the bottom of each tube. Holes were drilled in a 6 inch threaded cap to facilitate water flow, and was installed on the threaded male adapter of each tube. Near the top of the tube, two holes were drilled opposite each other to install a steel cable loop. The cable allowed the tubes to be suspend above the ground during testing.

Clear glass beads were placed into the bottom of the tube to a level just above the adapter. The beads were used as filler material to elevate the bottom of the soil column above the white adapter to allow for visual observations to be made during testing; in addition, the glass beads have a permeability much greater than the sediments, so water flow out of the sediment would not be restricted.

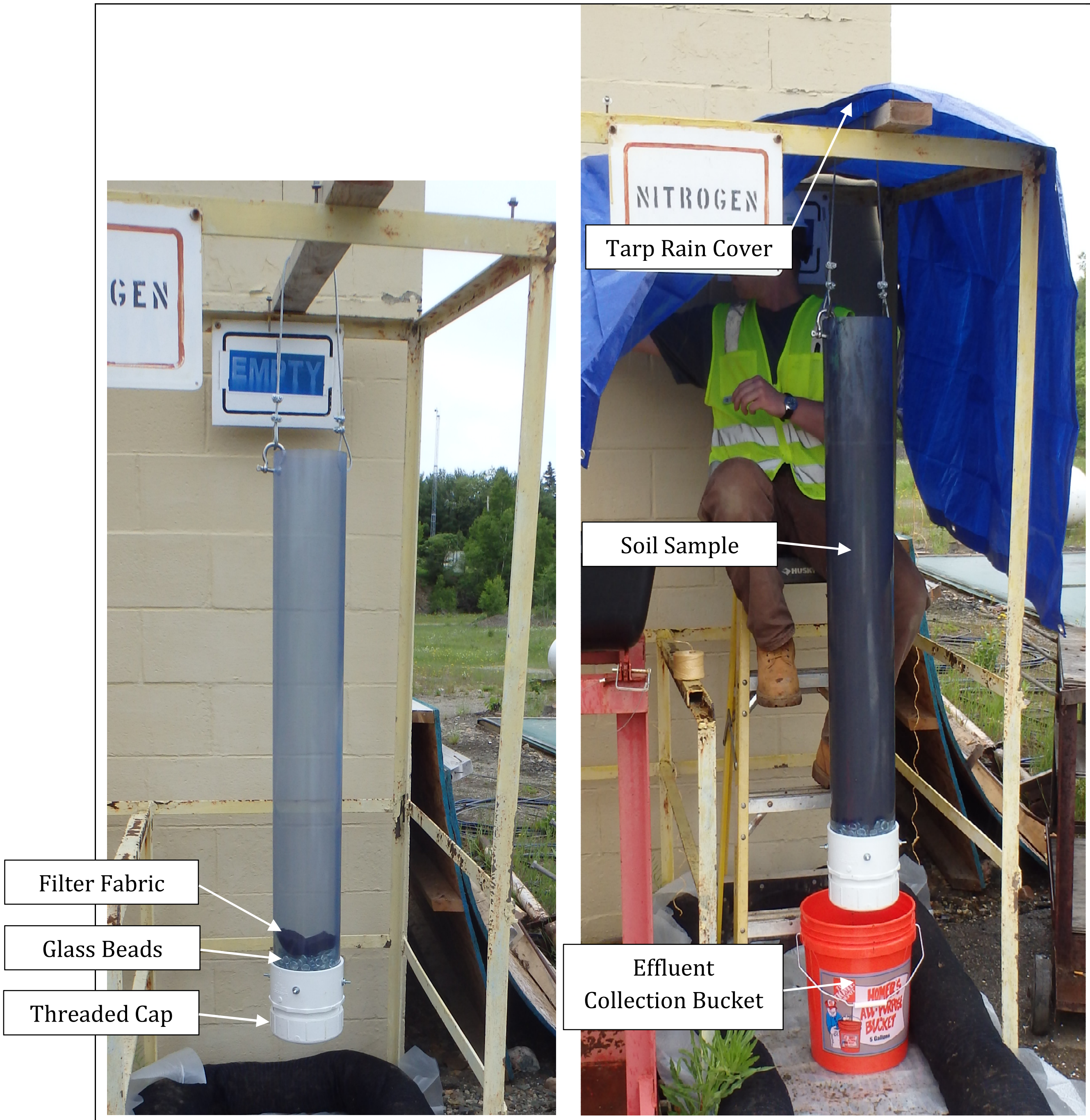
A nonwoven, needle-punched geotextile filter fabric was cut to size, and placed in the tube, on top of the beads, as a filter to separate the sediment sample from the glass beads. The filter fabric diameter was slightly larger than the inside diameter of the tube to minimize gaps between the filter fabric and tube wall.

Prior to filling each tube, the tubes were suspended approximately 2 feet above the ground from a steal frame present on site. A 5-gallon bucket was placed beneath the tube to collect effluent water draining from the bottom of the tube.

**Figure 2-1** illustrates the dewatering tube and various components prior to filling with sediment and during testing.

### 2.2.2 Paint Filter Test

The Paint Filter Liquids Test (EPA Method 9095B) method was used to evaluate the presence of free liquids in a representative sample of soil. This method was used to evaluate dewatering efforts and quantity of solidification/stabilization reagent required to removing free liquid from the sediment.



Dewatering Tube Prior to Start of Test

Dewatering Test in Progress

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**Figure 2-1**
**Dewatering Tube Setup**

The PFT is conducted by placing soil with various amounts of a solidification/stabilization reagent incorporated in a conical paint filter resting in a glass funnel. A 100 mL graduated cylinder is placed beneath the funnel to quantify free water escaping the soil sample. If any water from the test material collects in the graduated cylinder during a 5 minute interval, the material is deemed to contain free liquids and fails the test. If no water is present after the 5 minute interval, the material passes.

### 2.2.3 S/S Reagents

The Work Plan identified Portland cement, lime and site soils may be evaluated as drying reagents during the PFT. Prior to mobilization, CDM Smith conducted a review of locally available reagents; which included Portland cement, lime kiln dust (LKD), rock crusher dust, sawdust, wood chips, wood ash, and on-site soils.

Lime and LKD were found to not be readily available in the area, and rock crusher dust was a primarily coarse grained product with lower potential to absorb water than the other reagent options. Portland cement, sawdust, wood ash, wood shavings and on-site soils were selected as the reagents to be used for the S/S study.

On-site soils were collected from test pits within the Scrap Metal Yard; test pits and sampling were conducted by Geosyntec. Four samples were provided by Geosytnec; two samples were highly organic or peat material (TP-SMY-01-Peat and TP-SMY-02-Peat), the other two samples were granular materials (TP-SMY-01-Fill and TP-SMY-02-Fill). Geosyntec identified there was limited volume of peat material on site, so the two peat samples were composited for the PFT. Geosyntec estimated the available fill volume to range from 10,000-20,000 cubic yards; the fill soils were tested individually and as a composite. For both composite samples, they were mixed at a 1:1 ratio by total weight.

On-site soil index testing is summarized in Table 2-1.

# Section 3

# Treatability Studies and Laboratory Testing

## 3.1 Dewatering Study

### 3.1.1 Preparation of Sediments

From the field observations, CDM Smith identified samples SD-SC-08, -09, and -10 could be composited, as they had similar geotechnical index properties; including high fines content and high organic content. Sample SD-SC-07 was tested independently, as it had a low fines content and low organic content.

Approximately 69 pounds of SD-SC-07 sediment was placed in a large mixing tray to be prepared for dewatering. The material appeared to be at a moisture content less than what could be anticipated from mechanical dredging operations. Approximately 3.3 pounds of potable water were added to increase the moisture content to that which may be anticipated from mechanical dredging operations. The average moisture content of the dredge consistent sediment was 23.6 percent prior to placing it in the dewatering tube. Water was thoroughly mixed with the sediment using a garden hoe.

Approximately 20 pounds of each SD-SC-08, SD-SC-09 and SD-SC-10 sediments were placed in a mixing tray and composited. The material appeared to be at a moisture content less than what could be anticipated from mechanical dredging operations. Approximately 6.1 pounds of potable water were added to increase moisture content to that which may be anticipated from mechanical dredging operations. The average moisture content of the dredge consistent sediment composite prior to dewatering was 153.1 percent prior to placing it in the dewatering tube. Water was thoroughly mixed with the sediment using a garden hoe.

Sediment moisture contents are summarized in **Table 3-1**.

### 3.1.2 Dewatering Tests

Two dewatering tubes were used in the dewatering studies on site; one for SD-SC-07 sediments, and one for the SD-SC-08, -09, -10 Composite sediments. Both tubes were suspended from a steel frame structure present on-site; the dewatering tube setup is illustrated in Figure 2-1.

Initial sediment placement was conduct by placing small quantities of moisture conditioned sediment on the filter fabric to seat the fabric against the glass beads and the tube wall. During the initial placement of sediment, a small quantity (estimated to be less than 10 grams) of sediment passed by the filter fabric and were observed in the glass beads. Once the filter fabric was seated, the remaining moisture conditioned sediment was transferred from the respective mixing tray into the dewatering tube using a small bucket. The sediment was continuously mixed in the tray to keep the water and solids thoroughly homogenized during the transferring process.

The volume of effluent water was periodically measured and retained for future evaluations. As the soil column settled in the tube, the surface water was decanted from the top of each sample,

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## Table 3-1
## Summary of Sediment Moisture Contents

| Sediment Sample | Moisture Content (%)[(1)(2)] | | |
|---|---|---|---|
| | Minimum | Maximum | Average |
| SD-SC-07 (As Received) | 21.6 | 25.1 | 23.4 |
| SD-SC-07 Dredge Consistency[(3)] | - | - | 23.6 |
| SD-SC-07 Dewatered | - | - | 13.7 |
| | | | |
| SD-SC-08 (As Received) | - | - | 44.2 |
| SD-SC-09 (As Received) | 199.0 | 220.4 | 209.7 |
| SD-SC-10 (As Received) | 215.3 | 226.7 | 221.0 |
| SD-SC-08, -09, -10 Composite | 121.3 | 136.6 | 129.5 |
| SD-SC-08, -09, -10 Composite Dredge Consistency[(3)] | 126.6 | 173.5 | 153.1 |
| SD-SC-08, -09, -10 Composite Dewatered | 111.7 | 122.5 | 118.9 |

**Notes:**

1: Oven moisture content analysis was performed in accordance with ASTM D-2216.

2: Multiple moisture content analyses were performed for some samples; minimum, maximum, and average values are presented for those samples.  Where one moisture content test was conducted, the value is presented as the Average.

3: Water was added to soil to achieve a consistency similar to a dredged soil.

measured and retained; effluent and decanted surface water from a single tube were composited. The volume of decant water and effluent water collected during the tests are summarized in **Table 3-2**.

Each dewatering tube test was conducted for approximately 62 to 64 hours. At the completion of the dewatering tests, the tubes were removed from the supporting structure, and the contents were transferred to individual tubs. Observations of material consistency related to depth and particle distribution were noted, and photographs were collected of each sample. The dewatered sediment from a given tube were homogenized and a representative sample was collected for geotechnical testing. The remaining material was placed in 5 gallon bucket with air tight lids for paint filter testing.

A photo log of the sample preparation, filter fabric placement, dewatering tests, and test completion is presented in **Appendix C**.

Dewatering tubes, glass beads, mixing trays, and other tools were rinsed and decontaminated at the decontamination pad on-site.

## 3.2 S/S Study

S/S reagents were added to dewatered sediment samples in increments of 2.5, 5, 10, and 20 percent of the sediment total weight. Upon completion of thoroughly mixing the sediment and given dosage of reagent, the soil-reagent mix was allowed to hydrate for 15 minutes prior to conducting the PFT.

In addition to conducting the static paint filter test, the samples were tested “dynamically” as well; this variation simulated vibrations that may be induced during transportation. After samples passed the static paint filter test, the funnel was gently shaken to simulate transport of the material for disposal. For the dynamic test the same pass/fail criteria was used.

Results of the static and dynamic tests are summarized in **Table 3-3** and **Table 3-4**, respectively.

## 3.3 Effluent and Decant Water Analysis

Effluent and decant water volume collected from each tube was measured at each time interval and composited into one container for each tube; water from the SD-SC-07 test was not composited with water from the SD-SC-08-09-10 test. At the completion of on-site dewatering tests, the water samples were transferred to the CDM Smith Geotechnical Laboratory for additional testing; including, analytical testing and turbidity analysis.

Using a Hach 2100P Portable Turbidimeter, turbidity testing was conducted on each water sample from June 24, 2015 through September 1, 2015. Each water sample was stirred and appropriate volume of water placed in a jar and sealed. Samples were shaken immediately prior to conducting the first turbidity measurement, then left undisturbed for the duration of the test period. Turbidity was measured one to two times per work day for the duration of the test. Early turbidity readings of the SD-SC-07 effluent were not able to be obtained because the samples were too clouded to permit sufficient light to pass through them for the turbidity meter to register; maximum reading of the turbidimeter is 1,000 NTU.

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Orrington, Maine

## Table 3-2
## Summary of Effluent and Decant Water

| Date | Elapsed Time (hr) | Effluent Water (mL) | Decant Water (mL) | Rate of Dewatering (mL/hr) | Estimated Moisture Content (%)(1) |
|---|---|---|---|---|---|
| **SD-SC-07** | | | | | |
| Approximate Total Volume of Water in Sample at the Start of the Test (mL): | | 5284 | | | 23.6 |
| 6/16/2015 | 0 | Start of Test | | | |
| 6/16/2015 | 1 | 217.4 | | 217.4 | 22.1 |
| 6/16/2015 | 1.9 | | 754.2 | 838.0 | 18.8 |
| 6/17/2015 | 16.8 | 423.1 | | 28.4 | 16.9 |
| 6/17/2015 | 21.4 | 39.2 | | 8.5 | 16.8 |
| 6/18/2015 | 40.5 | 94.8 | | 5.0 | 16.3 |
| 6/18/2015 | 47.6 | 2.5 | | 0.4 | 16.3 |
| 6/19/2015 | 63.8 | 5.2 | | 0.3 | 16.3 |
| Total Effluent and Decant Volume (mL): | | 1536.4 | | | |
| | | | | | |
| **SD-SC-08, -09, -10 Composite** | | | | | |
| Approximate Total Volume of Water in Sample at the Start of the Test (mL): | | 13840 | | | 153.1 |
| 6/16/2015 | 0 | Start of Test | | | |
| 6/16/2015 | 0.5 | 73.8 | | 147.6 | 152.0 |
| 6/17/2015 | 15.3 | 259.7 | 1065.2 | 89.5 | 137.4 |
| 6/17/2015 | 20 | 36.2 | 319.7 | 75.7 | 133.5 |
| 6/17/2015 | 22 | | 59.7 | 29.9 | 132.8 |
| 6/18/2015 | 38.9 | 84.9 | 524 | 36.0 | 126.1 |
| 6/18/2015 | 43.2 | 0.5 | 50.9 | 12.0 | 125.5 |
| 6/19/2015 | 62.3 | 20.1 | 51.5 | 3.7 | 124.7 |
| Total Effluent and Decant Volume (mL): | | 2546.2 | | | |

Notes:
1: Estimated Moisture Content does not account for potential loss of water as a result of evaporation at the time of mixing, transfering the sample to the test tube, or during breakdown of the test tube.

# Holtrachem
# Covidien-Orrington Remediation
# Orrington, Maine

## Table 3-3
## Summary of Static Paint Filter Test Results

| Reagent | Reagent Dosage (%) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Sediment Composite SD-SC-07 | | | | | Sediment Composite SD-SC-08, -09, -10 | | | | |
| | 0 | 2.5 | 5 | 10 | 20 | 0 | 2.5 | 5 | 10 | 20 |
| Type II Portland Cement | P(1) | - | - | - | - | F | P | P | P | P |
| Sawdust | | - | - | - | - | | P | P | P | P |
| Wood Shavings | | - | - | - | - | | P | P | - | - |
| Wood Ash | | - | - | - | - | | P | P | P | - |
| TP-SMY-01 Fill | | P | P | - | - | | P | P | P | - |
| TP-SMY-02 Fill | | P | P | - | - | | P | P | P | - |
| TP-SMY-01 & TP-SMY-02 Fill | | P | P | - | - | | P | P | P | - |
| TP-SMY-01 & TP-SMY-02 | | P | P | - | - | | P | P | P | - |

**Notes:**

1: Paint filter test was performed in accordance with EPA Method 9095B.

**Abbreviations**

- Test Not Performed

P - Pass

F - Fail

## Holtrachem
## Covidien-Orrington Remediation
## Orrington, Maine

### Table 3-4
### Summary of Dynamic Paint Filter Tests

| Reagent | Reagent Dosage (%) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Sediment Composite SD-SC-07 | | | | | Sediment Composite SD-SC-08, -09, -10 | | | | |
| | 0 | 2.5 | 5 | 10 | 20 | 0 | 2.5 | 5 | 10 | 20 |
| Type II Portland Cement | P | - | - | - | - | F | P | P | P | P |
| Sawdust | | - | - | - | - | | F | P | P | P |
| Wood Shavings | | - | - | - | - | | P | P | - | - |
| Wood Ash | | - | - | - | - | | P | P | P | - |
| TP-SMY-01 Fill | | P | P | - | - | | P | P | P | - |
| TP-SMY-02 Fill | | P | P | - | - | | P | P | P | - |
| TP-SMY-01 & TP-SMY-02 Fill | | P | P | - | - | | F | P | P | - |
| TP-SMY-01 & TP-SMY-02 Peat | | P | P | - | - | | P | P | P | - |

**Notes:**

1: Paint filter test was performed in general accordance with EPA Method 9095B.

**Abbreviations**

- Test Not Performed

P - Pass

F - Fail

To assess the findings of the initial tests, an additional sample of SD-SC-07 effluent and a sample of 50% SD-SC-07 effluent and 50% tap water were tested from July 23 through September 1.

Water turbidity results are summarized in **Table 3-5** and **Figure 3-1**.

Analytical results are summarized in **Table 3-6**, and lab test results are included in **Appendix D**.

In addition to turbidity analysis, samples of the water were sent to Alpha Analytical to conduct testing for: Total RCRA8 Metals, Total Suspended Solids (TSS), pH, Total Dissolved Solids (TDS), Biochemical Oxygen Demand (BOD), and Total Organic Carbon (TOC). TSS analysis for sample SD-SC-07 was not conducted because there was not sufficient water volume.

## 3.4 Deviations from the Work Plan

The treatability study was conducted in general accordance with the Work Plan; deviations from the Work Plan were:

- In addition to conducting the Paint Filter Test in accordance with the EPA standard; a second (dynamic) variation of the test was conducted where the material was gently shaken to simulate transportation vibrations.
- Effluent water collected from SD-SC-07 sediment dewatering was not tested for TSS because there was not sufficient water volume to conduct all analytical tests.
- Anchor QEA submitted an additional sediment sample, from location SD-SC-21, to be evaluated as part of the Treatability Sample. The sample was submitted after the Treatability Study had been completed; therefore, the sample was evaluated based on the material gradation, moisture content and Atterberg limits.

Holtrachem
Covidien-Orrington Remediation
Orrington, Maine

## Table 3-5
## Summary of Dewatering Effluent Turbidity Readings

| Reading Date | Elapsed Time (hr) | Turbidity Reading (NTU)[1] | | Elapsed Time (hr) | Turbidity Reading (NTU) | |
|---|---|---|---|---|---|---|
| | | SD-SC-07 (Test 1) | SD-SC-08, -09, -10 Composite | | SD-SC-07 (Test 2)[2] | SD-SC-07 (50% Dilution)[3] |
| 6/24/2015 | 0 | >1000[4] | >1000 | | -[5] | - |
| 6/24/2015 | 3 | >1000 | 787 | | - | - |
| 6/24/2015 | 6 | >1000 | 668 | | - | - |
| 6/24/2015 | 7 | >1000 | 631 | | - | - |
| 6/25/2015 | 23 | >1000 | 462 | | - | - |
| 6/25/2015 | 30 | >1000 | 433 | | - | - |
| 6/26/2015 | 46 | >1000 | 386 | | - | - |
| 6/26/2015 | 54 | >1000 | 367 | | - | - |
| 6/29/2015 | 118 | >1000 | 257 | | - | - |
| 6/30/2015 | 143 | >1000 | 244 | | - | - |
| 6/30/2015 | 150 | >1000 | 242 | | - | - |
| 7/1/2015 | 168 | >1000 | 226 | | - | - |
| 7/2/2015 | 190 | >1000 | 219 | | - | - |
| 7/6/2015 | 287 | 429 | 176 | | - | - |
| 7/6/2015 | 294 | 409 | 174 | | - | - |
| 7/7/2015 | 310 | 376 | 167 | | - | - |
| 7/7/2015 | 319 | 362 | 166 | | - | - |
| 7/8/2015 | 335 | 346 | 164 | | - | - |
| 7/9/2015 | 359 | 327 | 159 | | - | - |
| 7/9/2015 | 366 | 321 | 156 | | - | - |
| 7/13/2015 | 454 | 280 | 132 | | - | - |
| 7/13/2015 | 463 | 277 | 135 | | - | - |
| 7/16/2015 | 526 | 260 | 118 | | - | - |
| 7/16/2015 | 534 | 257 | 118 | | - | - |
| 7/17/2015 | 550 | 252 | 116 | | - | - |
| 7/17/2015 | 557 | 247 | 115 | | - | - |
| 7/20/2015 | 626 | 228 | 104 | | - | - |
| 7/20/2015 | 630 | 226 | 104 | | - | - |
| 7/21/2015 | 646 | 226 | 101 | | - | - |
| 7/22/2015 | 670 | 228 | 99 | | - | - |
| 7/23/2015 | 696 | 225 | 97 | 0 | >1000 | >1000 |
| 7/27/2015 | 794 | 202 | 88 | 98 | 845 | 529 |
| 7/28/2015 | 814 | 200 | 85 | 119 | 664 | 450 |

## Table 3-5
## Summary of Dewatering Effluent Turbidity Readings

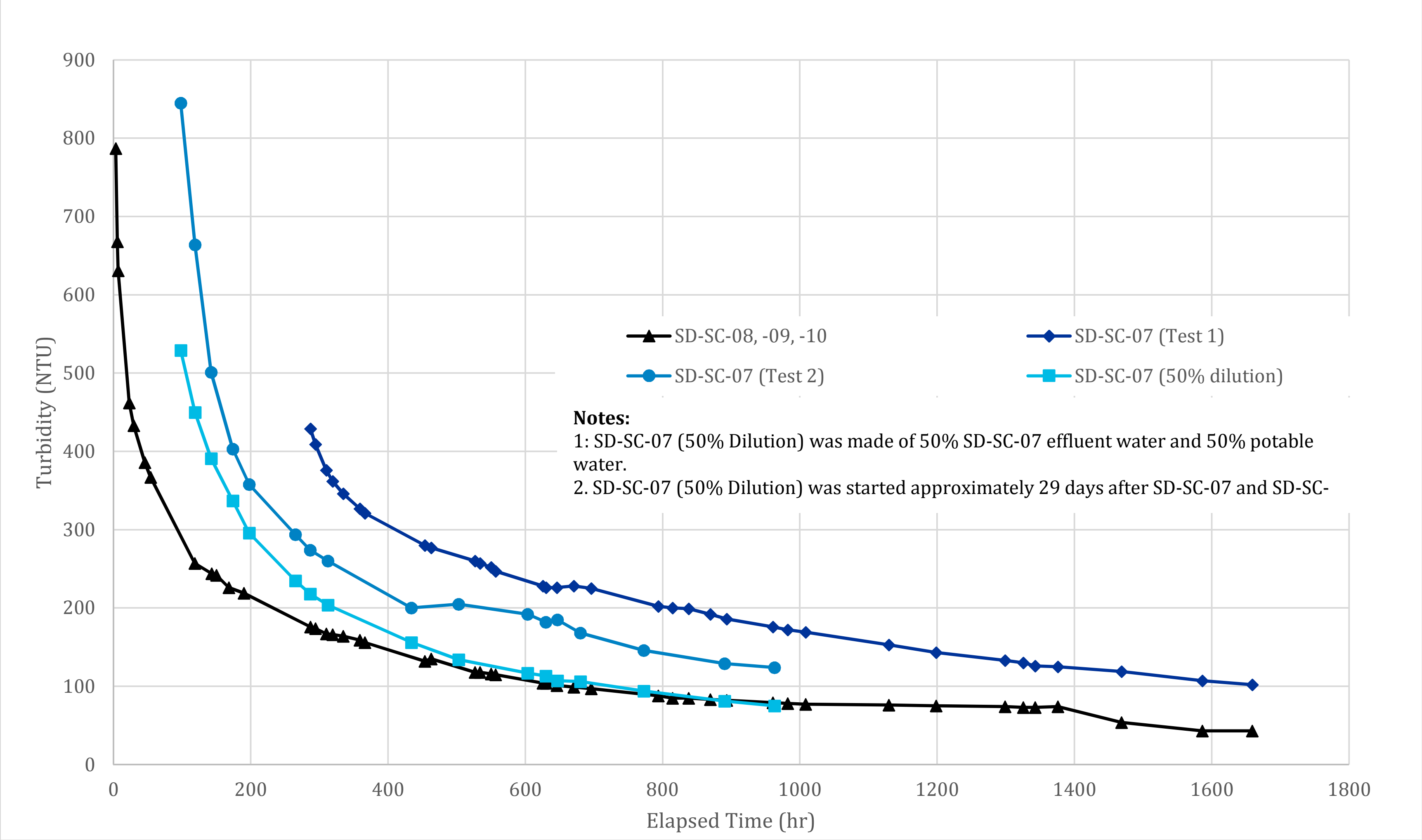
| Reading Date | Elapsed Time (hr) | Turbidity Reading (NTU)[1] | | Elapsed Time (hr) | Turbidity Reading (NTU) | |
|---|---|---|---|---|---|---|
| | | SD-SC-07 (Test 1) | SD-SC-08, -09, -10 Composite | | SD-SC-07 (Test 2)[2] | SD-SC-07 (50% Dilution)[3] |
| 7/29/2015 | 838 | 199 | 85 | 142 | 501 | 391 |
| 7/30/2015 | 870 | 192 | 83 | 174 | 403 | 337 |
| 7/31/2015 | 893 | 186 | 82 | 198 | 358 | 296 |
| 8/3/2015 | 961 | 176 | 79 | 265 | 294 | 235 |
| 8/4/2015 | 982 | 172 | 78 | 286 | 274 | 218 |
| 8/5/2015 | 1008 | 169 | 77 | 312 | 260 | 204 |
| 8/10/2015 | 1130 | 153 | 76 | 434 | 200 | 156 |
| 8/13/2015 | 1198 | 143 | 75 | 503 | 205 | 134 |
| 8/17/2015 | 1299 | 133 | 74 | 603 | 192 | 117 |
| 8/18/2015 | 1325 | 130 | 73 | 630 | 182 | 113 |
| 8/19/2015 | 1343 | 126 | 73 | 647 | 185 | 107 |
| 8/20/2015 | 1376 | 125 | 74 | 680 | 168 | 106 |
| 8/24/2015 | 1468 | 119 | 54 | 772 | 146 | 94 |
| 8/29/2015 | 1586 | 107 | 43 | 890 | 129 | 81 |
| 9/1/2015 | 1659 | 102 | 43 | 963 | 124 | 75 |

**Notes:**

1: Turbidity analysis was performed in accordance with ASTM D-7315.
2: SD-SC-07 (Test 2) was a second test performed using SD-SC-07 effluent.
3: SD-SC-07 (50% Dilution) was performed with 50%, by volume, SD-SC-07 effluent and 50% potable water.
4: Turbidity meter maximum reading is 1000 NTU.
5: SD-SC-07 (Test 2) and SD-SC-07 (50% Dilution) were started approximately 29 days after SD-SC-07 and SD-SC-08, -09, -10.

**Abbreviations:**

NTU - Nephelometric Turbidity Units
- Test Not Conducted



**Notes:**

1: SD-SC-07 (50% Dilution) was made of 50% SD-SC-07 effluent water and 50% potable water.

2. SD-SC-07 (50% Dilution) was started approximately 29 days after SD-SC-07 and SD-SC-

CDM Smith

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Orrington, Maine

**Figure 3-1**
**Dewatering Effluent Turbidity Readings**

## Table 3-6
## Summary of Effluent Analytical Results

| Parameter | Units | Contact Water Concentration Limits | Sample ID | |
|---|---|---|---|---|
| | | | SD-SC-07 | Composite SD-SC-08, -09, -10 |
| **Conventionals:** | | | | |
| Total Dissolved Solids | mg/L | | 630 | 690 |
| Total Suspended Solids | mg/L | 200 | - | 1500* |
| Biochemical Oxygen Demand (5 day) | mg/L | | 27 | <20(1) |
| Total Organic Carbon | mg/L | | 35 | 40 |
| pH | SU | 3.5-10.5 | 6.8 | 7.7 |
| | | | | |
| **Metals:** | | | | |
| Arsenic, Total | mg/L | | 0.0684 | 0.0394 |
| Barium, Total | mg/L | | 0.314 | 0.0621 |
| Cadmium, Total | mg/L | | 0.0069 | <0.005 |
| Chromium, Total | mg/L | | 0.500 | 0.086 |
| Lead, Total | mg/L | | 0.506 | 0.0574 |
| Mercury, Total | mg/L | 0.2 | 1.656* | 0.0042 |
| Selenium, Total | mg/L | | <0.01 | <0.01 |
| Silver, Total | mg/L | | <0.007 | <0.007 |

**Notes:**
1 : less than minimum detectable amount

**Abbreviations:**
mg/L : milligrams per liter
SU : standard unit
- : test not performed
*: results exceeding threshold

# Section 4

# Summary of Findings

## 4.1 Summary of Findings

The objective of the treatability study was to identify a dewatering method and solidification method that could be utilized during the sediment dredging process.

### 4.1.1 Sediment Classification

At the time of the dewatering study, four sediment samples (SD-SC-07, -08, -09, -10) were provide by Anchor QEA, those samples were described in Section 2. After the Treatability Study was completed, Anchor QEA submit an additional sediment sample, SD-SC-21, to be evaluated for dewatering. No dewatering or stabilization testing was conducted sample SD-SC-21; however, gradation and Atterberg limit testing was conducted, which identified:

- The gradation of sample SD-SC-21 is similar to SD-SC-07; both are coarse grained material with less than 12.5 percent fines.
- The fines plasticity of sample SD-SC-21 is greater than the plasticity of SD-SC-07; SD-SC-07 was Non Plastic, SD-SC-21 had a liquid limit and plasticity index of 46 and 10, respectively.

### 4.1.2 Dewatering Study

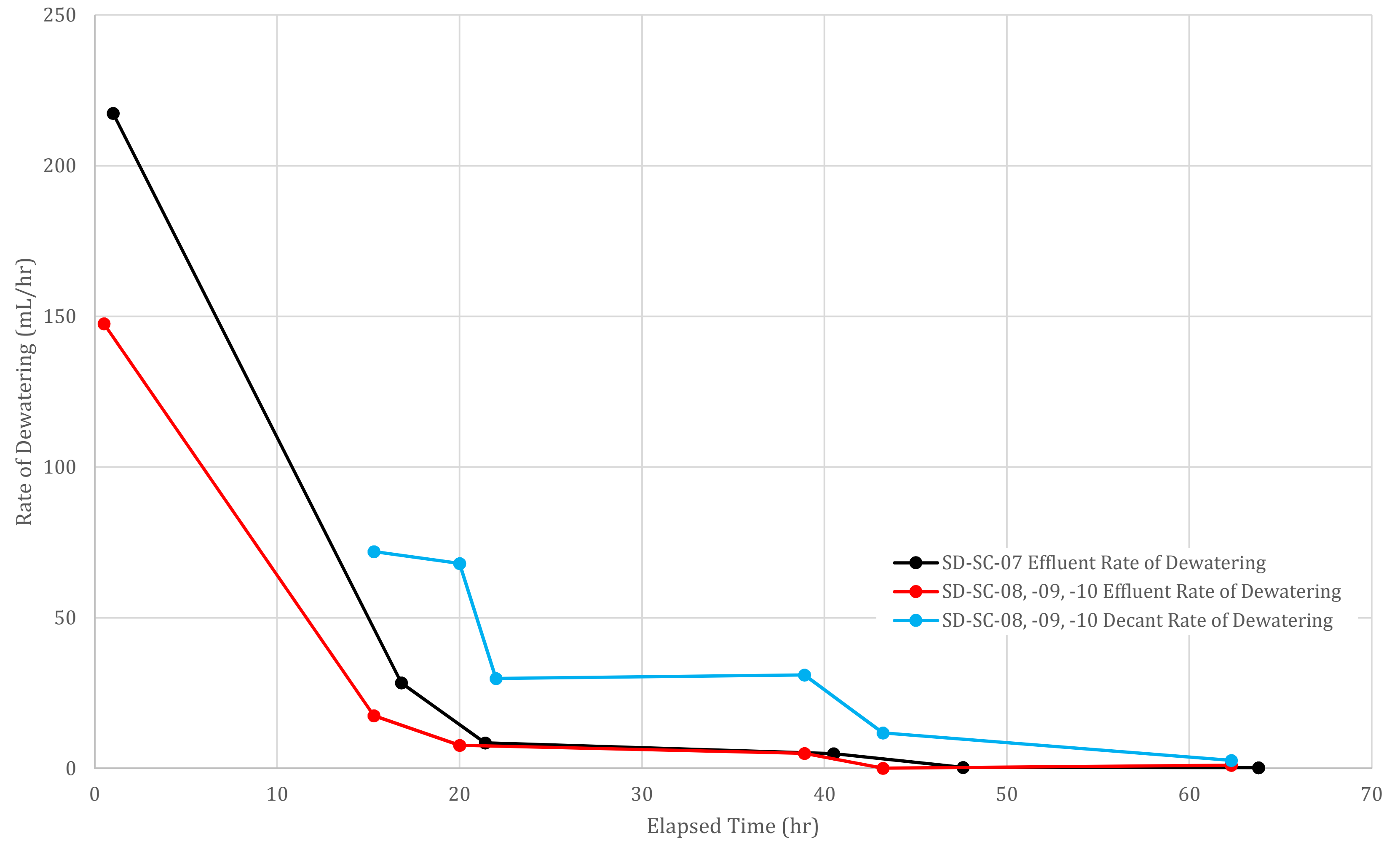
The dewatering study identified:

- The moisture content of the SD-SC-07 sediments were reduced from approximately 23.6 percent to 13.7 percent using passive dewatering methods.
- The moisture content of the SD-SC-08-09-10 sediments were reduced from approximately 153.1 percent to 118.9 percent using passive dewatering methods.
- The estimated rate of dewatering for each sediment sample is presented in **Figure 4-1**.

### 4.1.3 S/S Study

The S/S study identified:

- SD-SC-07 sediments passed the static and dynamic PFT at the end of the passive dewatering time period, with no reagents.
- SD-SC-08-09-10 Composite sediments failed the static and dynamic PFT at the end of the passive dewatering time period, with no reagents.
- SD-SC-08-09-10 Composite sediments passed the static and dynamic PFT with addition of 2.5 percent Portland cement, wood shavings, wood ash, TP-SMY-01-Fill and TP-SMY-02-Fill.



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Orrington, Maine

**Figure 4-1**
**Summary of Effluent and Decant Water**

- SD-SC-08-09-10 Composite sediments passed the static, however failed the dynamic PFT with the addition of 2.5 percent sawdust and Fill-01-02 Composite.
- SD-SC-08-09-10 Composite sediments passed the static and dynamic PFT with the addition of 5 percent of either reagent.

### 4.1.4 Effluent and Decant Water Testing

Results of the effluent and decant water testing identified:

- Test 1 turbidity readings of the SD-SC-07 exceeded the maximum reading capacity of the meter, which is 1,000NTU, for at least 287 hours.
- Test 1 turbidity readings of the SD-SC-07 water was greater than 200 NTU for approximately 814 hours (34 days.
- Test 2 turbidity readings of the SD-SC-07 exceeded the maximum reading capacity of the meter for at least 98 hours.
- Test 2 turbidity readings of the SD-SC-07 water was greater than 200 NTU for approximately 434 hours (18 days).
- Turbidity readings of the SD-SC-08-09-10 Composite exceeded the maximum reading capacity of the meter for 3 hours.
- Turbidity readings of the SD-SC-08-09-10 Composite was greater than 200 NTU for approximately 287 hours (12 days).
- TSS of SD-SC-08-09-10 Composite effluent water exceeded the CWCL of 200 mg/L, test result was 1,500 mg/L.
- Total Mercury of SD-SC-07 effluent water exceeded the CWCL of 0.2 mg/L, test result was 1.656 mg/L.

# Section 5

# Conclusions and Recommendations

## 5.1 Conclusions and Recommendations

Based on the findings of the treatability study, the following conclusions have been made:

- Both sediment materials can effectively be dewatered using passive dewatering methods, such as gravity drainage from stockpiling. Dewatering polymers are not necessary.

- On-site granular fill soils from the Scrap Metal Yard may be used to effectively bulk the dewatered sediments to pass the paint filter test prior to hauling sediments to an offsite disposal facility.

- Effluent water collected from the dewatering process may need to be treated to reduce the suspended solids prior to releasing the water to the on-site water treatment plant for treatment and disposal.

- Sediment sample SD-SC-21 has a gradation similar to that of SD-SC-07, and may dewater with similar characteristics as those observed during the dewatering test. However the plasticity of SD-SC-21 sample fines is greater than the plasticity of SD-SC-07;this may cause the material to dewater more slowly by gravity drainage.

- Plastic fines may "clog up" the filtering media more easily than the material with lower plasticity, increased plasticity may reduce the passive dewatering rate of stockpiled sediment.

The following recommendations have been made:

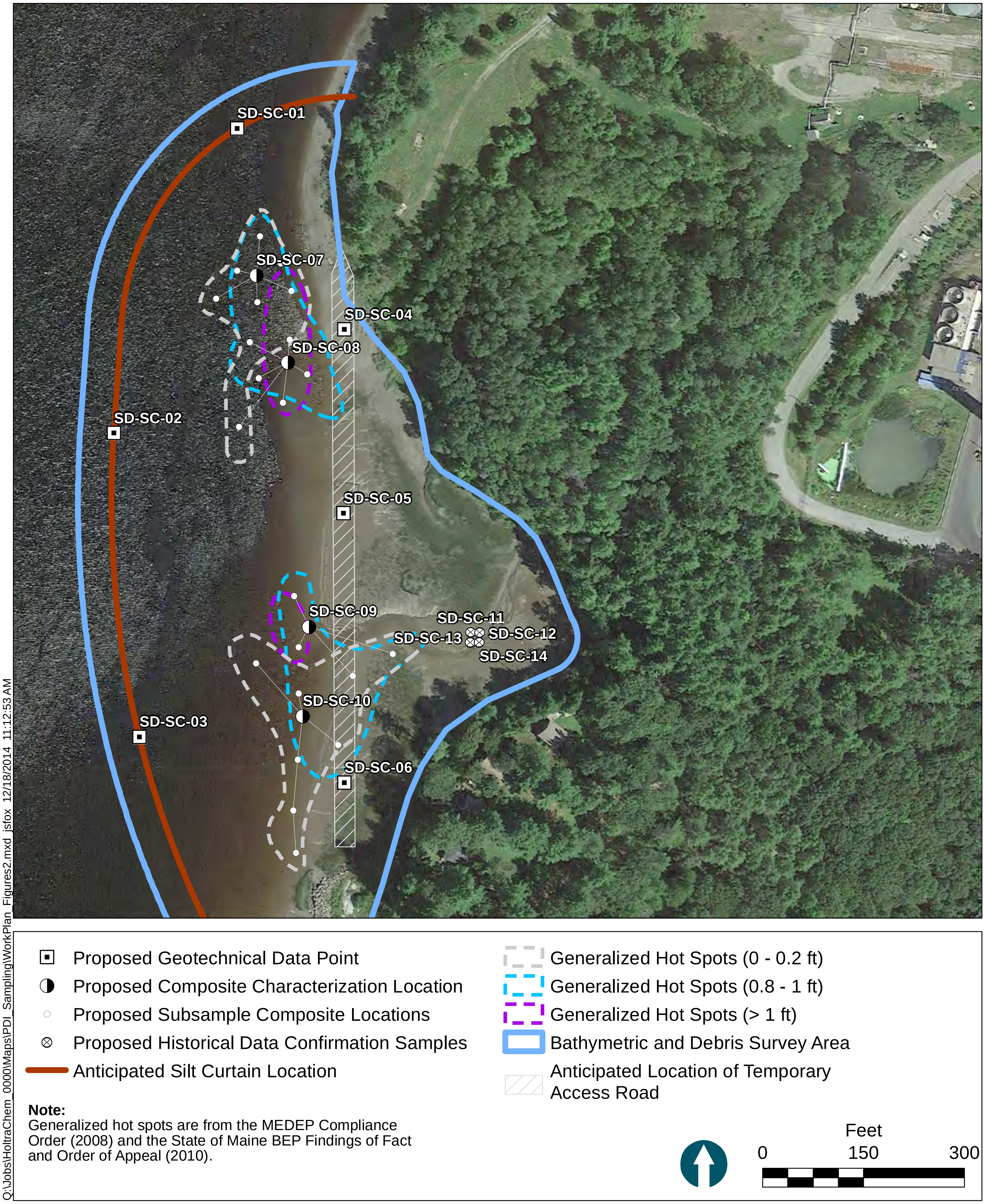
- Dredge sediments may be dewatered by constructing a bed of granular on-site fill soils, and placing dredge sediments directly on top. Water should pass through the fill soil bed before being collected and treated. This method will provide additional filtering of the dredge water runoff, reducing the suspended solids that may have to be treated.

- At the completion of dewatering the sediments on the granular fill soil bed, the fill soil and dewatered sediment could be mixed in place and further bulked as needed to pass the paint filter test.

- Water treatment plant influent requirements should be reviewed with plant operators to evaluate need for TSS reduction.

- Sediments representative of the sediment sample SD-SC-21 may be dewatered with the same methods as those represented by samples SD-SC-07, SC-SC-08, SD-SC-09, and SD-SC-10. However, dewatering rates may be slower and the more plastic fines may tend to clog the filter bed more easily depending on the actual volume of the sediments with these characteristics.

# Appendix A – Sediment Sampling Location Plan



**Note:**
Generalized hot spots are from the MEDEP Compliance Order (2008) and the State of Maine BEP Findings of Fact and Order of Appeal (2010).

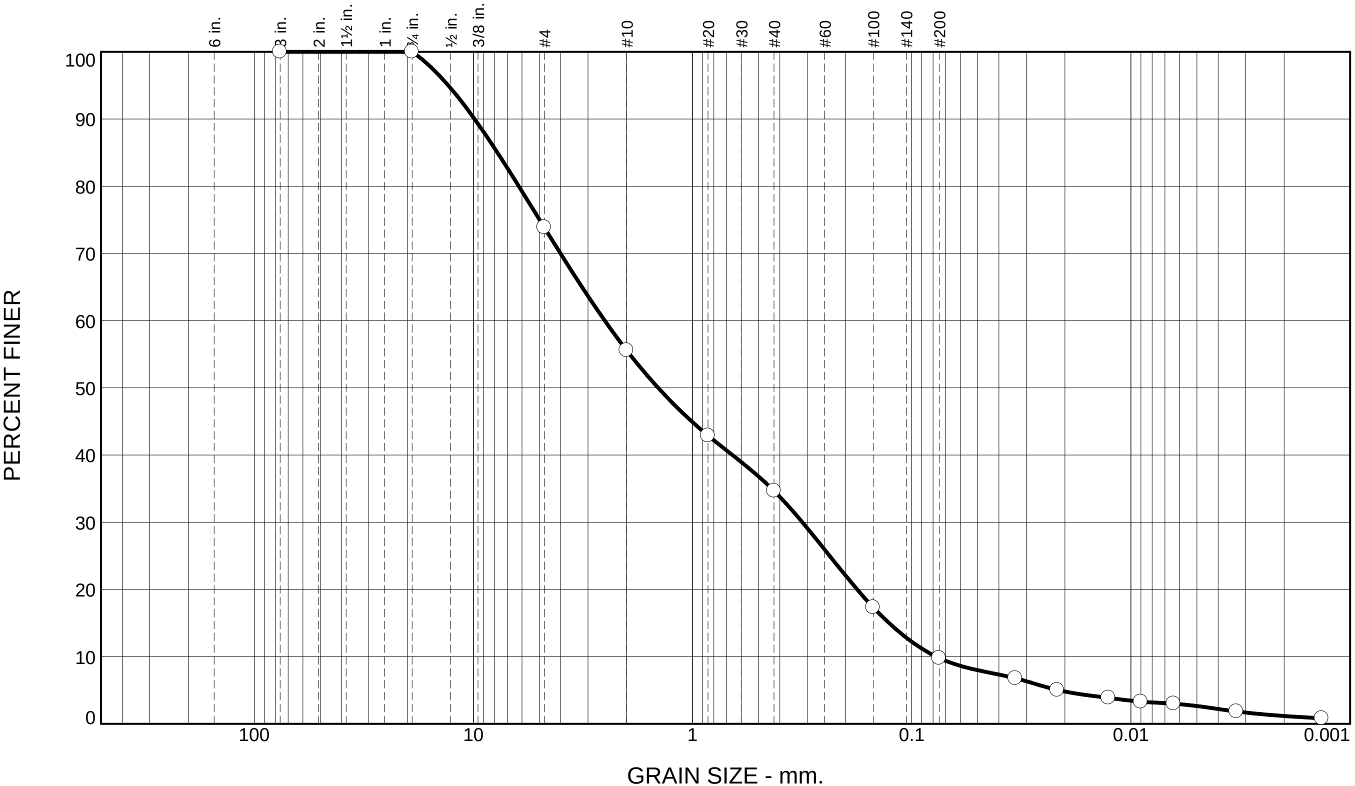
Q:\Jobs\HoltraChem_0000\Maps\PDI_SamplingWorkPlan_Figures2.mxd jsfox 12/18/2014 11:12:53 AM

**Figure 3-2**
Proposed Geotechnical and Sediment Characterization Sample Locations
Southern Cove

ANCHOR QEA

# Appendix B – Geotechnical Lab Testing

# Particle Size Distribution Report



| % +3" | % Gravel |  | % Sand |  |  | % Fines |  |
|---|---|---|---|---|---|---|---|
|  | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 26.1 | 18.3 | 20.9 | 24.9 | 7.2 | 2.6 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 |  |  |
| 3/4 | 100.0 |  |  |
| #4 | 73.9 |  |  |
| #10 | 55.6 |  |  |
| #20 | 42.9 |  |  |
| #40 | 34.7 |  |  |
| #100 | 17.3 |  |  |
| #200 | 9.8 |  |  |

* (no specification provided)

**Material Description**

Poorly graded sand with silt and gravel

**Atterberg Limits**

PL= NP LL= NV PI= NP

**Coefficients**

$D_{90}$= 9.8802 $D_{85}$= 7.7693 $D_{60}$= 2.5160

$D_{50}$= 1.4365 $D_{30}$= 0.3157 $D_{15}$= 0.1270

$D_{10}$= 0.0774 $C_u$= 32.49 $C_c$= 0.51

**Classification**

USCS= SP-SM AASHTO= A-1-b

**Remarks**

As received moisture content=25.1%

**Source of Sample:** SD-SC-07

**Date:** 6/16/15

**CDM Smith**

**Boston, Massachusetts**

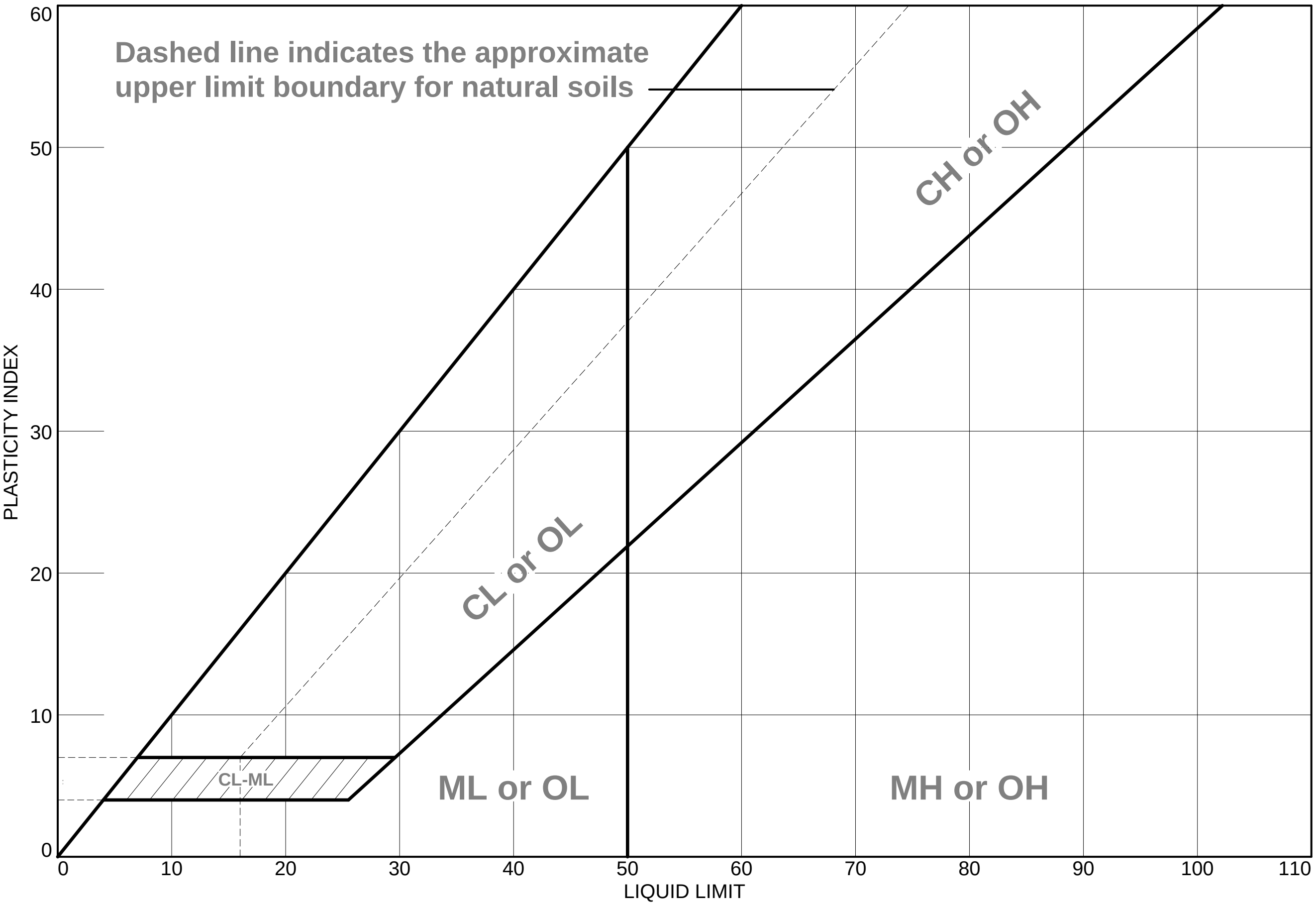
**Client:** Geosyntec

**Project:** Orrington Remediation Site

**Project No:** 5000.105855 **Figure**

**Tested By:** AW **Checked By:** JC

# LIQUID AND PLASTIC LIMITS TEST REPORT



| | MATERIAL DESCRIPTION | LL | PL | PI | %<#40 | %<#200 | USCS |
|---|---|---|---|---|---|---|---|
| ● | Poorly graded sand with silt and gravel | NV | NP | NP | 34.7 | 9.8 | SP-SM |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

**Project No.** 5000.105855 **Client:** Geosyntec

**Project:** Orrington Remediation Site

●**Source of Sample:** SD-SC-07

**CDM Smith**

**Boston, Massachusetts**

**Remarks:**

●As received moisture content=25.1%

**Figure**

**Tested By:** JC **Checked By:** BFM

# CDM Smith

**Geotechnical Engineering Laboratory**

## Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils(ASTM D2974)

Client: GeoSyntec

Project Name: Orrington Remediation Site

Project Location: Orrington, ME

Project Number: 5000-105855

Sample Number: SD-SC-07

Sample Location:

Sample Depth (ft):

Sample Date: 6/16/2015

Lab ID Number: 453075032

Tested By: JB

Test Date: 6/23/2015

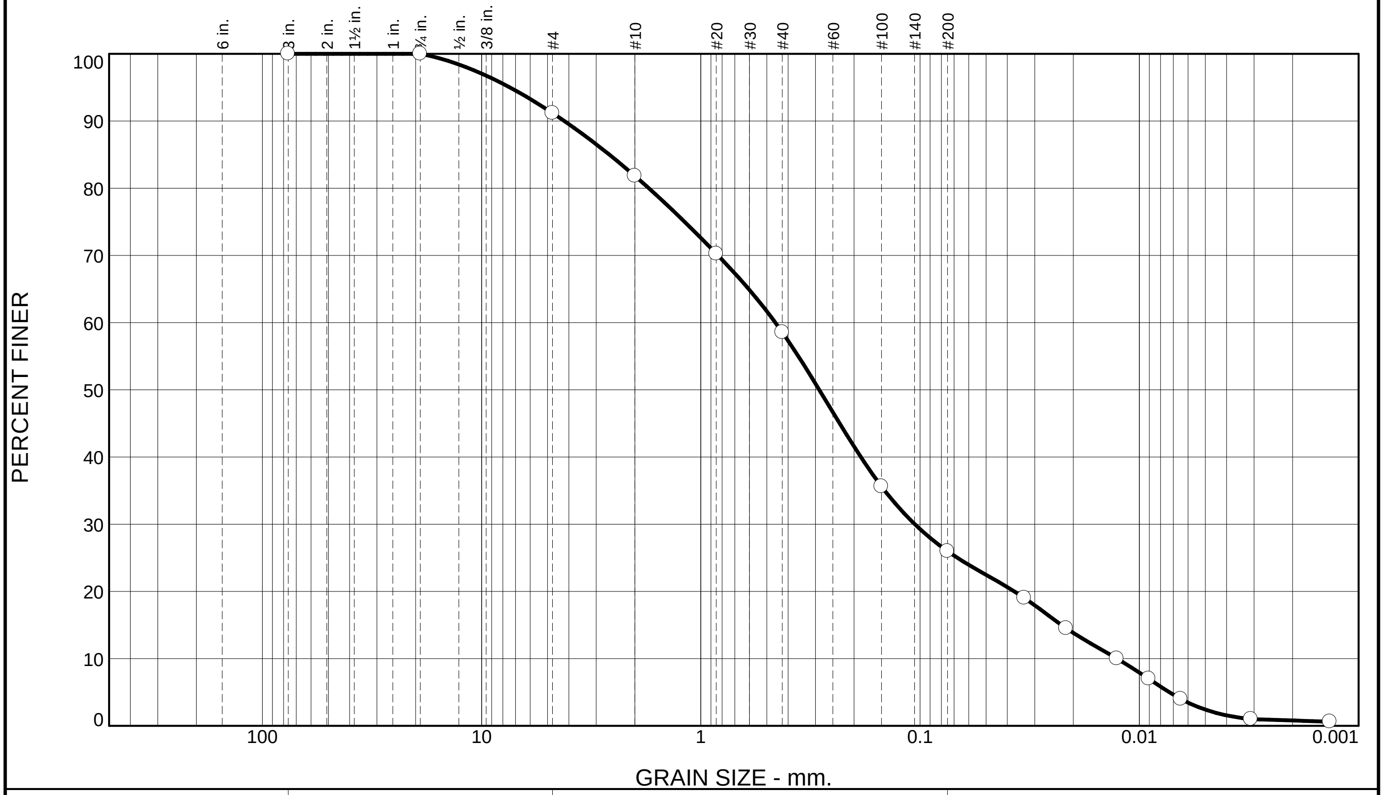
Procedure: C

Temperature: 440 $^0$C

| AS RECEIVED MOISTURE CONTENT | |
|---|---|
| Tin Mass (g) | 8.45 |
| Wet Mass of Sample & Tin (g) | 350.99 |
| Dry Mass of Sample & Tin (g) | 282.37 |
| Mass of Water (g) | 68.6 |
| Mass of Dry Soil (g) | 273.9 |
| Moisture Content (%) | 25.1 |

| ASH CONTENT | |
|---|---|
| Porcelain Dish Mass (g) | 18.5 |
| Porcelain Dish + Oven Dried Soil (g) | 50.5 |
| Mass of Oven Dried Soil (g) | 32.1 |
| Mass of Dish & Burned Soil (g) | 49.3 |
| Mass of Burned Soil (g) | 30.9 |
| Mass of Organic Material (g) | 1.2 |
| Ash Content (%) | 96.2 |
| | |
| Organic Content (%) | 3.8 |

# Particle Size Distribution Report



| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 8.8 | 9.4 | 23.2 | 32.6 | 23.6 | 2.4 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 91.2 | | |
| #10 | 81.8 | | |
| #20 | 70.2 | | |
| #40 | 58.6 | | |
| #100 | 35.6 | | |
| #200 | 26.0 | | |

* (no specification provided)

### Material Description

Silty sand

### Atterberg Limits

PL= NP LL= NV PI= NP

### Coefficients

$D_{90}$= 4.1965 $D_{85}$= 2.6166 $D_{60}$= 0.4571

$D_{50}$= 0.2885 $D_{30}$= 0.1057 $D_{15}$= 0.0226

$D_{10}$= 0.0126 $C_u$= 36.14 $C_c$= 1.93

### Classification

USCS= SM AASHTO= A-2-4(0)

### Remarks

As received moisture content=47.5%
Fines classification and description based on
Visual Manual Procedure ASTM D2488

**Source of Sample:** SD-SC-08

**Date:** 6/23/15

## CDM Smith

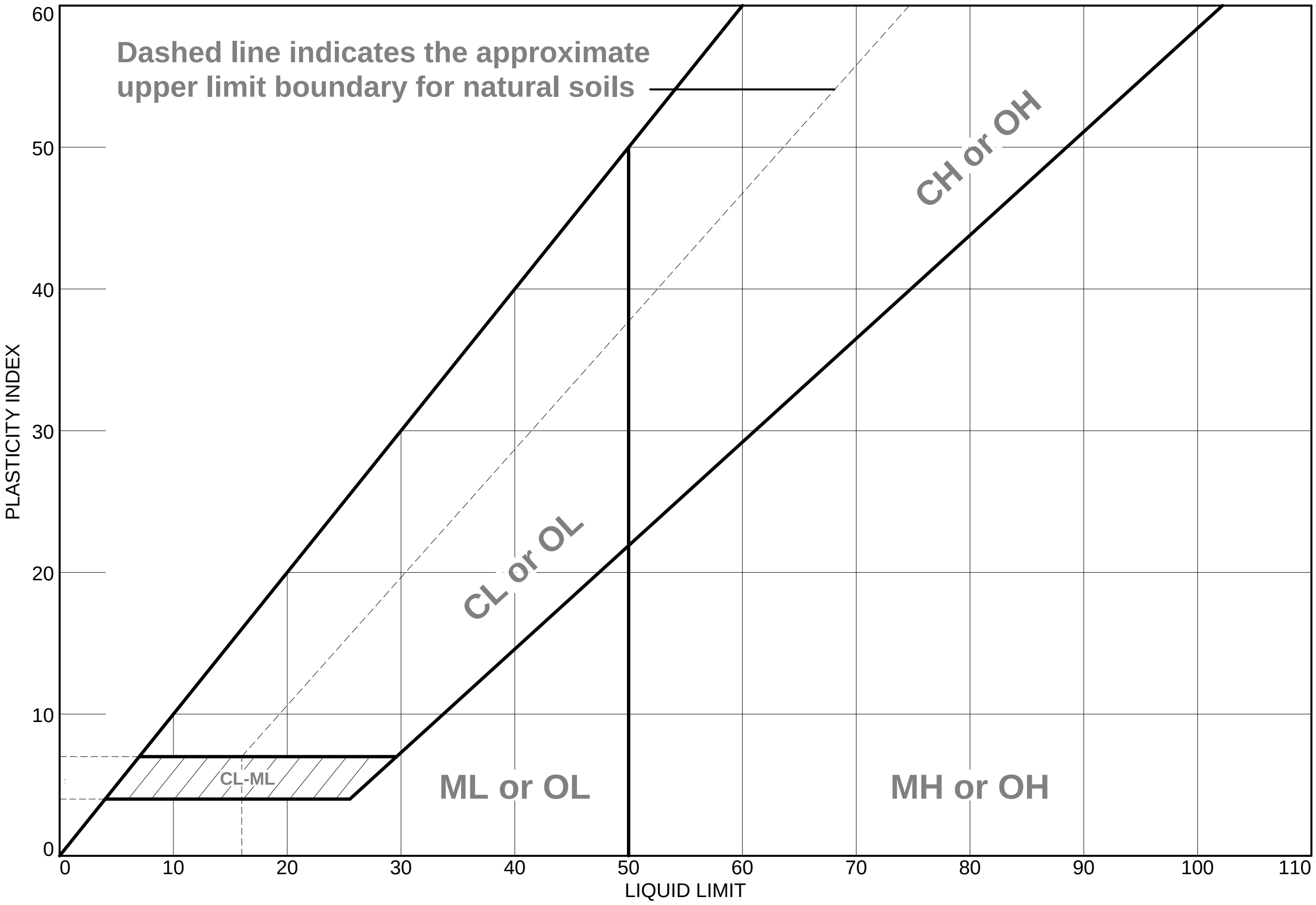
## Boston, Massachusetts

**Client:** Anchor QEA
**Project:** Orrington Remediation Site. Orrington, ME

**Project No:** 5000-105855 **Figure**

**Tested By:** JB **Checked By:** JC

# LIQUID AND PLASTIC LIMITS TEST REPORT



| | MATERIAL DESCRIPTION | LL | PL | PI | %<#40 | %<#200 | USCS |
|---|---|---|---|---|---|---|---|
| ● | Silty sand | NV | NP | NP | 58.6 | 26.0 | SM |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

**Project No.** 5000-105855 **Client:** Anchor QEA

**Project:** Orrington Remediation Site. Orrington, ME

●**Source of Sample:** SD-SC-08

**Remarks:**

●As received moisture content=47.5%

**CDM Smith**

**Boston, Massachusetts**

**Figure**

**Tested By:** JC **Checked By:** BFM

# CDM Smith

## Geotechnical Engineering Laboratory

### Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils(ASTM D2974)

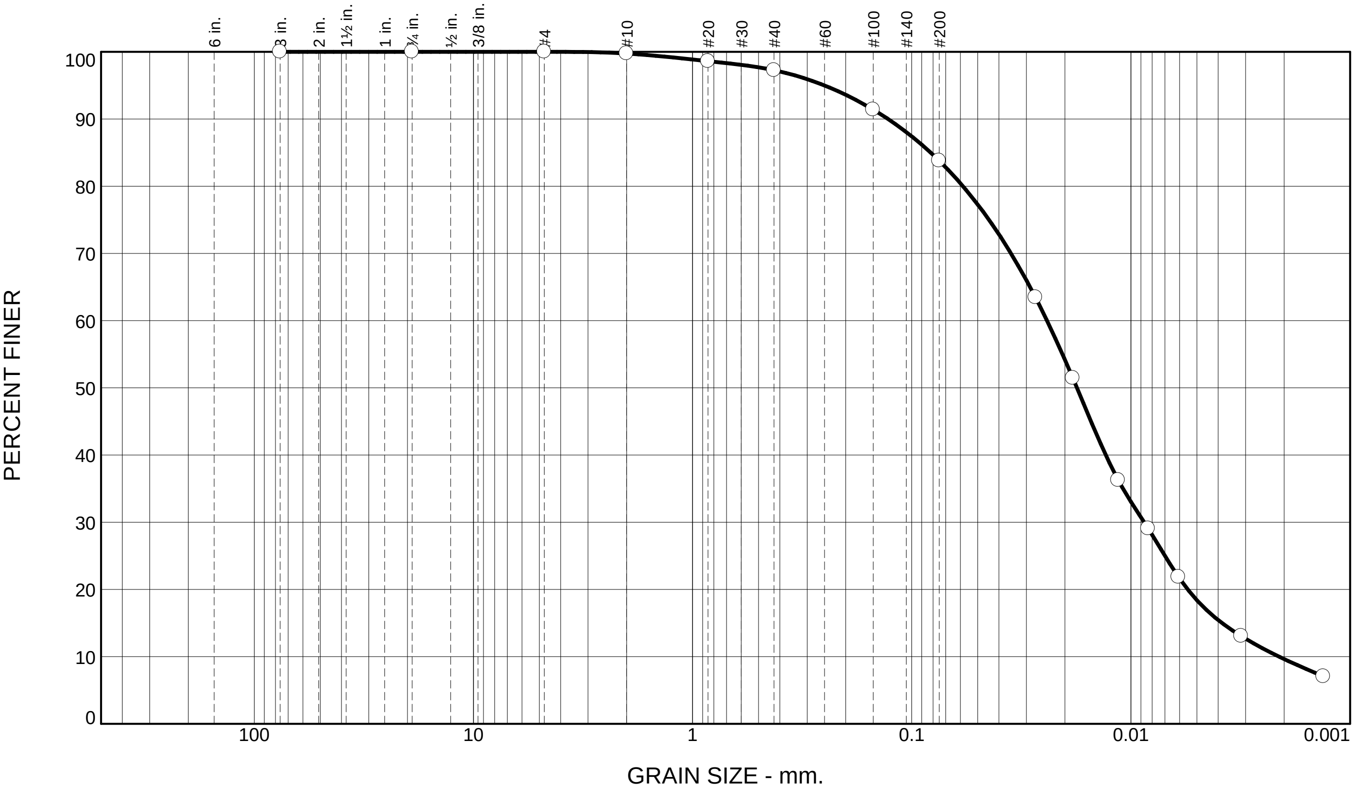
Client: GeoSyntec
Project Name: Orrington Remediation Site
Project Location: Orrington, ME
Project Number: 5000-105855
Sample Number: SD-SC-08
Sample Location:
Sample Depth (ft):
Sample Date: 6/16/2015
Lab ID Number: 453075033

Tested By: JB
Test Date: 6/23/2015
Procedure: C
Temperature: 440 $^0$C

| AS RECEIVED MOISTURE CONTENT | |
|---|---|
| Tin Mass (g) | 1.46 |
| Wet Mass of Sample & Tin (g) | 10.45 |
| Dry Mass of Sample & Tin (g) | 7.69 |
| Mass of Water (g) | 2.8 |
| Mass of Dry Soil (g) | 6.2 |
| Moisture Content (%) | 44.2 |

| ASH CONTENT | |
|---|---|
| Porcelain Dish Mass (g) | 18.5 |
| Porcelain Dish + Oven Dried Soil (g) | 24.8 |
| Mass of Oven Dried Soil (g) | 6.3 |
| Mass of Dish & Burned Soil (g) | 24.5 |
| Mass of Burned Soil (g) | 6.0 |
| Mass of Organic Material (g) | 0.3 |
| Ash Content (%) | 95.5 |
| | |
| Organic Content (%) | 4.5 |

# Particle Size Distribution Report



| % +3" | % Gravel |  | % Sand |  |  | % Fines |  |
|---|---|---|---|---|---|---|---|
|  | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 0.0 | 0.3 | 2.4 | 13.5 | 65.4 | 18.4 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 |  |  |
| 3/4 | 100.0 |  |  |
| #4 | 100.0 |  |  |
| #10 | 99.7 |  |  |
| #20 | 98.6 |  |  |
| #40 | 97.3 |  |  |
| #100 | 91.4 |  |  |
| #200 | 83.8 |  |  |

* (no specification provided)

### Material Description

Silt with sand

### Atterberg Limits

PL= NP LL= NV PI= NP

### Coefficients

$D_{90}$= 0.1284 $D_{85}$= 0.0820 $D_{60}$= 0.0242
$D_{50}$= 0.0176 $D_{30}$= 0.0087 $D_{15}$= 0.0038
$D_{10}$= 0.0021 $C_u$= 11.45 $C_c$= 1.49

### Classification

USCS= ML AASHTO= A-4(0)

### Remarks

As received moisture content=220.4%

**Source of Sample:** SD-SC-09

**Date:** 6/16/15

## CDM Smith

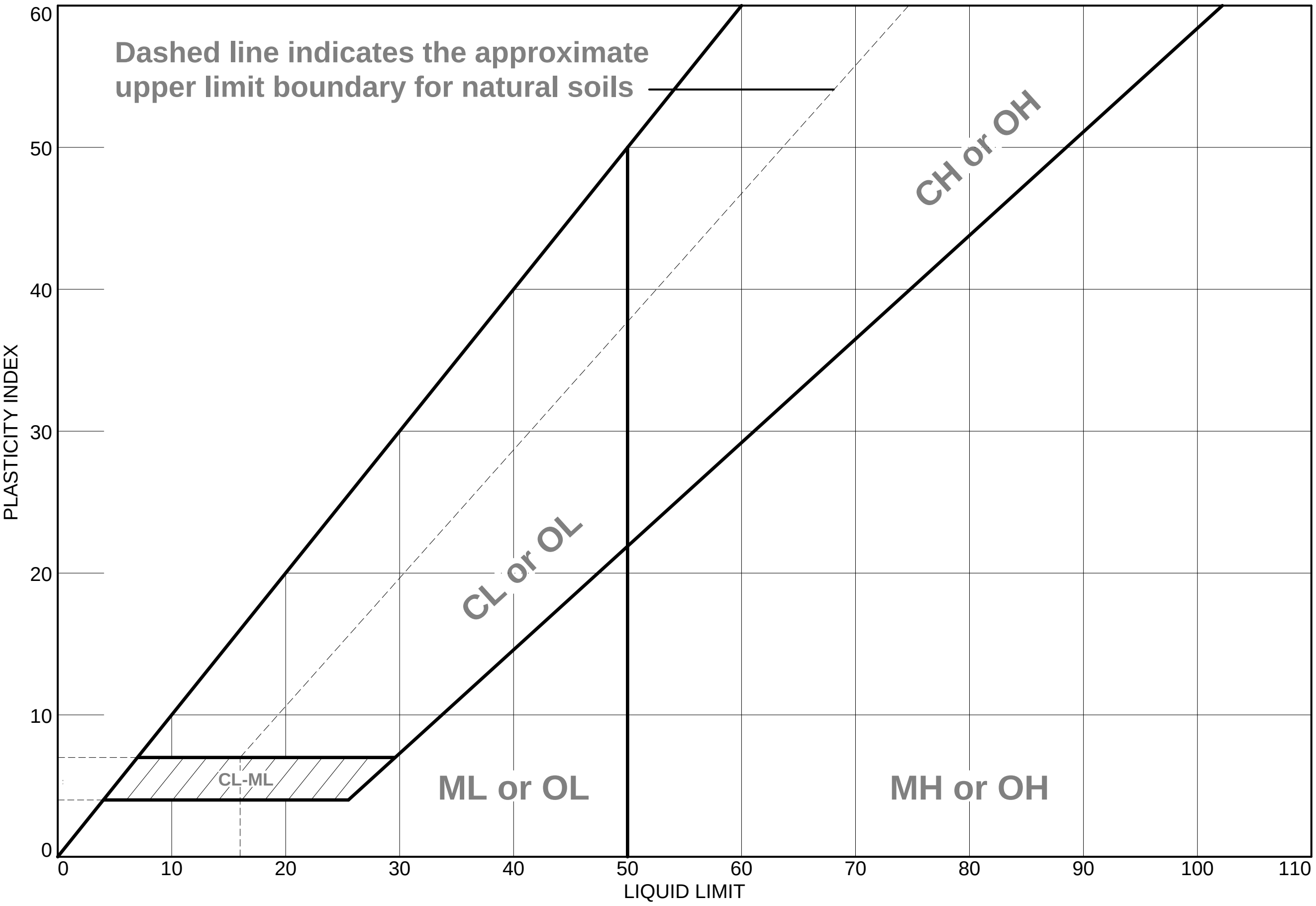
## Boston, Massachusetts

**Client:** Geosyntec
**Project:** Orrington Remediation Site

**Project No:** 5000.105855 **Figure**

**Tested By:** AW **Checked By:** JC

# LIQUID AND PLASTIC LIMITS TEST REPORT



| | MATERIAL DESCRIPTION | LL | PL | PI | %<#40 | %<#200 | USCS |
|---|---|---|---|---|---|---|---|
| ● | Silt with sand | NV | NP | NP | 97.3 | 83.8 | ML |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

**Project No.** 5000.105855 **Client:** Geosyntec

**Project:** Orrington Remediation Site

●**Source of Sample:** SD-SC-09

**Remarks:**

●As received moisture content=
220.4%

**CDM Smith**

**Boston, Massachusetts**

**Figure**

**Tested By:** JC **Checked By:** BFM

# CDM Smith

## Geotechnical Engineering Laboratory

### Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils(ASTM D2974)

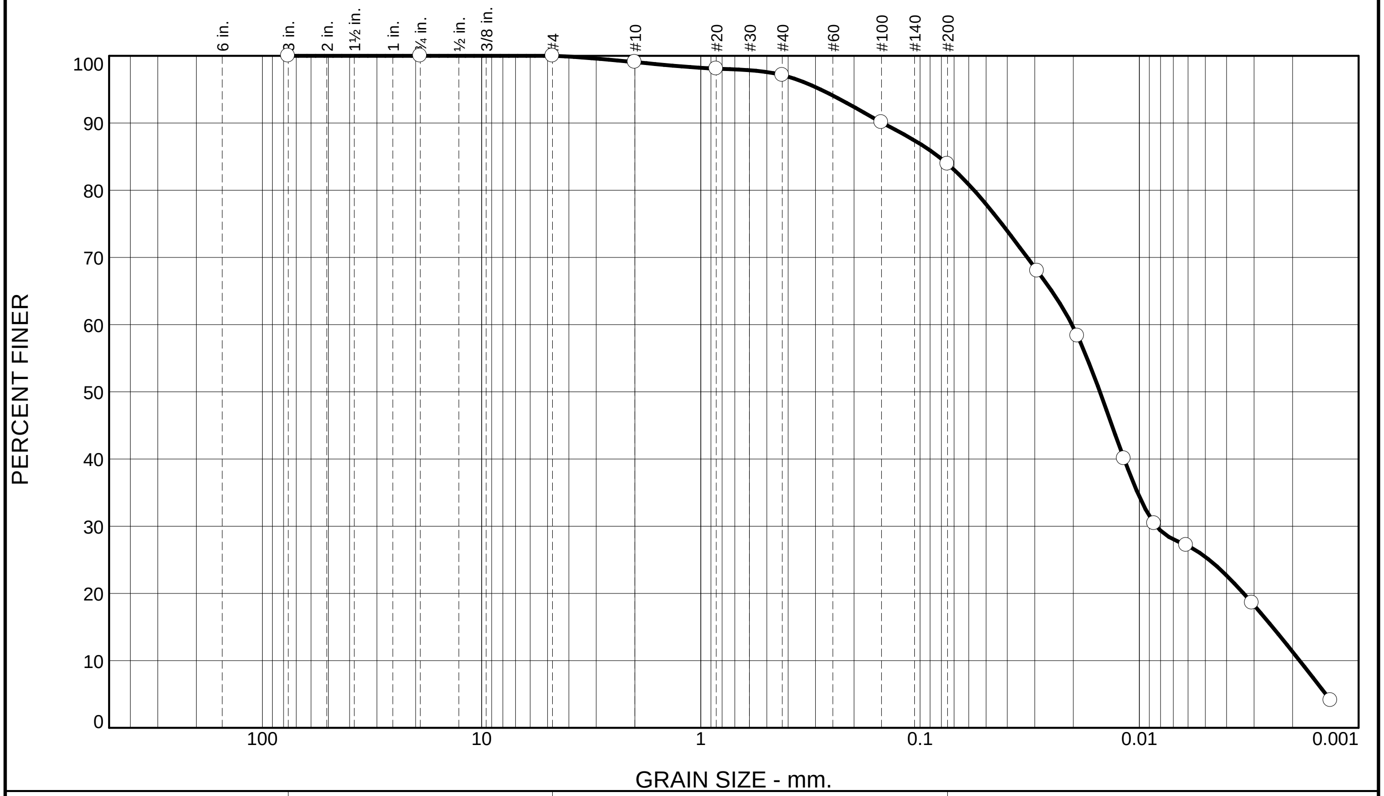
Client: GeoSyntec
Project Name: Orrington Remediation Site
Project Location: Orrington, ME
Project Number: 5000-105855
Sample Number: SD-SC-09
Sample Location:
Sample Depth (ft):
Sample Date: 6/16/2015
Lab ID Number: 453075034

Tested By: JB
Test Date: 6/23/2015
Procedure: C
Temperature: 440 $^0$C

| AS RECEIVED MOISTURE CONTENT | |
|---|---|
| Tin Mass (g) | 1.42 |
| Wet Mass of Sample & Tin (g) | 27.21 |
| Dry Mass of Sample & Tin (g) | 9.47 |
| Mass of Water (g) | 17.7 |
| Mass of Dry Soil (g) | 8.1 |
| Moisture Content (%) | 220.4 |

| ASH CONTENT | |
|---|---|
| Porcelain Dish Mass (g) | 97.4 |
| Porcelain Dish + Oven Dried Soil (g) | 99.8 |
| Mass of Oven Dried Soil (g) | 2.4 |
| Mass of Dish & Burned Soil (g) | 99.3 |
| Mass of Burned Soil (g) | 1.9 |
| Mass of Organic Material (g) | 0.5 |
| Ash Content (%) | 78.2 |
| | |
| Organic Content (%) | 21.8 |

# Particle Size Distribution Report



| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 0.0 | 0.9 | 2.0 | 13.2 | 58.5 | 25.4 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 100.0 | | |
| #10 | 99.1 | | |
| #20 | 98.1 | | |
| #40 | 97.1 | | |
| #100 | 90.1 | | |
| #200 | 83.9 | | |

* (no specification provided)

**Material Description**

Silt with sand

**Atterberg Limits**

| | | |
|---|---|---|
| PL= NP | LL= NV | PI= NP |

**Coefficients**

| | | |
|---|---|---|
| $D_{90}$= 0.1480 | $D_{85}$= 0.0824 | $D_{60}$= 0.0203 |
| $D_{50}$= 0.0151 | $D_{30}$= 0.0084 | $D_{15}$= 0.0025 |
| $D_{10}$= 0.0019 | $C_u$= 10.92 | $C_c$= 1.85 |

**Classification**

USCS= ML AASHTO= A-4(0)

**Remarks**

As received moisture content=226.7%

**Source of Sample:** SD-SC-10

**Date:** 6/16/15

**CDM Smith**

**Boston, Massachusetts**

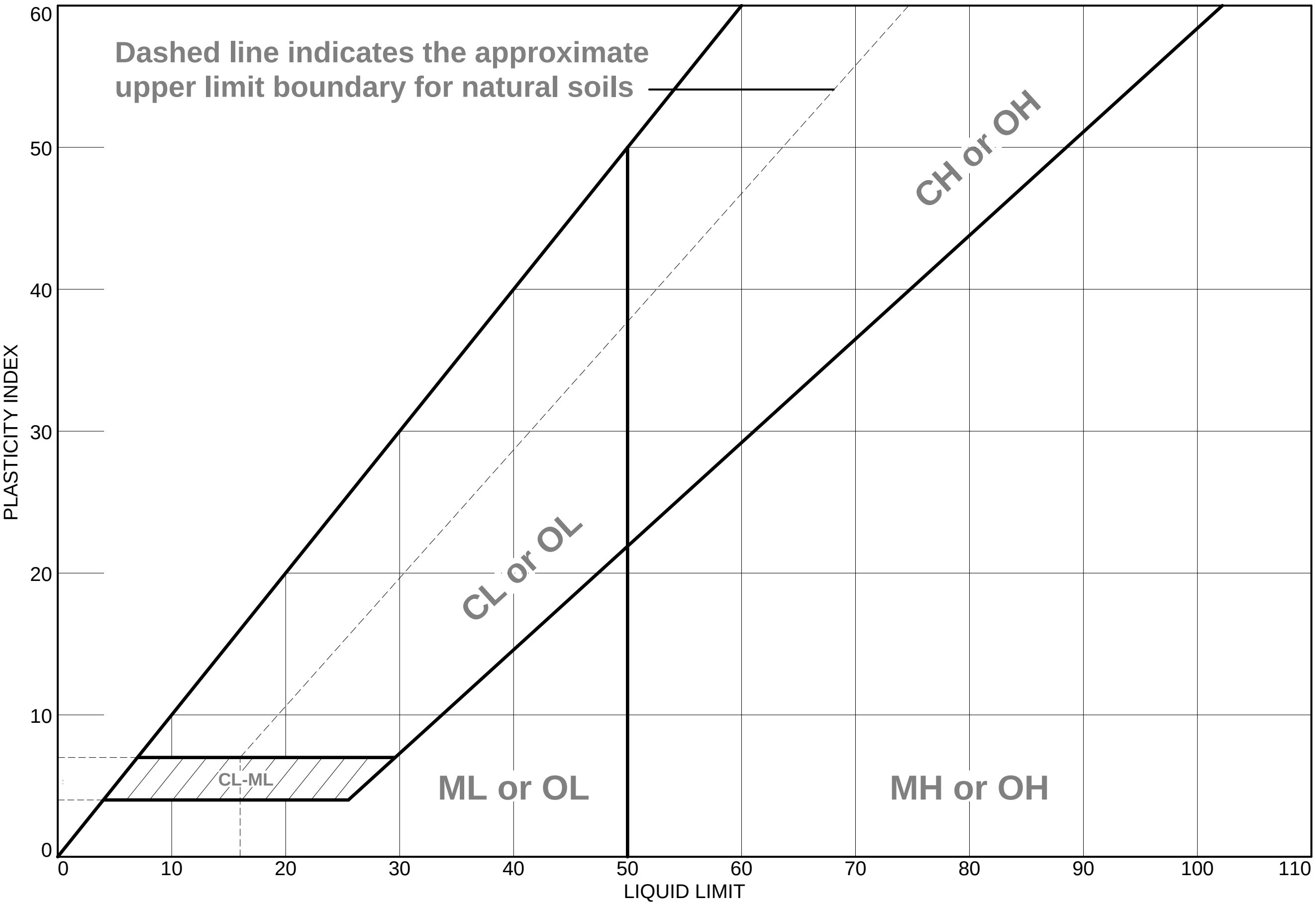
**Client:** Geosyntec

**Project:** Orrington Remediation Site

**Project No:** 5000.105855 **Figure**

**Tested By:** AW **Checked By:** JC

# LIQUID AND PLASTIC LIMITS TEST REPORT



| | MATERIAL DESCRIPTION | LL | PL | PI | %<#40 | %<#200 | USCS |
|---|---|---|---|---|---|---|---|
| ● | Silt with sand | NV | NP | NP | 97.1 | 83.9 | ML |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

**Project No.** 5000.105855 **Client:** Geosyntec

**Project:** Orrington Remediation Site

●**Source of Sample:** SD-SC-10

**Remarks:**

●As received moisture content= 226.7%

**CDM Smith**

**Boston, Massachusetts**

**Figure**

**Tested By:** JC **Checked By:** BFM

# CDM Smith

## Geotechnical Engineering Laboratory

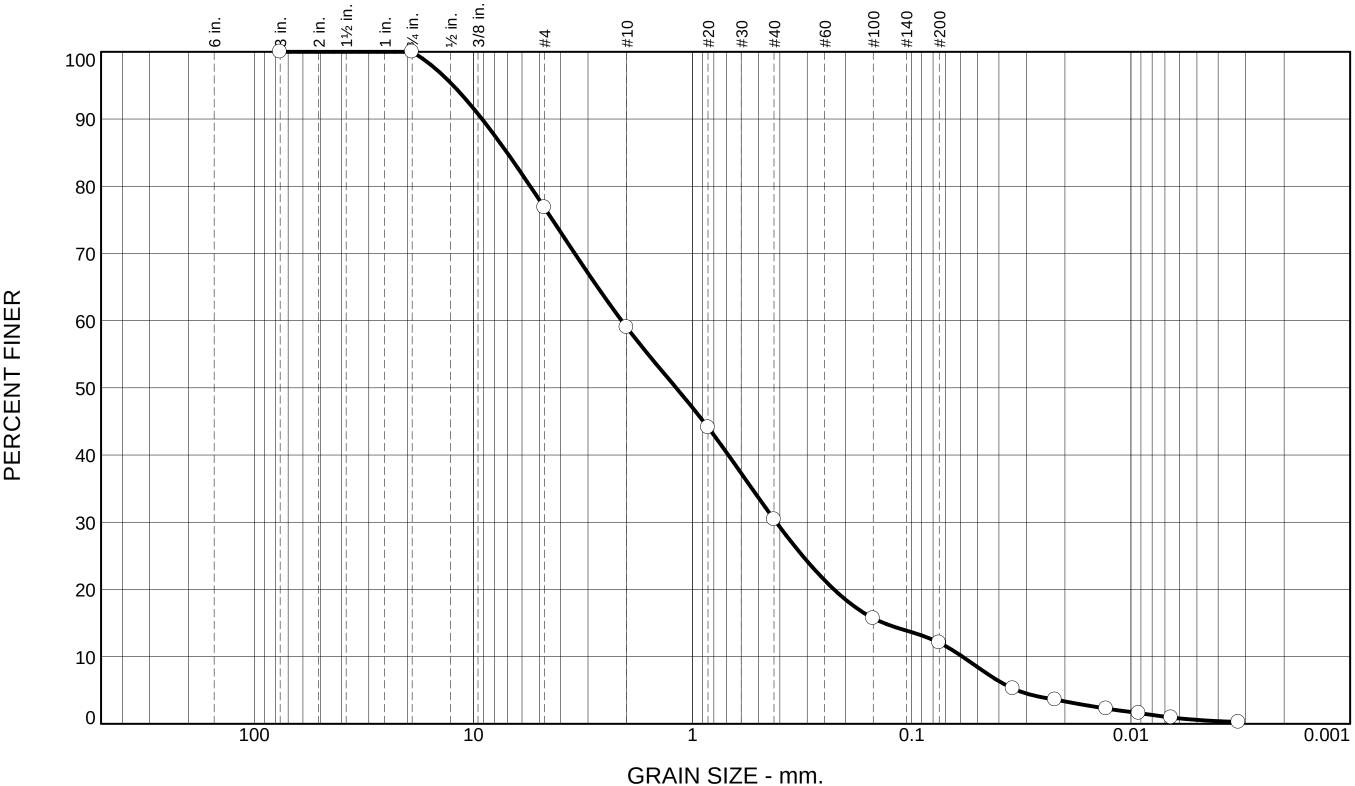
### Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils(ASTM D2974)

| | | | |
|---|---|---|---|
| Client: | GeoSyntec | | |
| Project Name: | Orrington Remediation Site | Tested By: | JB |
| Project Location: | Orrington, ME | Test Date: | 6/23/2015 |
| Project Number: | 5000-105855 | | |
| Sample Number: | SD-SC-10 | Procedure: | C |
| Sample Location: | | Temperature: | 440 $^0$C |
| Sample Depth (ft): | | | |
| Sample Date: | 6/16/2015 | | |
| Lab ID Number: | 453075035 | | |

| AS RECEIVED MOISTURE CONTENT | |
|---|---|
| Tin Mass (g) | 97.54 |
| Wet Mass of Sample & Tin (g) | 154.32 |
| Dry Mass of Sample & Tin (g) | 114.92 |
| Mass of Water (g) | 39.4 |
| Mass of Dry Soil (g) | 17.4 |
| Moisture Content (%) | 226.7 |

| ASH CONTENT | |
|---|---|
| Porcelain Dish Mass (g) | 97.5 |
| Porcelain Dish + Oven Dried Soil (g) | 114.9 |
| Mass of Oven Dried Soil (g) | 17.4 |
| Mass of Dish & Burned Soil (g) | 112.2 |
| Mass of Burned Soil (g) | 14.7 |
| Mass of Organic Material (g) | 2.7 |
| Ash Content (%) | 84.6 |
| | |
| Organic Content (%) | 15.4 |

# Particle Size Distribution Report



| % +3" | % Gravel |  | % Sand |  |  | % Fines |  |
|---|---|---|---|---|---|---|---|
|  | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 23.1 | 17.9 | 28.6 | 18.3 | 11.5 | 0.6 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 |  |  |
| 3/4 | 100.0 |  |  |
| #4 | 76.9 |  |  |
| #10 | 59.0 |  |  |
| #20 | 44.1 |  |  |
| #40 | 30.4 |  |  |
| #100 | 15.7 |  |  |
| #200 | 12.1 |  |  |

* (no specification provided)

**Material Description**

Silty sand with gravel

**Atterberg Limits**

PL= 36 LL= 46 PI= 10

**Coefficients**

$D_{90}$= 9.1363 $D_{85}$= 7.0261 $D_{60}$= 2.1083
$D_{50}$= 1.1885 $D_{30}$= 0.4155 $D_{15}$= 0.1342
$D_{10}$= 0.0587 $C_u$= 35.90 $C_c$= 1.39

**Classification**

USCS= SM AASHTO= A-2-5(0)

**Remarks**

As received moisture content=34.0%

**Source of Sample:** SD-SC-21-150922-0-0.5 **Depth:** 0-0.5

**Date:** 9/22/15

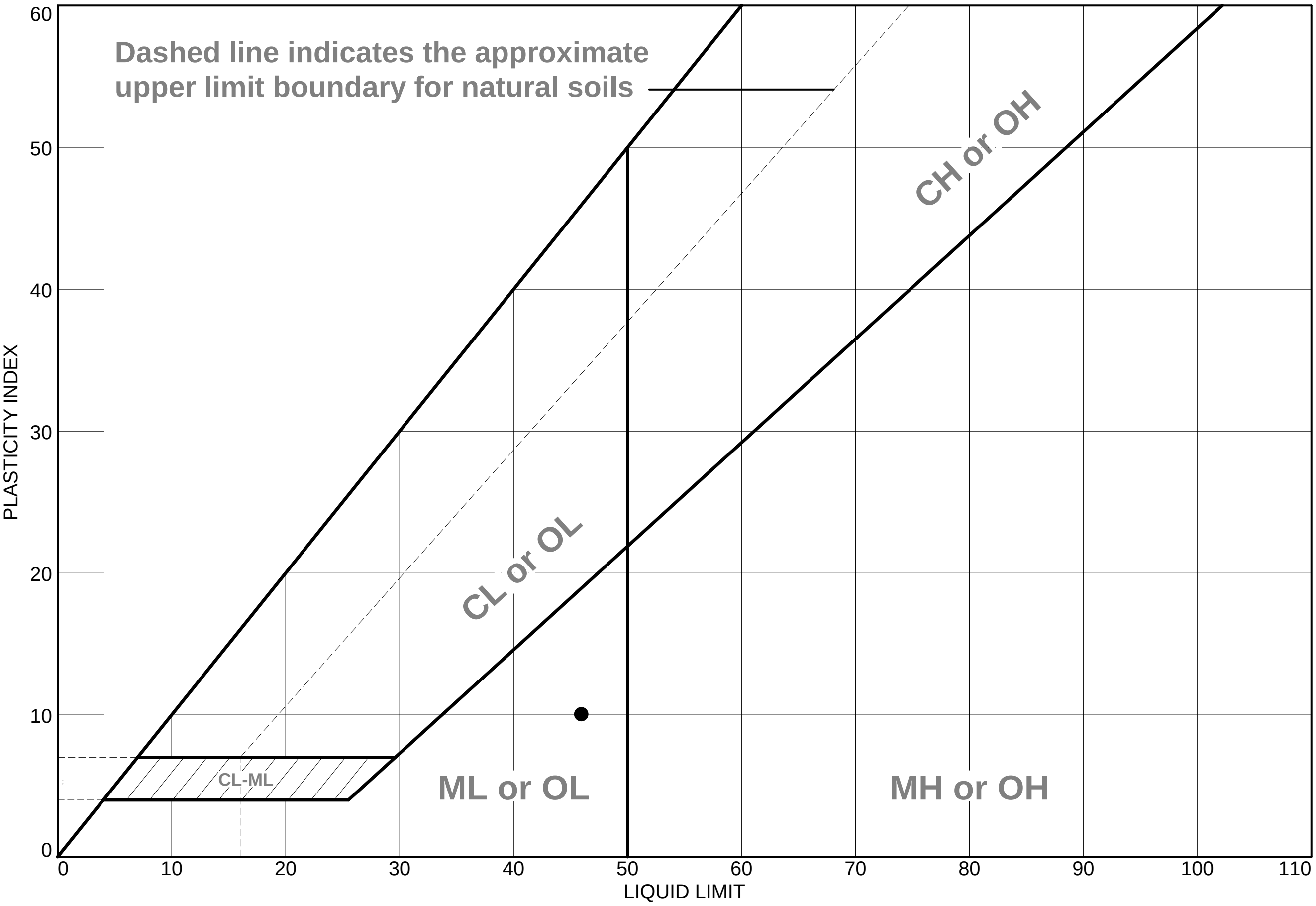
**CDM Smith**

**Boston, Massachusetts**

**Client:** Geosyntec
**Project:** Orrington Remediation Site. Orrington, ME
**Project No:** 5000-105855 **Figure**

**Tested By:** JC **Checked By:** BFM

# LIQUID AND PLASTIC LIMITS TEST REPORT



| | MATERIAL DESCRIPTION | LL | PL | PI | %<#40 | %<#200 | USCS |
|---|---|---|---|---|---|---|---|
| ● | Silty sand with gravel | 46 | 36 | 10 | 30.4 | 12.1 | SM |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

**Project No.** 5000-105855 **Client:** Geosyntec

**Project:** Orrington Remediation Site. Orrington, ME

●**Source of Sample:** SD-SC-21-150922-0-0.5 **Depth:** 0-0.5

**Remarks:**

●As received moisture content=34.0%

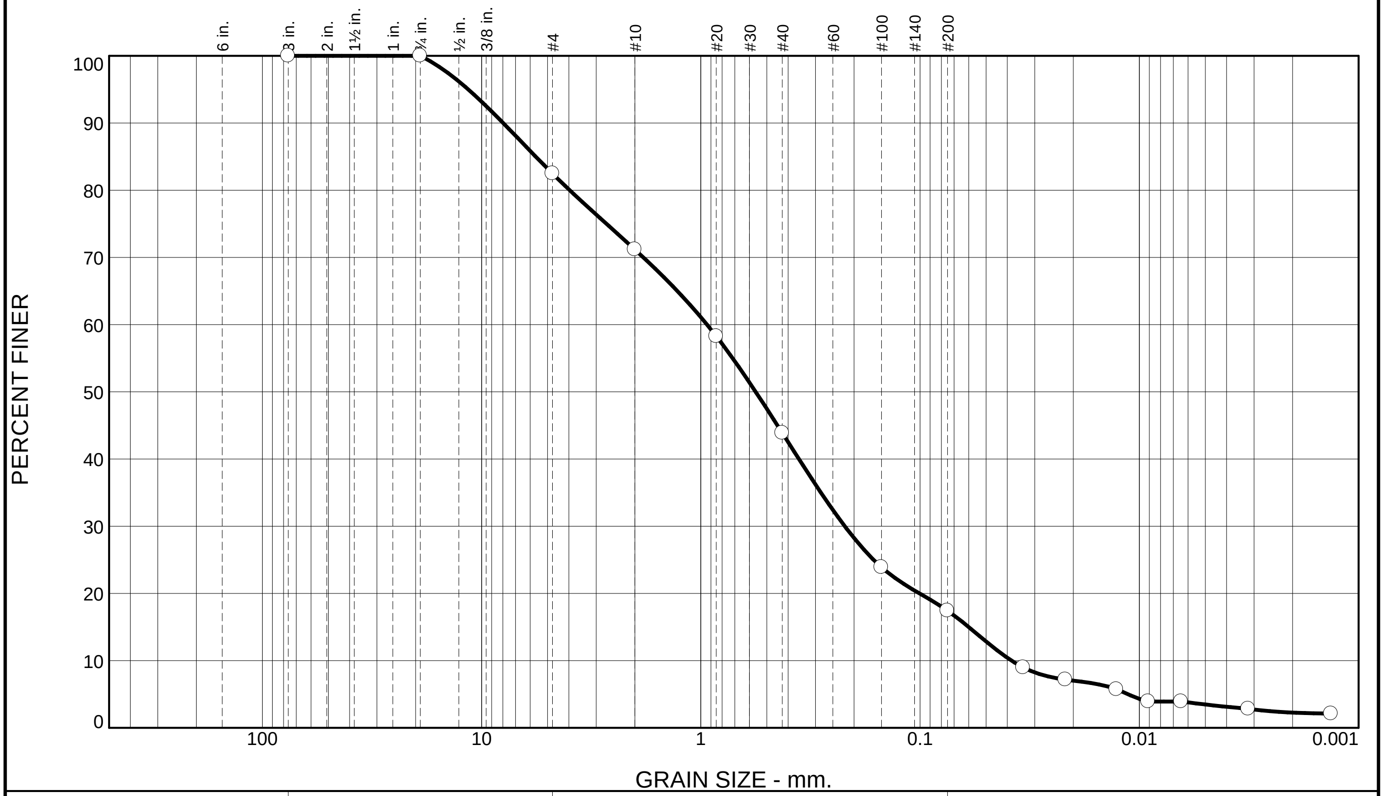
**CDM Smith**

**Boston, Massachusetts**

**Figure**

**Tested By:** JC **Checked By:** BFM

# Particle Size Distribution Report



| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 17.5 | 11.3 | 27.3 | 26.5 | 13.9 | 3.5 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 82.5 | | |
| #10 | 71.2 | | |
| #20 | 58.3 | | |
| #40 | 43.9 | | |
| #100 | 23.9 | | |
| #200 | 17.4 | | |

* (no specification provided)

**Material Description**

Silty sand with gravel

**Atterberg Limits**

PL= NP LL= NV PI= NP

**Coefficients**

$D_{90}$= 7.9731 $D_{85}$= 5.6650 $D_{60}$= 0.9374
$D_{50}$= 0.5625 $D_{30}$= 0.2206 $D_{15}$= 0.0601
$D_{10}$= 0.0383 $C_u$= 24.48 $C_c$= 1.36

**Classification**

USCS= SM AASHTO= A-1-b

**Remarks**

As received moisture content=11.5%

**Source of Sample:** TP-SMY-1 + 2 Fill

**Date:** 8/27/15

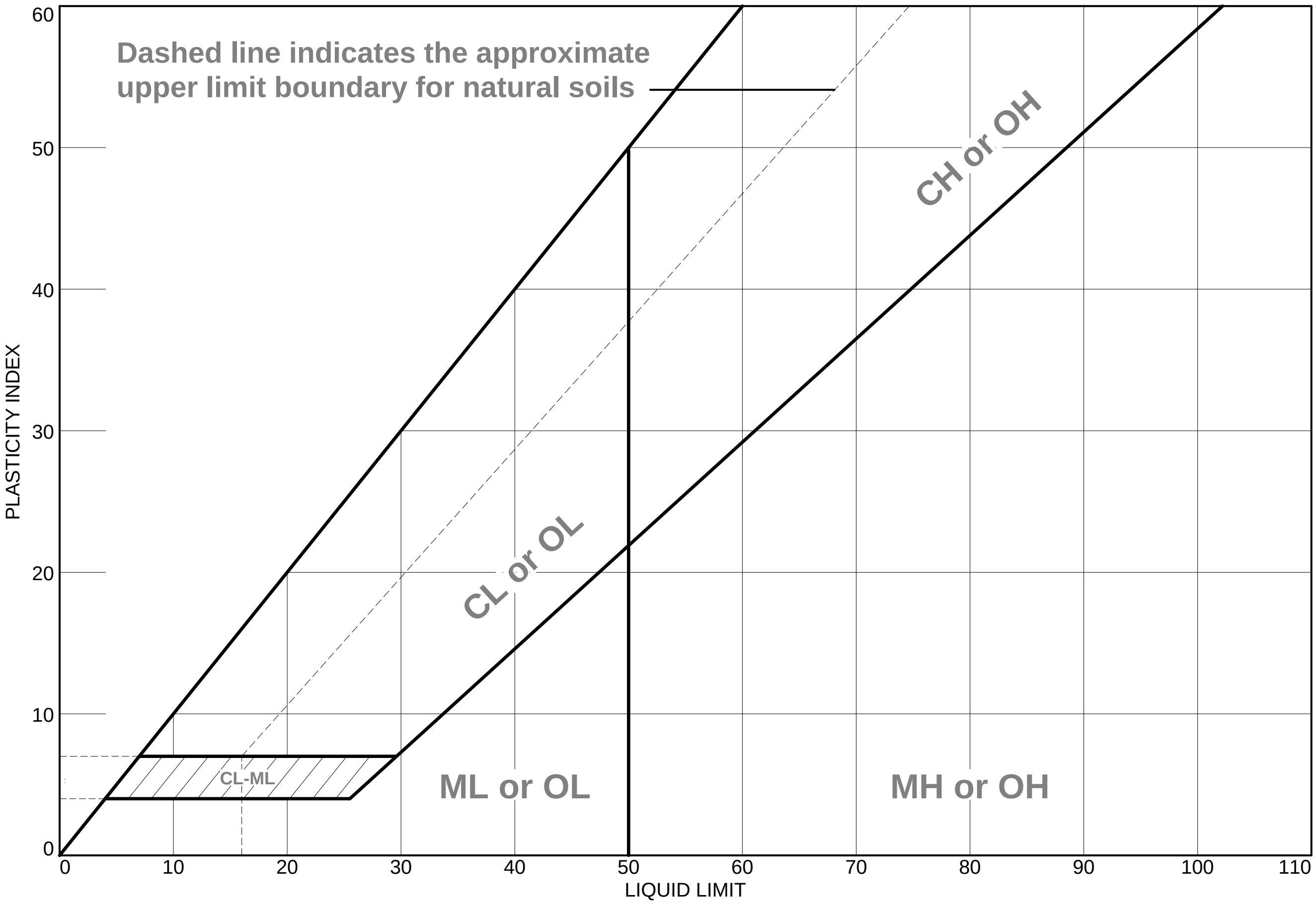
**CDM Smith**

**Boston, Massachusetts**

**Client:** CDM Companies
**Project:** Orrington Remediation Site. Orrington, ME
**Project No:** 5000-110260 **Figure**

**Tested By:** JC **Checked By:** BFM

# LIQUID AND PLASTIC LIMITS TEST REPORT



| | MATERIAL DESCRIPTION | LL | PL | PI | %<#40 | %<#200 | USCS |
|---|---|---|---|---|---|---|---|
| ● | Silty sand with gravel | NV | NP | NP | 43.9 | 17.4 | SM |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

**Project No.** 5000-110260 **Client:** CDM Companies

**Project:** Orrington Remediation Site. Orrington, ME

●**Source of Sample:** TP-SMY-1 + 2 Fill

**Remarks:**

●As received moisture content=11.5%

**CDM Smith**

**Boston, Massachusetts**

**Figure**

**Tested By:** JC **Checked By:** BFM

# CDM Smith

## Geotechnical Engineering Laboratory

## Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils(ASTM D2974)

Client: CDM Companies

Project Name: Orrington Remediation Site

Project Location: Orrington, ME

Project Number: 5000-110260

Sample Number: TP-SMY-1 & TP-SMY 2 Fill

Sample Location: -

Sample Depth (ft): -

Sample Date: 8/27/2015

Lab ID Number: 453075932

Tested By: JC

Test Date: 8/29/2015

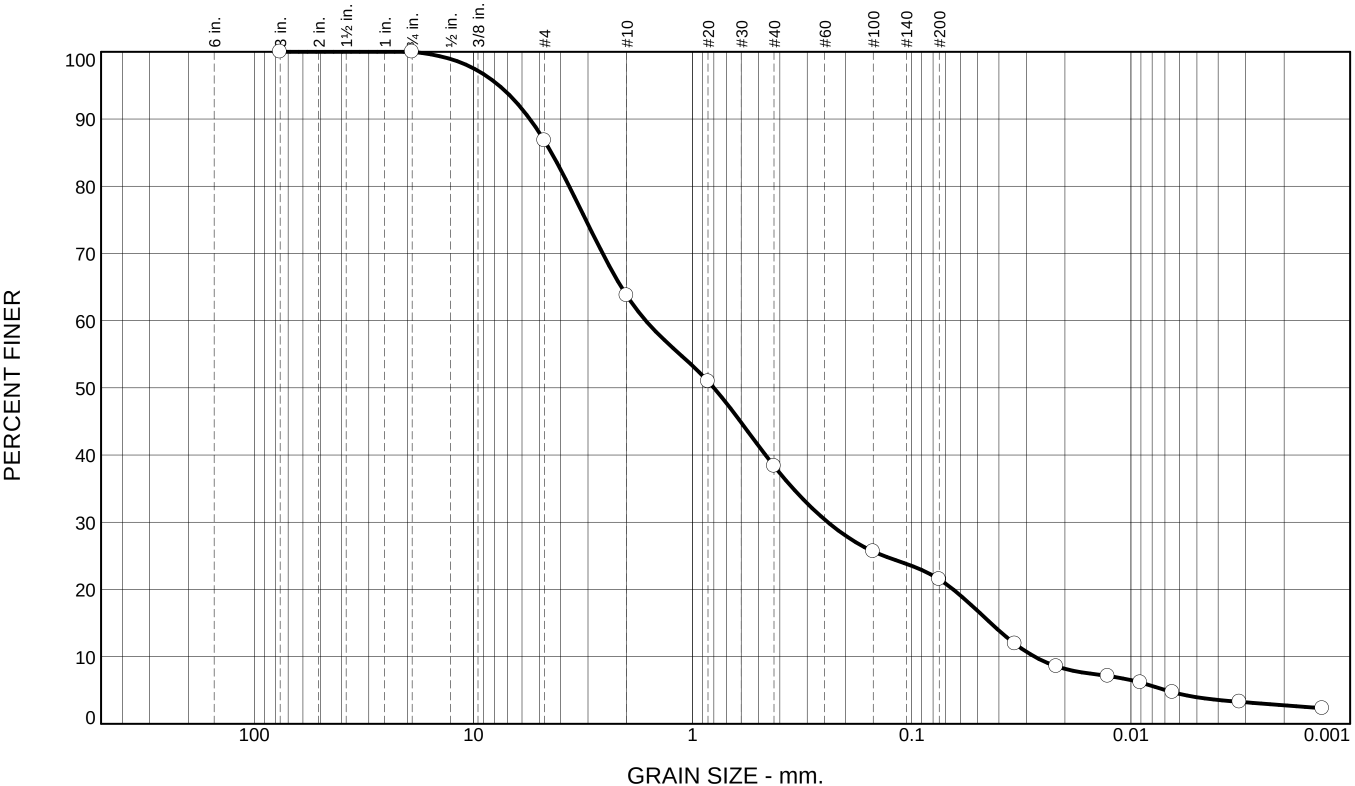
Procedure: C

Temperature: 440 $^0$C

| AS RECEIVED MOISTURE CONTENT | |
|---|---|
| Tin Mass (g) | 8.20 |
| Wet Mass of Sample & Tin (g) | 94.51 |
| Dry Mass of Sample & Tin (g) | 85.62 |
| Mass of Water (g) | 8.9 |
| Mass of Dry Soil (g) | 77.4 |
| Moisture Content (%) | 11.5 |

| ASH CONTENT | |
|---|---|
| Porcelain Dish Mass (g) | 18.5 |
| Porcelain Dish + Oven Dried Soil (g) | 56.2 |
| Mass of Oven Dried Soil (g) | 37.7 |
| Mass of Dish & Burned Soil (g) | 55.6 |
| Mass of Burned Soil (g) | 37.1 |
| Mass of Organic Material (g) | 0.6 |
| Ash Content (%) | 98.4 |
| | |
| Organic Content (%) | 1.6 |

# Particle Size Distribution Report



| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 13.2 | 23.0 | 25.4 | 16.9 | 17.5 | 4.0 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 86.8 | | |
| #10 | 63.8 | | |
| #20 | 51.0 | | |
| #40 | 38.4 | | |
| #100 | 25.6 | | |
| #200 | 21.5 | | |

* (no specification provided)

**Material Description**

Peat

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= 5.5255 $D_{85}$= 4.4082 $D_{60}$= 1.6369

$D_{50}$= 0.8003 $D_{30}$= 0.2416 $D_{15}$= 0.0437

$D_{10}$= 0.0275 $C_u$= 59.45 $C_c$= 1.30

**Classification**

USCS= PT AASHTO=

**Remarks**

As received moisture content=220.9%
Fines classification and description based on
Visual Manual Procedure ASTM D2488

**Source of Sample:** TP-SMY-1 + 2 Peat

**Date:** 8/27/15

**CDM Smith**

**Boston, Massachusetts**

**Client:** CDM Companies
**Project:** Orrington Remediation Site. Orrington, ME
**Project No:** 5000-110260 **Figure**

**Tested By:** JC **Checked By:** BFM

# CDM Smith

## Geotechnical Engineering Laboratory

### Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils(ASTM D2974)

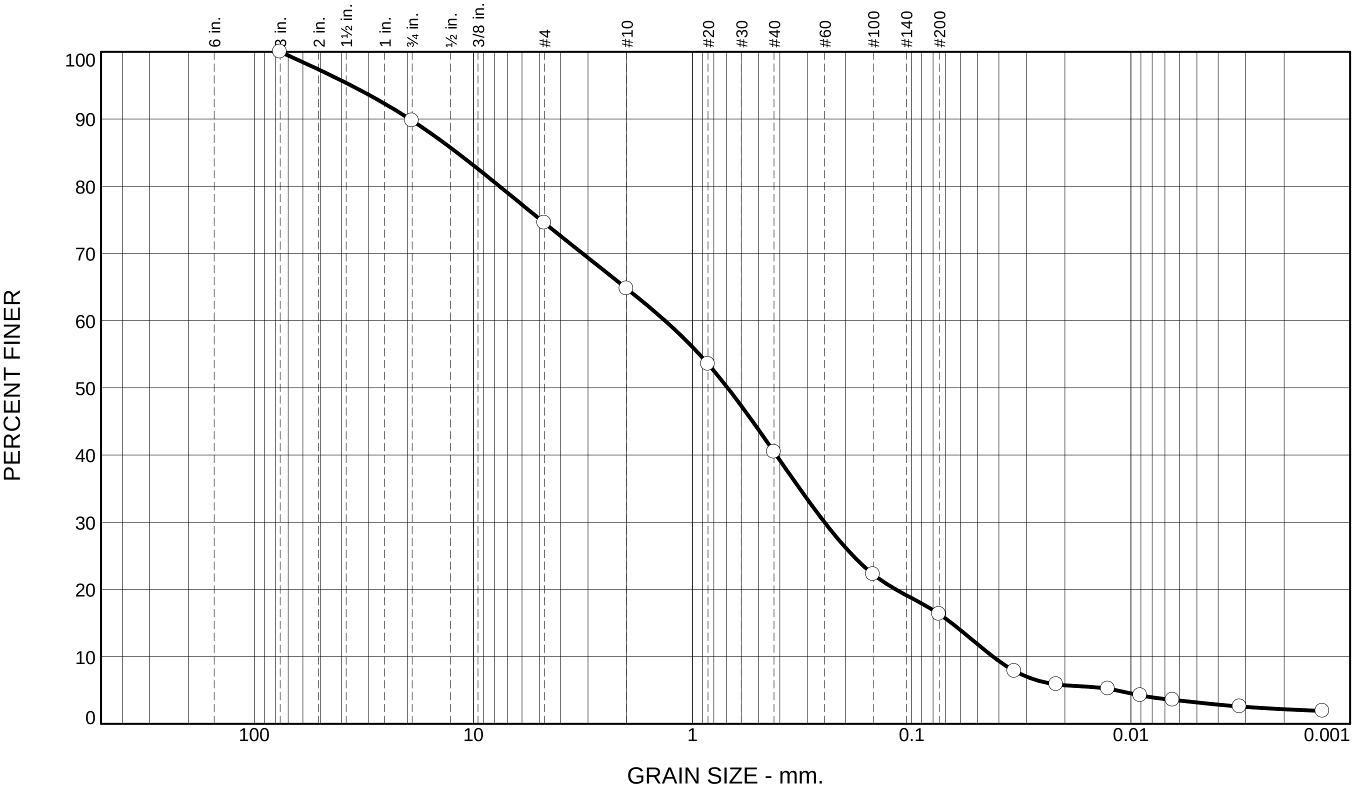
Client: CDM Companies
Project Name: Orrington Remediation Site
Project Location: Orrington, ME
Project Number: 5000-110260
Sample Number: TP-SMY-1 + TP-SMY-2 Peat
Sample Location: -
Sample Depth (ft): -
Sample Date: 8/27/2015
Lab ID Number: 453075936

Tested By: JC
Test Date: 8/29/2015
Procedure: C
Temperature: 440 $^0$C

| AS RECEIVED MOISTURE CONTENT | |
|---|---|
| Tin Mass (g) | 8.51 |
| Wet Mass of Sample & Tin (g) | 116.53 |
| Dry Mass of Sample & Tin (g) | 42.17 |
| Mass of Water (g) | 74.4 |
| Mass of Dry Soil (g) | 33.7 |
| Moisture Content (%) | 220.9 |

| ASH CONTENT | |
|---|---|
| Porcelain Dish Mass (g) | 19.5 |
| Porcelain Dish + Oven Dried Soil (g) | 28.9 |
| Mass of Oven Dried Soil (g) | 9.4 |
| Mass of Dish & Burned Soil (g) | 24.3 |
| Mass of Burned Soil (g) | 4.8 |
| Mass of Organic Material (g) | 4.7 |
| Ash Content (%) | 50.7 |
| | |
| Organic Content (%) | 49.3 |

# Particle Size Distribution Report



| % +3" | % Gravel |  | % Sand |  |  | % Fines |  |
|---|---|---|---|---|---|---|---|
|  | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 10.2 | 15.2 | 9.8 | 24.3 | 24.2 | 13.1 | 3.2 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 |  |  |
| 3/4 | 89.8 |  |  |
| #4 | 74.6 |  |  |
| #10 | 64.8 |  |  |
| #20 | 53.5 |  |  |
| #40 | 40.5 |  |  |
| #100 | 22.2 |  |  |
| #200 | 16.3 |  |  |

* (no specification provided)

### Material Description

Silty sand with gravel

### Atterberg Limits

PL= NP LL= NV PI= NP

### Coefficients

$D_{90}$= 19.5468 $D_{85}$= 11.8891 $D_{60}$= 1.3373
$D_{50}$= 0.6925 $D_{30}$= 0.2502 $D_{15}$= 0.0658
$D_{10}$= 0.0426 $C_u$= 31.38 $C_c$= 1.10

### Classification

USCS= SM AASHTO= A-1-b

### Remarks

As received moisture content=10.9%

**Source of Sample:** TP-SMY-1 Fill

**Date:** 8/27/15

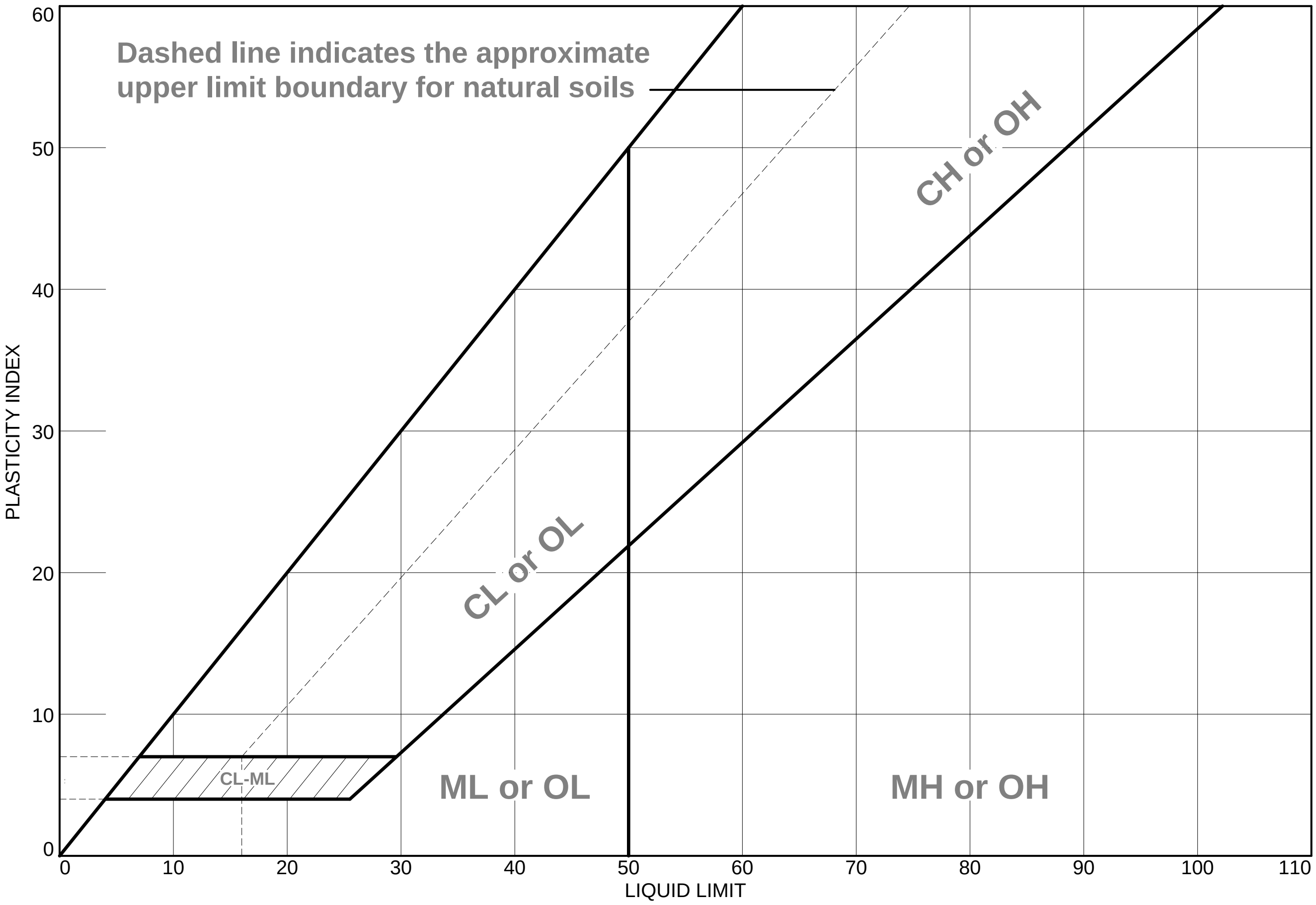
**CDM Smith**

**Boston, Massachusetts**

**Client:** CDM Companies
**Project:** Orrington Remediation Site. Orrington, ME
**Project No:** 5000-110260 **Figure**

**Tested By:** JC **Checked By:** BFM

# LIQUID AND PLASTIC LIMITS TEST REPORT



|  | MATERIAL DESCRIPTION | LL | PL | PI | %<#40 | %<#200 | USCS |
|---|---|---|---|---|---|---|---|
| ● | Silty sand with gravel | NV | NP | NP | 40.5 | 16.3 | SM |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |

**Project No.** 5000-110260 **Client:** CDM Companies

**Project:** Orrington Remediation Site. Orrington, ME

●**Source of Sample:** TP-SMY-1 Fill

**Remarks:**

●As received moisture content=10.9%

**CDM Smith**

**Boston, Massachusetts**

**Figure**

**Tested By:** JC **Checked By:** BFM

# CDM Smith

## Geotechnical Engineering Laboratory

## Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils(ASTM D2974)

Client: CDM Companies

Project Name: Orrington Remediation Site

Project Location: Orrington, ME

Project Number: 5000-110260

Sample Number: TP-SMY-1 Fill

Sample Location: -

Sample Depth (ft): -

Sample Date: 8/27/2015

Lab ID Number: 453075930

Tested By: JC

Test Date: 8/29/2015

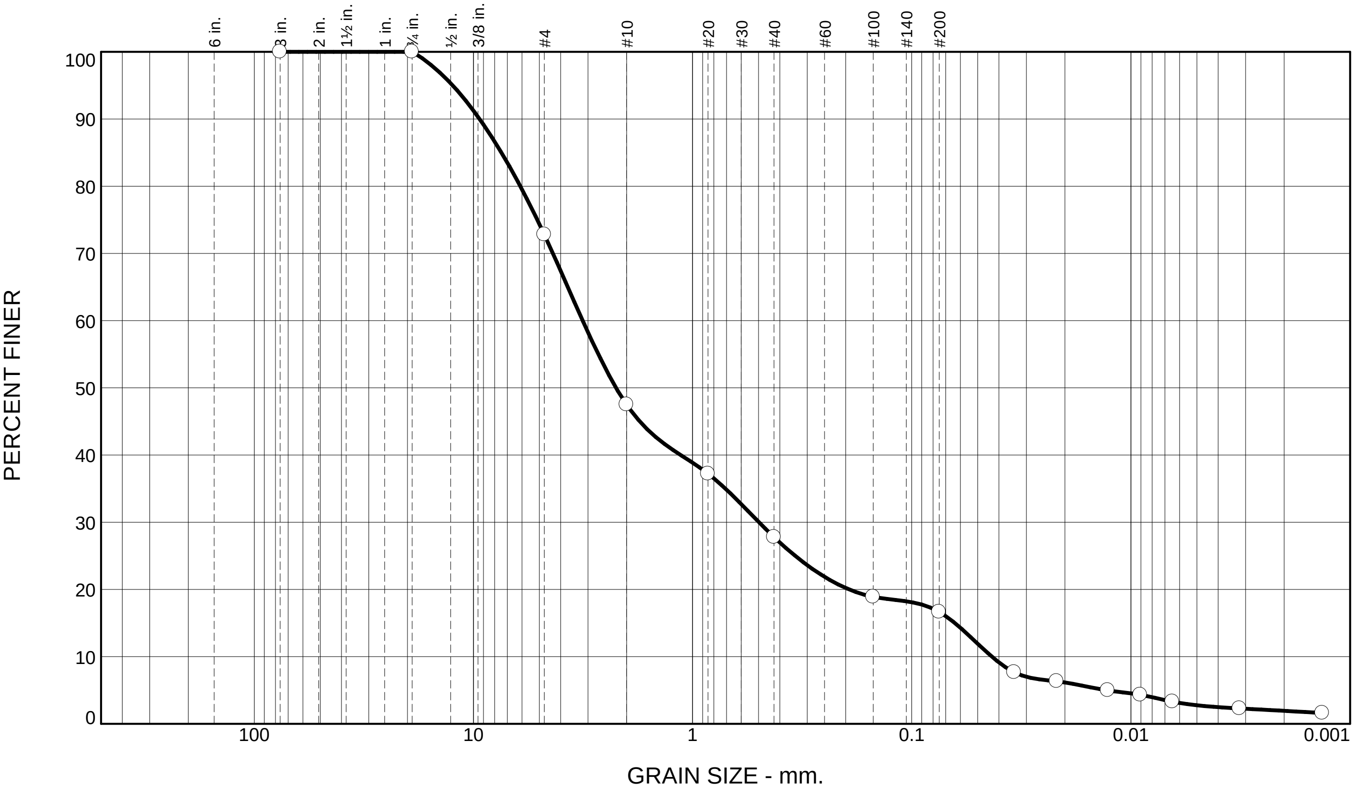
Procedure: C

Temperature: 440 $^0$C

| AS RECEIVED MOISTURE CONTENT | |
|---|---|
| Tin Mass (g) | 8.59 |
| Wet Mass of Sample & Tin (g) | 62.04 |
| Dry Mass of Sample & Tin (g) | 56.77 |
| Mass of Water (g) | 5.3 |
| Mass of Dry Soil (g) | 48.2 |
| Moisture Content (%) | 10.9 |

| ASH CONTENT | |
|---|---|
| Porcelain Dish Mass (g) | 18.5 |
| Porcelain Dish + Oven Dried Soil (g) | 45.7 |
| Mass of Oven Dried Soil (g) | 27.2 |
| Mass of Dish & Burned Soil (g) | 45.4 |
| Mass of Burned Soil (g) | 26.9 |
| Mass of Organic Material (g) | 0.4 |
| Ash Content (%) | 98.6 |
| | |
| Organic Content (%) | 1.4 |

# Particle Size Distribution Report



| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 27.2 | 25.3 | 19.7 | 11.1 | 13.9 | 2.8 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 72.8 | | |
| #10 | 47.5 | | |
| #20 | 37.2 | | |
| #40 | 27.8 | | |
| #100 | 18.9 | | |
| #200 | 16.7 | | |

* (no specification provided)

### Material Description

Peat with gravel

### Atterberg Limits

PL= LL= PI=

### Coefficients

| | | |
|---|---|---|
| $D_{90}$= 9.3753 | $D_{85}$= 7.4533 | $D_{60}$= 3.1735 |
| $D_{50}$= 2.2351 | $D_{30}$= 0.4979 | $D_{15}$= 0.0636 |
| $D_{10}$= 0.0431 | $C_u$= 73.63 | $C_c$= 1.81 |

### Classification

USCS= PT AASHTO=

### Remarks

As received moisture content=166.2%
Fines classification and description based on
Visual Manual Procedure ASTM D2488

**Source of Sample:** TP-SMY-1 Peat

**Date:** 8/27/15

**CDM Smith**

**Boston, Massachusetts**

**Client:** CDM Companies
**Project:** Orrington Remediation Site. Orrington, ME

**Project No:** 5000-110260 **Figure**

**Tested By:** JC **Checked By:** BFM

# CDM Smith

## Geotechnical Engineering Laboratory

## Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils(ASTM D2974)

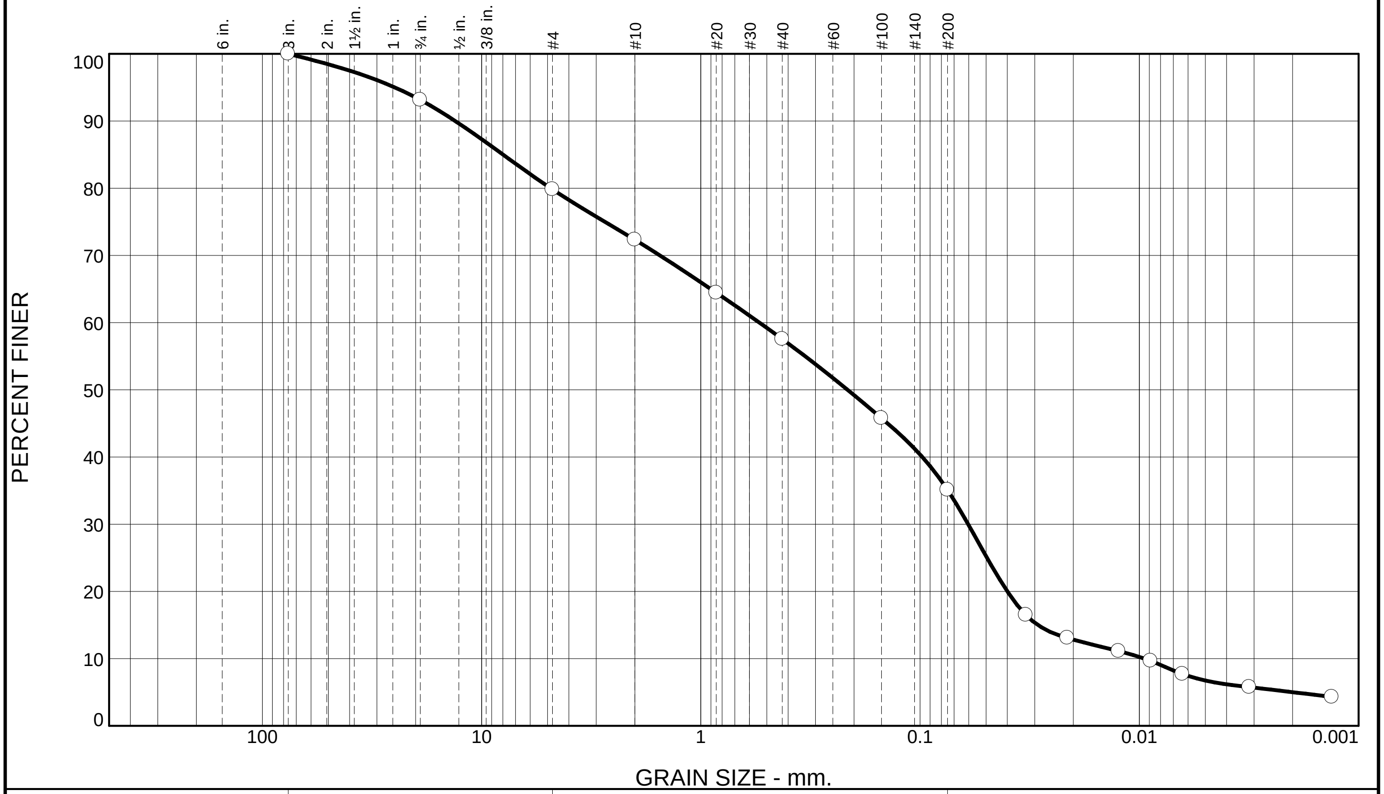
Client: CDM Companies
Project Name: Orrington Remediation Site
Project Location: Orrington, ME
Project Number: 5000-110260
Sample Number: TP-SMY-1 Peat
Sample Location: -
Sample Depth (ft): -
Sample Date: 8/27/2015
Lab ID Number: 453075933

Tested By: JC
Test Date: 8/29/2015
Procedure: C
Temperature: 440 $^0$C

| AS RECEIVED MOISTURE CONTENT | |
|---|---|
| Tin Mass (g) | 8.34 |
| Wet Mass of Sample & Tin (g) | 63.21 |
| Dry Mass of Sample & Tin (g) | 28.95 |
| Mass of Water (g) | 34.3 |
| Mass of Dry Soil (g) | 20.6 |
| Moisture Content (%) | 166.2 |

| ASH CONTENT | |
|---|---|
| Porcelain Dish Mass (g) | 19.5 |
| Porcelain Dish + Oven Dried Soil (g) | 32.1 |
| Mass of Oven Dried Soil (g) | 12.6 |
| Mass of Dish & Burned Soil (g) | 26.6 |
| Mass of Burned Soil (g) | 7.1 |
| Mass of Organic Material (g) | 5.5 |
| Ash Content (%) | 56.5 |
| | |
| Organic Content (%) | 43.5 |

# Particle Size Distribution Report



| % +3" | % Gravel |  | % Sand |  |  | % Fines |  |
|---|---|---|---|---|---|---|---|
|  | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 6.9 | 13.3 | 7.5 | 14.8 | 22.4 | 28.4 | 6.7 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 |  |  |
| 3/4 | 93.1 |  |  |
| #4 | 79.8 |  |  |
| #10 | 72.3 |  |  |
| #20 | 64.4 |  |  |
| #40 | 57.5 |  |  |
| #100 | 45.8 |  |  |
| #200 | 35.1 |  |  |

* (no specification provided)

### Material Description

Silty sand with gravel

### Atterberg Limits

PL= NP
LL= NV
PI= NP

### Coefficients

$D_{90}$= 13.2068
$D_{85}$= 7.9866
$D_{60}$= 0.5406
$D_{50}$= 0.2143
$D_{30}$= 0.0604
$D_{15}$= 0.0290
$D_{10}$= 0.0095
$C_u$= 57.03
$C_c$= 0.71

### Classification

USCS= SM
AASHTO= A-2-4(0)

### Remarks

As received moisture content=14.6%

**Source of Sample:** TP-SMY-2 Fill

**Date:** 8/28/15

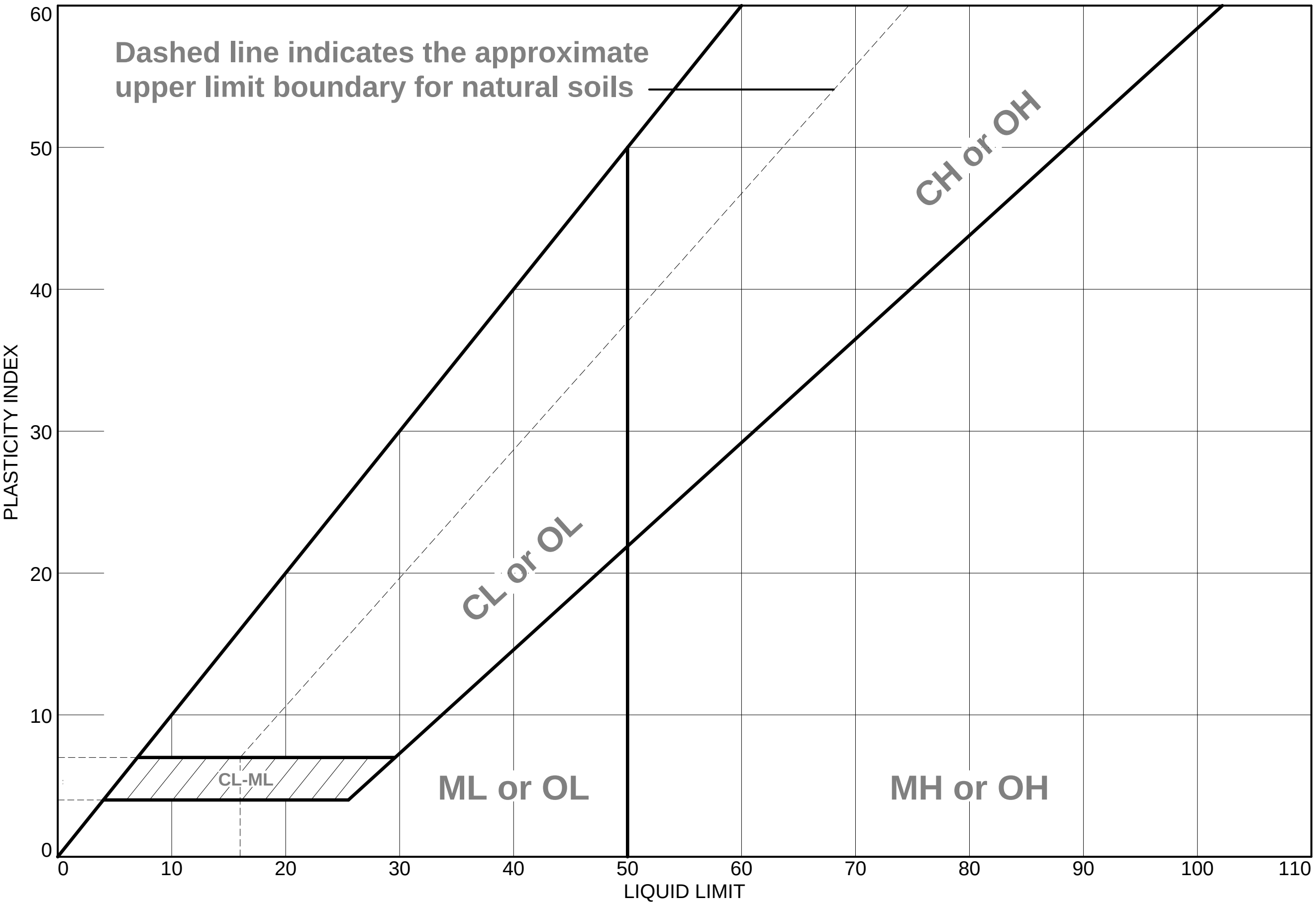
**CDM Smith**

**Boston, Massachusetts**

**Client:** CDM Companies
**Project:** Orrington Remediation Site. Orrington, ME
**Project No:** 5000-110260
**Figure**

**Tested By:** JC **Checked By:** BFM

# LIQUID AND PLASTIC LIMITS TEST REPORT



| | MATERIAL DESCRIPTION | LL | PL | PI | %<#40 | %<#200 | USCS |
|---|---|---|---|---|---|---|---|
| ● | Silty sand with gravel | NV | NP | NP | 57.5 | 35.1 | SM |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

**Project No.** 5000-110260 **Client:** CDM Companies

**Project:** Orrington Remediation Site. Orrington, ME

●**Source of Sample:** TP-SMY-2 Fill

**Remarks:**

●As received moisture content=14.6%

**CDM Smith**

**Boston, Massachusetts**

**Figure**

**Tested By:** JC **Checked By:** BFM

# CDM Smith

## Geotechnical Engineering Laboratory

### Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils(ASTM D2974)

Client: CDM Companies

Project Name: Orrington Remediation Site

Project Location: Orrington, ME

Project Number: 5000-110260

Sample Number: TP-SMY-2 Fill

Sample Location: -

Sample Depth (ft): -

Sample Date: 8/28/2015

Lab ID Number: 453075931

Tested By: JC

Test Date: 8/29/2015

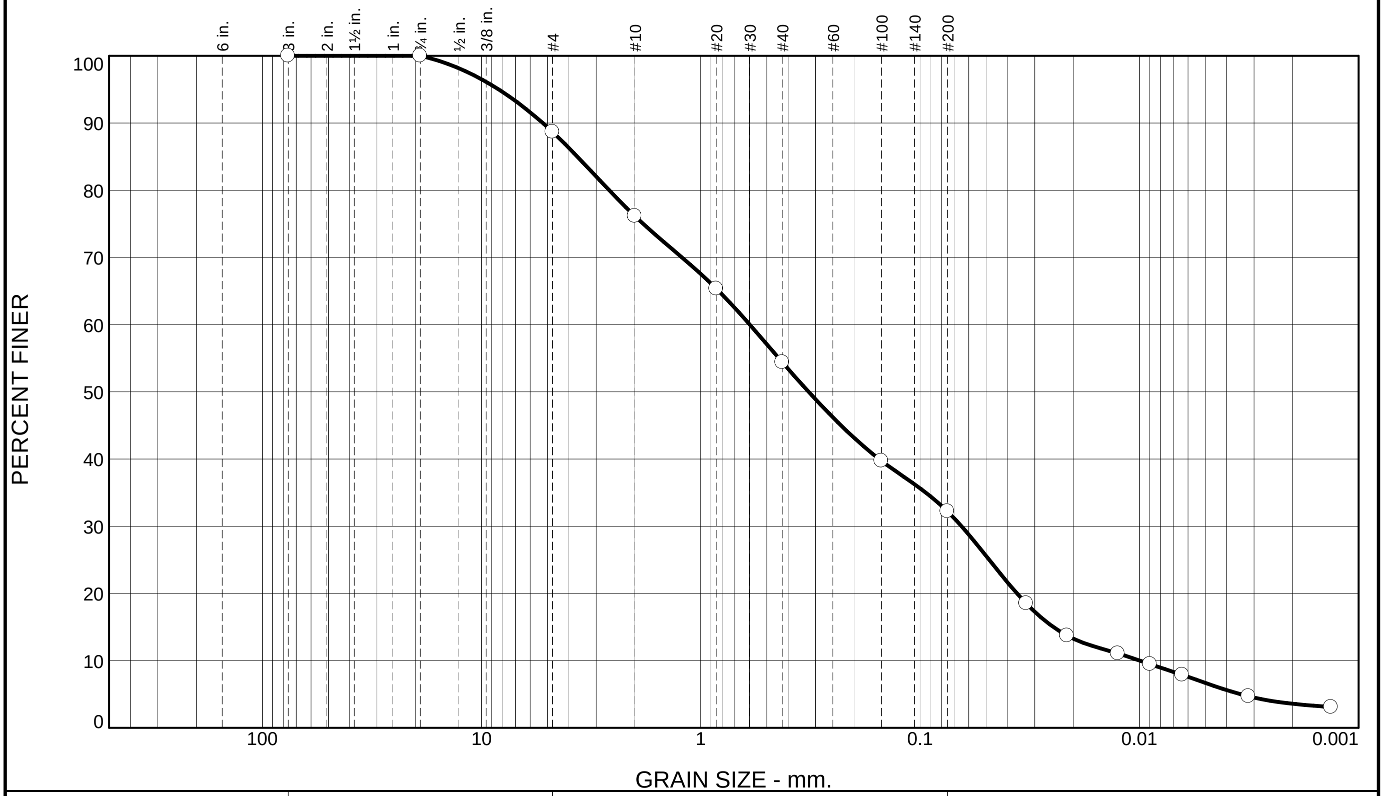
Procedure: C

Temperature: 440 $^0$C

| AS RECEIVED MOISTURE CONTENT | |
|---|---|
| Tin Mass (g) | 8.40 |
| Wet Mass of Sample & Tin (g) | 81.30 |
| Dry Mass of Sample & Tin (g) | 71.99 |
| Mass of Water (g) | 9.3 |
| Mass of Dry Soil (g) | 63.6 |
| Moisture Content (%) | 14.6 |

| ASH CONTENT | |
|---|---|
| Porcelain Dish Mass (g) | 19.5 |
| Porcelain Dish + Oven Dried Soil (g) | 47.2 |
| Mass of Oven Dried Soil (g) | 27.7 |
| Mass of Dish & Burned Soil (g) | 46.6 |
| Mass of Burned Soil (g) | 27.1 |
| Mass of Organic Material (g) | 0.6 |
| Ash Content (%) | 97.7 |
| | |
| Organic Content (%) | 2.3 |

# Particle Size Distribution Report



| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 11.3 | 12.6 | 21.7 | 22.2 | 25.5 | 6.7 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 88.7 | | |
| #10 | 76.1 | | |
| #20 | 65.3 | | |
| #40 | 54.4 | | |
| #100 | 39.7 | | |
| #200 | 32.2 | | |

* (no specification provided)

## Material Description

Peat

## Atterberg Limits

PL= LL= PI=

## Coefficients

$D_{90}$= 5.2616 $D_{85}$= 3.6612 $D_{60}$= 0.5985
$D_{50}$= 0.3224 $D_{30}$= 0.0648 $D_{15}$= 0.0247
$D_{10}$= 0.0100 $C_u$= 60.11 $C_c$= 0.70

## Classification

USCS= PT AASHTO=

## Remarks

As received moisture content=204.4%
Fines classification and description based on
Visual Manual Procedure ASTM D2488

**Source of Sample:** TP-SMY-2 Peat

**Date:** 8/27/15

**CDM Smith**

**Boston, Massachusetts**

**Client:** CDM Companies
**Project:** Orrington Remediation Site. Orrington, ME
**Project No:** 5000-110260 **Figure**

**Tested By:** JC **Checked By:** BFM

# CDM Smith

## Geotechnical Engineering Laboratory

## Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils(ASTM D2974)

Client: CDM Companies
Project Name: Orrington Remediation Site
Project Location: Orrington, ME
Project Number: 5000-110260
Sample Number: TP-SMY-2 Peat
Sample Location: -
Sample Depth (ft): -
Sample Date: 8/27/2015
Lab ID Number: 453075934

Tested By: JC
Test Date: 8/29/2015
Procedure: C
Temperature: 440 $^0$C

| AS RECEIVED MOISTURE CONTENT | |
|---|---|
| Tin Mass (g) | 8.51 |
| Wet Mass of Sample & Tin (g) | 67.56 |
| Dry Mass of Sample & Tin (g) | 27.91 |
| Mass of Water  (g) | 39.7 |
| Mass of Dry Soil (g) | 19.4 |
| Moisture Content (%) | 204.4 |

| ASH CONTENT | |
|---|---|
| Porcelain Dish Mass (g) | 18.5 |
| Porcelain Dish + Oven Dried Soil (g) | 27.1 |
| Mass of Oven Dried Soil (g) | 8.6 |
| Mass of Dish & Burned Soil (g) | 23.2 |
| Mass of Burned Soil  (g) | 4.7 |
| Mass of Organic Material (g) | 3.9 |
| Ash Content (%) | 54.2 |
| | |
| Organic Content (%) | 45.8 |

# Appendix C – Dewatering Test Photo Log

**Photo 1: SD-SC-07 as received**

**Photo 2: SD-SC-08 as received**

**Photo 3: SD-SC-09 as received**

**Photo 4: SD-SC-10 as received**

**Photo 5: SD-SC-07, mixed to dredge consistency before dewatering.**

**Photo 6: SD-SC-08, -09, -10 Composite, mixed to dredged consistency before dewatering.**

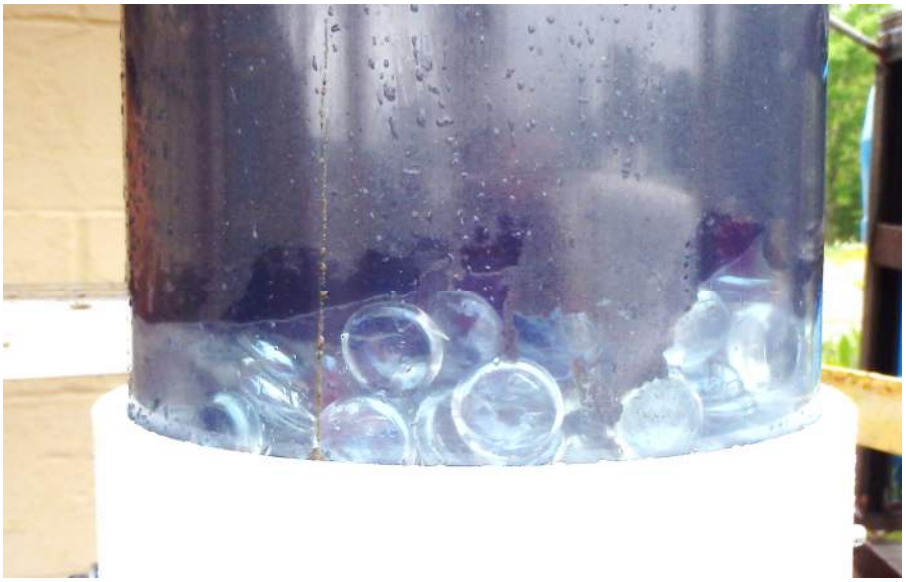


Photo 7: Sediment migration at filter fabric during dewatering.

06/16/2015

Photo 8:  Sediment migration at filter fabric during dewatering.

**Photo 9: SD-SC-07, water and sediment levels in dewatering tube.**

**Photo 10: Decanting water from dewatering tube after approximately 21 hours from start of test.**

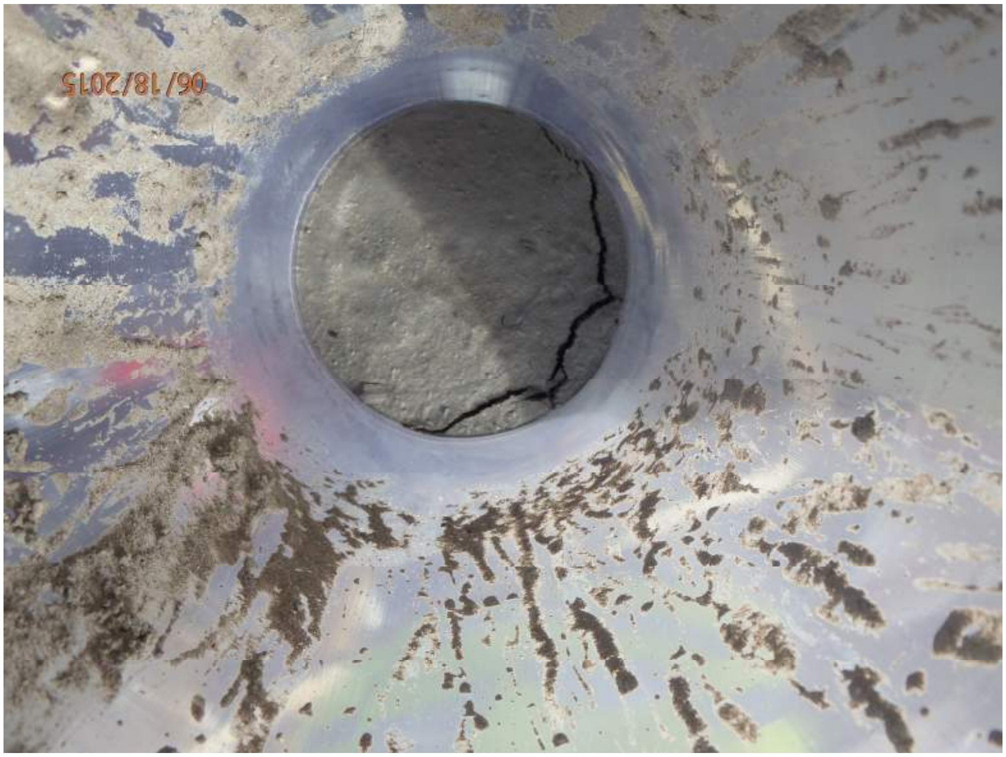


**Photo 11: Top of SD-SC-07 dewatered sediment at completion of test.**

**Photo 12: SD-SC-07 dewatering testing, additional measurements.**

**Photo 13: SD-SC-08, -09, -10 Composite dewatering test, approximately 62 hours test time.**

**Photo 14: SD-SC-08, -09, -10 Composite, after dewatering**

**Note: Green hue in photographs is from interior lighting, soils are not actually green.**

**Photo 15: SD-SC-08, -09, -10 Composite, after dewatering**

**Photo 16: SD-SC-07, after dewatering**

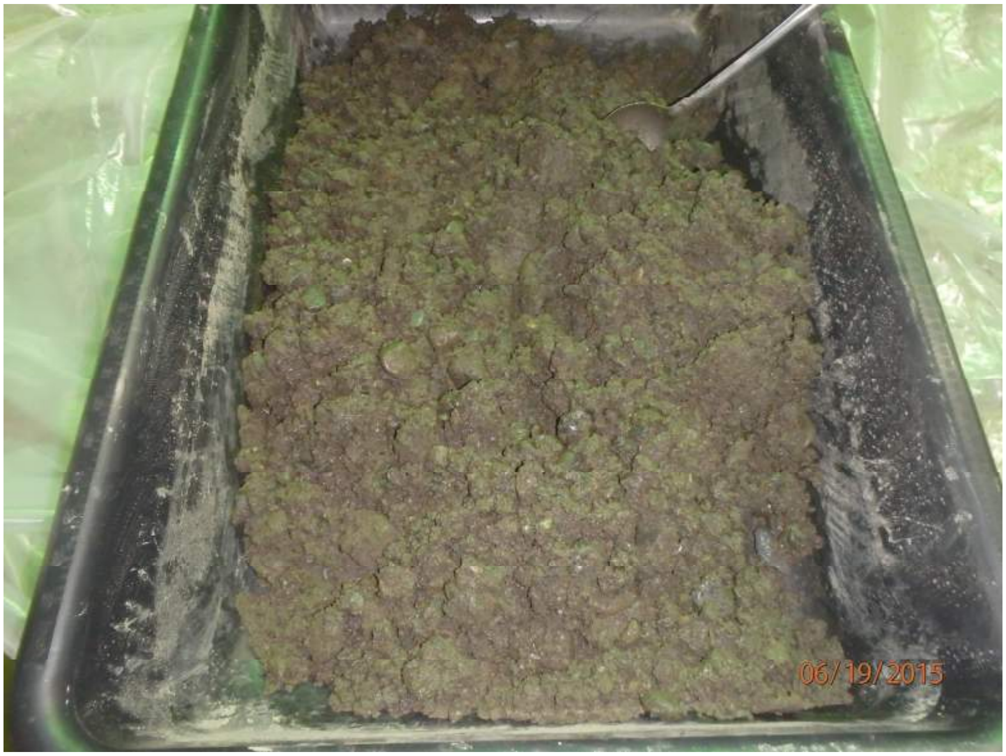


**Photo 17: SD-SC-07, after dewatering**

# Appendix D – Effluent Water Analytical Testing

# ANALYTICAL REPORT

| | |
|---|---|
| Lab Number: | L1517090 |
| Client: | CDM Smith, Inc.<br>75 State Street<br>Suite 701<br>Boston, MA 02109 |
| ATTN: | Andrew Thompson |
| Phone: | (617) 452-6801 |
| Project Name: | ORRINGTON REMEDIATION SITE |
| Project Number: | Not Specified |
| Report Date: | 07/31/15 |

Certifications & Approvals: MA (M-MA086), NY (11148), CT (PH-0574), NH (2003), NJ NELAP (MA935), RI (LAO00065), ME (MA00086), PA (68-03671), VA (460195), MD (348), IL (200077), NC (666), TX (T104704476), DOD (L2217), USDA (Permit #P-330-11-00240).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

| Alpha Sample ID | Client ID | Matrix | Sample Location | Collection Date/Time | Receive Date |
|---|---|---|---|---|---|
| L1517090-01 | SD-SC-8-9-10 DEWATERING | WATER | ORRINGTON, ME | 07/23/15 08:00 | 07/23/15 |
| L1517090-02 | SD-SC-7 DEWATERING | WATER | ORRINGTON, ME | 07/23/15 08:00 | 07/23/15 |

## Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet all of the requirements of NELAC, for all NELAC accredited parameters. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

HOLD POLICY
For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Client Service Representative and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Client Services at 800-624-9220 with any questions.

## Case Narrative (continued)

Metals

The WG805572-3 Laboratory Duplicate RPD, performed on L1517090-01, is outside the acceptance criteria for chromium (23%). The elevated RPD has been attributed to the non-homogeneous nature of the sample utilized for the laboratory duplicate.

BOD, 5 day

L1517090-01 was set at the correct dilution for BOD analysis according to prep screening; however, not enough depletion occurred. Therefore, the sample result is reported as "non-detect" at an elevated detection limit. Due to the expiration of the method required holding time, re-analysis could not be performed.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Michelle M. Morris Michelle M. Morris

Title: Technical Director/Representative Date: 07/31/15

# METALS

| | | | |
|---|---|---|---|
| **Project Name:** | ORRINGTON REMEDIATION SITE | **Lab Number:** | L1517090 |
| **Project Number:** | Not Specified | **Report Date:** | 07/31/15 |

## SAMPLE RESULTS

| | | | |
|---|---|---|---|
| Lab ID: | L1517090-01 | Date Collected: | 07/23/15 08:00 |
| Client ID: | SD-SC-8-9-10 DEWATERING | Date Received: | 07/23/15 |
| Sample Location: | ORRINGTON, ME | Field Prep: | Not Specified |
| Matrix: | Water | | |

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Metals - Westborough Lab | | | | | | | | | | | |
| Arsenic, Total | 0.0394 | | mg/l | 0.0100 | -- | 1 | 07/24/15 07:56 | 07/28/15 02:13 | EPA 3005A | 1,6010C | MC |
| Barium, Total | 0.0621 | | mg/l | 0.0100 | -- | 1 | 07/24/15 07:56 | 07/28/15 02:13 | EPA 3005A | 1,6010C | MC |
| Cadmium, Total | ND | | mg/l | 0.0050 | -- | 1 | 07/24/15 07:56 | 07/28/15 02:13 | EPA 3005A | 1,6010C | MC |
| Chromium, Total | 0.086 | | mg/l | 0.010 | -- | 1 | 07/24/15 07:56 | 07/28/15 02:13 | EPA 3005A | 1,6010C | MC |
| Lead, Total | 0.0574 | | mg/l | 0.0100 | -- | 1 | 07/24/15 07:56 | 07/28/15 02:13 | EPA 3005A | 1,6010C | MC |
| Mercury, Total | 0.00420 | | mg/l | 0.00020 | -- | 1 | 07/24/15 15:26 | 07/24/15 18:32 | EPA 7470A | 1,7470A | EA |
| Selenium, Total | ND | | mg/l | 0.0100 | -- | 1 | 07/24/15 07:56 | 07/28/15 02:13 | EPA 3005A | 1,6010C | MC |
| Silver, Total | ND | | mg/l | 0.0070 | -- | 1 | 07/24/15 07:56 | 07/28/15 02:13 | EPA 3005A | 1,6010C | MC |

|  |  |  |  |
|---|---|---|---|
| **Project Name:** | ORRINGTON REMEDIATION SITE | **Lab Number:** | L1517090 |
| **Project Number:** | Not Specified | **Report Date:** | 07/31/15 |

## SAMPLE RESULTS

|  |  |  |  |
|---|---|---|---|
| Lab ID: | L1517090-02 | Date Collected: | 07/23/15 08:00 |
| Client ID: | SD-SC-7 DEWATERING | Date Received: | 07/23/15 |
| Sample Location: | ORRINGTON, ME | Field Prep: | Not Specified |
| Matrix: | Water |  |  |

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Metals - Westborough Lab |  |  |  |  |  |  |  |  |  |  |  |
| Arsenic, Total | 0.0684 |  | mg/l | 0.0100 | -- | 1 | 07/24/15 07:56 | 07/28/15 02:28 | EPA 3005A | 1,6010C | MC |
| Barium, Total | 0.314 |  | mg/l | 0.0100 | -- | 1 | 07/24/15 07:56 | 07/28/15 02:28 | EPA 3005A | 1,6010C | MC |
| Cadmium, Total | 0.0069 |  | mg/l | 0.0050 | -- | 1 | 07/24/15 07:56 | 07/28/15 02:28 | EPA 3005A | 1,6010C | MC |
| Chromium, Total | 0.50 |  | mg/l | 0.010 | -- | 1 | 07/24/15 07:56 | 07/28/15 02:28 | EPA 3005A | 1,6010C | MC |
| Lead, Total | 0.506 |  | mg/l | 0.0100 | -- | 1 | 07/24/15 07:56 | 07/28/15 02:28 | EPA 3005A | 1,6010C | MC |
| Mercury, Total | 1.656 |  | mg/l | 0.02000 | -- | 100 | 07/24/15 15:26 | 07/24/15 18:50 | EPA 7470A | 1,7470A | EA |
| Selenium, Total | ND |  | mg/l | 0.0100 | -- | 1 | 07/24/15 07:56 | 07/28/15 02:28 | EPA 3005A | 1,6010C | MC |
| Silver, Total | ND |  | mg/l | 0.0070 | -- | 1 | 07/24/15 07:56 | 07/28/15 02:28 | EPA 3005A | 1,6010C | MC |

**Project Name:** ORRINGTON REMEDIATION SITE
**Lab Number:** L1517090
**Project Number:** Not Specified
**Report Date:** 07/31/15

# Method Blank Analysis
# Batch Quality Control

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Metals - Westborough Lab for sample(s): 01-02 Batch: WG805572-1 | | | | | | | | | | |
| Arsenic, Total | ND | | mg/l | 0.0100 | -- | 1 | 07/24/15 07:56 | 07/28/15 01:27 | 1,6010C | MC |
| Barium, Total | ND | | mg/l | 0.0100 | -- | 1 | 07/24/15 07:56 | 07/28/15 01:27 | 1,6010C | MC |
| Cadmium, Total | ND | | mg/l | 0.0050 | -- | 1 | 07/24/15 07:56 | 07/28/15 01:27 | 1,6010C | MC |
| Chromium, Total | ND | | mg/l | 0.010 | -- | 1 | 07/24/15 07:56 | 07/28/15 01:27 | 1,6010C | MC |
| Lead, Total | ND | | mg/l | 0.0100 | -- | 1 | 07/24/15 07:56 | 07/28/15 01:27 | 1,6010C | MC |
| Selenium, Total | ND | | mg/l | 0.0100 | -- | 1 | 07/24/15 07:56 | 07/28/15 01:27 | 1,6010C | MC |
| Silver, Total | ND | | mg/l | 0.0070 | -- | 1 | 07/24/15 07:56 | 07/28/15 01:27 | 1,6010C | MC |

**Prep Information**

Digestion Method: EPA 3005A

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Metals - Westborough Lab for sample(s): 01-02 Batch: WG805694-1 | | | | | | | | | | |
| Mercury, Total | ND | | mg/l | 0.00020 | -- | 1 | 07/24/15 15:26 | 07/24/15 18:21 | 1,7470A | EA |

**Prep Information**

Digestion Method: EPA 7470A

# Lab Control Sample Analysis

## Batch Quality Control

**Project Name:** ORRINGTON REMEDIATION SITE

**Lab Number:** L1517090

**Project Number:** Not Specified

**Report Date:** 07/31/15

| Parameter | LCS %Recovery | Qual | LCSD %Recovery | Qual | %Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|
| Total Metals - Westborough Lab Associated sample(s): 01-02 Batch: WG805572-2 | | | | | | | | |
| Arsenic, Total | 108 | | - | | 80-120 | - | | |
| Barium, Total | 95 | | - | | 80-120 | - | | |
| Cadmium, Total | 107 | | - | | 80-120 | - | | |
| Chromium, Total | 100 | | - | | 80-120 | - | | |
| Lead, Total | 102 | | - | | 80-120 | - | | |
| Selenium, Total | 108 | | - | | 80-120 | - | | |
| Silver, Total | 96 | | - | | 80-120 | - | | |
| Total Metals - Westborough Lab Associated sample(s): 01-02 Batch: WG805694-2 | | | | | | | | |
| Mercury, Total | 92 | | - | | 80-120 | - | | |

# Matrix Spike Analysis

## Batch Quality Control

**Project Name:** ORRINGTON REMEDIATION SITE

**Project Number:** Not Specified

**Lab Number:** L1517090

**Report Date:** 07/31/15

| Parameter | Native Sample | MS Added | MS Found | MS %Recovery | Qual | MSD Found | MSD %Recovery | Qual | Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Metals - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG805572-4 QC Sample: L1517090-01 Client ID: SD-SC-8-9-10 DEWATERING | | | | | | | | | | | | |
| Arsenic, Total | 0.0394 | 0.12 | 0.157 | 98 | | - | - | | 75-125 | - | | 20 |
| Barium, Total | 0.0621 | 2 | 1.94 | 94 | | - | - | | 75-125 | - | | 20 |
| Cadmium, Total | ND | 0.051 | 0.0537 | 105 | | - | - | | 75-125 | - | | 20 |
| Chromium, Total | 0.086 | 0.2 | 0.27 | 92 | | - | - | | 75-125 | - | | 20 |
| Lead, Total | 0.0574 | 0.51 | 0.562 | 99 | | - | - | | 75-125 | - | | 20 |
| Selenium, Total | ND | 0.12 | 0.120 | 100 | | - | - | | 75-125 | - | | 20 |
| Silver, Total | ND | 0.05 | 0.0484 | 97 | | - | - | | 75-125 | - | | 20 |
| Total Metals - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG805694-3 WG805694-4 QC Sample: L1517150-03 Client ID: MS Sample | | | | | | | | | | | | |
| Mercury, Total | ND | 0.005 | 0.00455 | 91 | | 0.00461 | 92 | | 80-120 | 1 | | 20 |

# Lab Duplicate Analysis
## Batch Quality Control

**Project Name:** ORRINGTON REMEDIATION SITE
**Project Number:** Not Specified

**Lab Number:** L1517090
**Report Date:** 07/31/15

| Parameter | Native Sample | Duplicate Sample | Units | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|
| Total Metals - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG805572-3 QC Sample: L1517090-01 Client ID: SD-SC-8-9-10 DEWATERING | | | | | | |
| Arsenic, Total | 0.0394 | 0.0384 | mg/l | 3 | | 20 |
| Barium, Total | 0.0621 | 0.0578 | mg/l | 7 | | 20 |
| Cadmium, Total | ND | ND | mg/l | NC | | 20 |
| Chromium, Total | 0.086 | 0.068 | mg/l | **23** | Q | 20 |
| Lead, Total | 0.0574 | 0.0569 | mg/l | 1 | | 20 |
| Selenium, Total | ND | ND | mg/l | NC | | 20 |
| Silver, Total | ND | ND | mg/l | NC | | 20 |

# INORGANICS
# &
# MISCELLANEOUS

## SAMPLE RESULTS

Lab ID: L1517090-01
Client ID: SD-SC-8-9-10 DEWATERING
Sample Location: ORRINGTON, ME
Matrix: Water
Date Collected: 07/23/15 08:00
Date Received: 07/23/15
Field Prep: Not Specified

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab | | | | | | | | | | |
| Solids, Total Dissolved | 690 | | mg/l | 100 | -- | 10 | - | 07/27/15 13:00 | 30,2540C | DW |
| Solids, Total Suspended | 1500 | | mg/l | 200 | NA | 40 | - | 07/27/15 13:45 | 30,2540D | DW |
| pH (H) | 7.7 | | SU | - | NA | 1 | - | 07/24/15 00:05 | 1,9040C | LH |
| BOD, 5 day | ND | | mg/l | 20 | NA | 10 | 07/23/15 22:20 | 07/28/15 16:35 | 30,5210B | SE |
| Total Organic Carbon | 40. | | mg/l | 5.0 | -- | 10 | - | 07/24/15 07:35 | 1,9060A | DW |

## SAMPLE RESULTS

Lab ID: L1517090-02
Client ID: SD-SC-7 DEWATERING
Sample Location: ORRINGTON, ME
Matrix: Water

Date Collected: 07/23/15 08:00
Date Received: 07/23/15
Field Prep: Not Specified

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab | | | | | | | | | | |
| Solids, Total Dissolved | 630 | | mg/l | 100 | -- | 10 | - | 07/27/15 13:00 | 30,2540C | DW |
| pH (H) | 6.8 | | SU | - | NA | 1 | - | 07/24/15 00:05 | 1,9040C | LH |
| BOD, 5 day | 27. | | mg/l | 20 | NA | 10 | 07/23/15 22:20 | 07/28/15 16:35 | 30,5210B | SE |
| Total Organic Carbon | 35. | | mg/l | 5.0 | -- | 10 | - | 07/27/15 07:32 | 1,9060A | DW |

# Method Blank Analysis
## Batch Quality Control

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab for sample(s): 01-02 Batch: WG805519-1 | | | | | | | | | | |
| BOD, 5 day | ND | | mg/l | 2.0 | NA | 1 | 07/23/15 22:20 | 07/28/15 16:35 | 30,5210B | SE |
| General Chemistry - Westborough Lab for sample(s): 01 Batch: WG805620-1 | | | | | | | | | | |
| Total Organic Carbon | ND | | mg/l | 0.50 | -- | 1 | - | 07/24/15 07:35 | 1,9060A | DW |
| General Chemistry - Westborough Lab for sample(s): 02 Batch: WG805651-1 | | | | | | | | | | |
| Total Organic Carbon | ND | | mg/l | 0.50 | -- | 1 | - | 07/27/15 07:32 | 1,9060A | DW |
| General Chemistry - Westborough Lab for sample(s): 01-02 Batch: WG806136-1 | | | | | | | | | | |
| Solids, Total Dissolved | ND | | mg/l | 10 | -- | 1 | - | 07/27/15 13:00 | 30,2540C | DW |
| General Chemistry - Westborough Lab for sample(s): 01 Batch: WG806140-1 | | | | | | | | | | |
| Solids, Total Suspended | ND | | mg/l | 5.0 | NA | 1 | - | 07/27/15 13:45 | 30,2540D | DW |

# Lab Control Sample Analysis

## Batch Quality Control

**Project Name:** ORRINGTON REMEDIATION SITE

**Project Number:** Not Specified

**Lab Number:** L1517090

**Report Date:** 07/31/15

| Parameter | LCS %Recovery | Qual | LCSD %Recovery | Qual | %Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab Associated sample(s): 01-02 Batch: WG805519-2 | | | | | | | | |
| BOD, 5 day | 93 | | - | | 85-115 | - | | 20 |
| General Chemistry - Westborough Lab Associated sample(s): 01-02 Batch: WG805535-1 | | | | | | | | |
| pH | 99 | | - | | 99-101 | - | | 5 |
| General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG805620-2 | | | | | | | | |
| Total Organic Carbon | 99 | | - | | 90-110 | - | | |
| General Chemistry - Westborough Lab Associated sample(s): 02 Batch: WG805651-2 | | | | | | | | |
| Total Organic Carbon | 98 | | - | | 90-110 | - | | |
| General Chemistry - Westborough Lab Associated sample(s): 01-02 Batch: WG806136-2 | | | | | | | | |
| Solids, Total Dissolved | 92 | | - | | 80-120 | - | | |

# Matrix Spike Analysis
## Batch Quality Control

**Project Name:** ORRINGTON REMEDIATION SITE
**Project Number:** Not Specified

**Lab Number:** L1517090
**Report Date:** 07/31/15

| Parameter | Native Sample | MS Added | MS Found | MS %Recovery | Qual | MSD Found | MSD %Recovery | Qual | Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG805519-4 QC Sample: L1515003-85 Client ID: MS Sample | | | | | | | | | | | | |
| BOD, 5 day | ND | 100 | 110 | 111 | | - | - | | 50-145 | - | | 35 |
| General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG805620-4 QC Sample: L1517008-02 Client ID: MS Sample | | | | | | | | | | | | |
| Total Organic Carbon | ND | 800 | 860 | 107 | | - | - | | 80-120 | - | | 20 |
| General Chemistry - Westborough Lab Associated sample(s): 02 QC Batch ID: WG805651-4 QC Sample: L1517149-01 Client ID: MS Sample | | | | | | | | | | | | |
| Total Organic Carbon | 22 | 160 | 190 | 103 | | - | - | | 80-120 | - | | 20 |

# Lab Duplicate Analysis

## Batch Quality Control

**Project Name:** ORRINGTON REMEDIATION SITE
**Project Number:** Not Specified

**Lab Number:** L1517090
**Report Date:** 07/31/15

| Parameter | Native Sample | Duplicate Sample | Units | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG805519-3 QC Sample: L1515003-84 Client ID: DUP Sample | | | | | | |
| BOD, 5 day | 130 | 150 | mg/l | 14 | | 35 |
| General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG805535-2 QC Sample: L1517090-01 Client ID: SD-SC-8-9-10 DEWATERING | | | | | | |
| pH | 7.7 | 7.7 | SU | 0 | | 5 |
| General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG805620-3 QC Sample: L1517008-01 Client ID: DUP Sample | | | | | | |
| Total Organic Carbon | ND | ND | mg/l | NC | | 20 |
| General Chemistry - Westborough Lab Associated sample(s): 02 QC Batch ID: WG805651-3 QC Sample: L1517149-01 Client ID: DUP Sample | | | | | | |
| Total Organic Carbon | 22 | 22 | mg/l | 0 | | 20 |
| General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG806136-3 QC Sample: L1517175-01 Client ID: DUP Sample | | | | | | |
| Solids, Total Dissolved | 58 | 63 | mg/l | 8 | | 17 |
| General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG806140-2 QC Sample: L1517090-01 Client ID: SD-SC-8-9-10 DEWATERING | | | | | | |
| Solids, Total Suspended | 1500 | 1500 | mg/l | 0 | | 29 |

## Sample Receipt and Container Information

Were project specific reporting limits specified? YES

**Reagent H2O Preserved Vials Frozen on:** NA

### Cooler Information

| Cooler | Custody Seal |
|---|---|
| A | Absent |

### Container Information

| Container ID | Container Type | Cooler | pH | Temp deg C | Pres | Seal | Analysis(*) |
|---|---|---|---|---|---|---|---|
| L1517090-01A | Vial H2SO4 preserved | A | N/A | 2.8 | Y | Absent | TOC-9060(28) |
| L1517090-01B | Vial H2SO4 preserved | A | N/A | 2.8 | Y | Absent | TOC-9060(28) |
| L1517090-01C | Plastic 250ml HNO3 preserved | A | <2 | 2.8 | Y | Absent | AS-TI(180),BA-TI(180),AG-TI(180),CR-TI(180),PB-TI(180),SE-TI(180),HG-T(28),CD-TI(180) |
| L1517090-01D | Plastic 950ml unpreserved | A | 7 | 2.8 | Y | Absent | PH-9040(1),ME-BOD-5210(1),TDS-2540(7) |
| L1517090-01E | Plastic 950ml unpreserved | A | 7 | 2.8 | Y | Absent | TSS-2540(7) |
| L1517090-02A | Vial H2SO4 preserved | A | N/A | 2.8 | Y | Absent | TOC-9060(28) |
| L1517090-02B | Vial H2SO4 preserved | A | N/A | 2.8 | Y | Absent | TOC-9060(28) |
| L1517090-02C | Plastic 250ml HNO3 preserved | A | <2 | 2.8 | Y | Absent | AS-TI(180),BA-TI(180),AG-TI(180),CR-TI(180),PB-TI(180),SE-TI(180),HG-T(28),CD-TI(180) |
| L1517090-02D | Plastic 950ml unpreserved | A | 7 | 2.8 | Y | Absent | PH-9040(1),ME-BOD-5210(1),TDS-2540(7) |

*Values in parentheses indicate holding time in days

## GLOSSARY

### *Acronyms*

EDL - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).

EPA - Environmental Protection Agency.

LCS - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LCSD - Laboratory Control Sample Duplicate: Refer to LCS.

LFB - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

MDL - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

MS - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.

MSD - Matrix Spike Sample Duplicate: Refer to MS.

NA - Not Applicable.

NC - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.

NI - Not Ignitable.

NP - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.

RL - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

RPD - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.

SRM - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

TIC - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

### *Footnotes*

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

### *Terms*

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

### *Data Qualifiers*

**A** - Spectra identified as "Aldol Condensation Product".

**B** - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

**C** - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

***Data Qualifiers***

**D** - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

**E** - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

**G** - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

**H** - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

**I** - The lower value for the two columns has been reported due to obvious interference.

**M** - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

**NJ** - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

**P** - The RPD between the results for the two columns exceeds the method-specified criteria.

**Q** - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

**R** - Analytical results are from sample re-analysis.

**RE** - Analytical results are from sample re-extraction.

**S** - Analytical results are from modified screening analysis.

**J** - Estimated value. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

**ND** - Not detected at the reporting limit (RL) for the sample.

## REFERENCES

| | |
|---|---|
| 1 | Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - IV, 2007. |
| 30 | Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WPCF. 18th Edition. 1992. |

## LIMITATION OF LIABILITIES

# Certification Information

Last revised December 16, 2014

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**The following analytes are not included in our NELAP Scope of Accreditation:**

**Westborough Facility**
**EPA 524.2:** Acetone, 2-Butanone (Methyl ethyl ketone (MEK)), Tert-butyl alcohol, 2-Hexanone, Tetrahydrofuran, 1,3,5-Trichlorobenzene, 4-Methyl-2-pentanone (MIBK), Carbon disulfide, Diethyl ether.
**EPA 8260C:** 1,2,4,5-Tetramethylbenzene, 4-Ethyltoluene, Iodomethane (methyl iodide), Methyl methacrylate, Azobenzene.
**EPA 8270D:** 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine.
**EPA 625:** 4-Chloroaniline, 4-Methylphenol.
**SM4500**: Soil: Total Phosphorus, TKN, NO2, NO3.
**EPA 9071:** Total Petroleum Hydrocarbons, Oil & Grease.

**Mansfield Facility**
**EPA 8270D:** Biphenyl.
**EPA 2540D:** TSS
**EPA TO-15:** Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.

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**The following analytes are included in our Massachusetts DEP Scope of Accreditation, Westborough Facility:**

***Drinking Water***
**EPA 200.8**: Sb,As,Ba,Be,Cd,Cr,Cu,Pb,Ni,Se,Tl; **EPA 200.7**: Ba,Be,Ca,Cd,Cr,Cu,Na; **EPA 245.1:** Mercury;
**EPA 300.0**: Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B**
**EPA 332**: Perchlorate.
**Microbiology**: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT, Enterolert-QT.**

***Non-Potable Water***
**EPA 200.8**: Al,Sb,As,Be,Cd,Cr,Cu,Pb,Mn,Ni,Se,Ag,Tl,Zn;
**EPA 200.7**: Al,Sb,As,Be,Cd,Ca,Cr,Co,Cu,Fe,Pb,Mg,Mn,Mo,Ni,K,Se,Ag,Na,Sr,Ti,Tl,V,Zn;
**EPA 245.1, SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2340B, SM2320B, SM4500CL-E, SM4500F-BC, SM426C, SM4500NH3-BH**, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500NH3-BC-NES, EPA 351.1, SM4500P-E, SM4500P-B, E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, SM14 510AC, EPA 420.1, SM4500-CN-CE, SM2540D.**
**EPA 624**: Volatile Halocarbons & Aromatics,
**EPA 608**: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
**EPA 625**: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
**Microbiology**: **SM9223B-Colilert-QT; Enterolert-QT, SM9222D-MF**.

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For a complete listing of analytes and methods, please contact your Alpha Project Manager.

# CHAIN OF CUSTODY

PAGE 1 OF 1

Date Rec'd in Lab: 7/23/15

ALPHA Job #: L1517090

ALPHA ANALYTICAL

8 Walkup Drive
Westboro, MA 01581
Tel: 508-898-9220

320 Forbes Blvd
Mansfield, MA 02048
Tel: 508-822-9300

## Client Information

Client: CDM Smith

Address: 153 South St
Somerville, MA 02142

Phone: 617-452-6860

Email: thompsonad@cdmsmith.com

Additional Project Information:

## Project Information

Project Name: Orrington, ME Remediation

Project Location: Orrington, ME

Project #:

Project Manager: Andrew Thompson

ALPHA Quote #:

## Turn-Around Time

☑ Standard ☐ RUSH *(only confirmed if pre-approved!)*

Date Due:

## Report Information - Data Deliverables

☒ ADEx ☐ EMAIL

## Billing Information

☐ Same as Client info PO #:

## Regulatory Requirements & Project Information Requirements

☐ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☐ No CT RCP Analytical Methods
☐ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)
☐ Yes ☐ No GW1 Standards (Info Required for Metals & EPH with Targets)
☐ Yes ☐ No NPDES RGP
☐ Other State /Fed Program ______ Criteria ______

**SAMPLE INFO**

*Filtration*
☐ Field
☐ Lab to do

*Preservation*
☐ Lab to do

| ALPHA Lab ID (Lab Use Only) | Sample ID | Collection Date | Collection Time | Sample Matrix | Sampler Initials | ANALYSIS VOC: ☐ 8260 ☐ 624 ☐ 524.2 | SVOC: ☐ ABN ☐ PAH | METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15 | METALS: ☐ RCRA5 ☒ RCRA8 ☐ PP13 | EPH: ☐ Ranges & Targets ☐ Ranges Only | VPH: ☐ Ranges & Targets ☐ Ranges Only | ☐ PCB ☐ PEST | TPH: ☐ Quant Only ☐ Fingerprint | TSS | pH, TDS, BOD | TRCRA8 | TOC | | | Sample Comments | TOTAL # BOTTLES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17090.01 | SD-SC-8-9-10 Dewatering | 7/23/15 | 800 | E | ADT | | | | AA ADT | | | | | X | X | X | X | | | | |
| .02 | SD-SC-7 Dewatering | 7/23/15 | 800 | E | ADT | | | | AA ADT | | | | | | X | X | X | | | | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Container Type | | | | | | | | | P | P | P | A | | |
| Preservative | | | | | | | | | A | A | C | D | | |

*Container Type*
P= Plastic
A= Amber glass
V= Vial
G= Glass
B= Bacteria cup
C= Cube
O= Other
E= Encore
D= BOD Bottle

*Preservative*
A= None
B= HCl
C= $HNO_3$
D= $H_2SO_4$
E= NaOH
F= MeOH
G= $NaHSO_4$
H = $Na_2S_2O_3$
I= Ascorbic Acid
J = $NH_4Cl$
K= Zn Acetate
O= Other

| Relinquished By: | Date/Time | Received By: | Date/Time |
|---|---|---|---|
| Andrew Thompson | 7/23/15 800 | | 7/23/15 1115 |
| | 7/23/15 1820 | | 7/23/15 18:20 |

All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 12-Mar-2012)

# A.6: Mercury Data Report

## Attachment A.6
## Mercury Data Report

| | | | | ALPHA Analytics | | | | | | Orrington Field Lab | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Mercury | | Total Organic Carbon | | Total Solids | | Mercury (DMA) | | Total Solids | |
| **Location ID** | **Sample ID** | **Depth (feet)** | **Sample Date** | ***Concentration*** | ***Lab qualifiers*** | ***Concentration*** | ***Lab qualifiers*** | ***Concentration*** | ***Lab qualifiers*** | ***Concentration*** | ***Lab qualifiers*** | ***Concentration*** | ***Lab qualifiers*** |
| SD-SC-07 | SD-SC-07-150618-0-24 | 0-2 | 6/18/2015 | 2.10 | | 0.18 | | 87.70 | | | | | |
| SD-SC-07 | SD-SC-07-150618-30-36 | 2.5-3 | 6/18/2015 | 13.00 | | | | 86.90 | | | | | |
| SD-SC-07A | SD-SC-07A-150618-0.9-1 | 0.9-1 | 6/18/2015 | | | | | 92.20 | | | | | |
| SD-SC-07B | SD-SC-07B-150618-1-1.5 | 1-1.5 | 6/18/2015 | | | | | 86.80 | | | | | |
| SD-SC-07C | SD-SC-07C-150619-1-1.5 | 1-1.5 | 6/19/2015 | | | | | 79.80 | | | | | |
| SD-SC-07D | SD-SC-07D-150618-1-1.5 | 1-1.5 | 6/18/2015 | | | | | 84.70 | | | | | |
| SD-SC-07E | SD-SC-07E-150618-1-1.5 | 1-1.5 | 6/18/2015 | | | | | 89.60 | | | | | |
| SD-SC-08 | SD-SC-08-150618-0-24 | 0-2 | 6/18/2015 | 24.00 | | 1.18 | | 77.70 | | | | | |
| SD-SC-08 | SD-SC-08-150618-30-36 | 2.5-3 | 6/18/2015 | 0.06 | J | | | 84.50 | | | | | |
| SD-SC-09 | SD-SC-09-150616-0-25 | 0-2.08 | 6/16/2015 | 15.00 | | 8.55 | | 42.20 | | | | | |
| SD-SC-09 | SD-SC-09-150616-30-33 | 2.5-2.75 | 6/16/2015 | 0.04 | J | | | 88.20 | | | | | |
| SD-SC-10 | BD-1506191325 | 0-1.5 | 6/19/2015 | 12.00 | | 4.69 | | 35.20 | | | | | |
| SD-SC-10 | SD-SC-10-150619-0-18 | 0-1.5 | 6/19/2015 | 4.00 | | 7.16 | | 44.40 | | | | | |
| SD-SC-10 | SD-SC-10-150619-18-20 | 1.5-1.67 | 6/19/2015 | 0.05 | J | | | 87.60 | | | | | |
| SD-SC-11 | SD-SC-11-150616-0.2-1 | 0.8-1 | 6/16/2015 | 0.06 | J | | | 77.50 | | | | | |
| SD-SC-12 | SD-SC-12-150616-0.8-1 | 0.8-1 | 6/16/2015 | 0.39 | | | | 71.40 | | | | | |
| SD-SC-13 | SD-SC-13-150616-0.8-1 | 0.8-1 | 6/16/2015 | 0.04 | J | | | 85.80 | | | | | |
| SD-SC-14 | SD-SC-14-150616-0.8-1 | 0.8-1 | 6/16/2015 | 0.46 | | | | 76.00 | | | | | |
| SD-SC-15 | SD-SC-15-150619-0-0.2 | 0-0.2 | 6/19/2015 | 1.10 | | | | 26.60 | | | | | |
| SD-SC-16 | SD-SC-16-150619-0-0.2 | 0-0.2 | 6/19/2015 | 1.50 | | | | 25.50 | | | | | |
| SD-SC-17 | BD-1506191340 | 0-0.2 | 6/19/2015 | 1.50 | | | | 29.90 | | | | | |
| SD-SC-17 | SD-SC-17-150619-0-0.2 | 0-0.2 | 6/19/2015 | 1.60 | | | | 26.70 | | | | | |
| SD-SC-18 | BD-1506191341 | 0-0.2 | 6/19/2015 | 0.81 | | | | 29.60 | | | | | |
| SD-SC-18 | SD-SC-18-150619-0-0.2 | 0-0.2 | 6/19/2015 | 1.10 | | | | 24.40 | | | | | |
| SD-SC-19 | SD-SC-19-150617-0.2-0.8 | 0.2-0.8 | 6/17/2015 | 2.30 | | | | 38.90 | | | | | |
| SD-SC-20 | SD-SC-20-150922-0-0.2 | 0-0.2 | 9/22/2015 | 0.75 | | | | 23.80 | | | | | |
| SD-SC-22 | BD-1509220000 | 0-0.2 | 9/22/2015 | 0.91 | | | | 24.80 | | | | | |
| SD-SC-22 | SD-SC-22-150922-0.8-1 | 0.8-1 | 9/22/2015 | 1.70 | | | | 31.40 | | | | | |
| SD-SC-22 | SD-SC-22-150922-0-0.2 | 0-0.2 | 9/22/2015 | 1.00 | | | | 23.30 | | | | | |
| SD-SC-23 | SD-SC-23-150922-0.8-1 | 0.8-1 | 9/22/2015 | 0.02 | J | | | 78.90 | | | | | |
| SD-SC-24 | SD-SC-24-150922-0.8-1 | 0.8-1 | 9/22/2015 | 0.21 | | | | 45.20 | | | | | |
| SD-SC-25 | SD-SC-25-150922-0.8-1 | 0.8-1 | 9/22/2015 | 0.09 | U | | | 78.70 | | | | | |
| SD-SC-26 | BD-1605031500 | 0-0.2 | 5/3/2016 | | | | | | | 0.59 | U | 85.02 | |
| SD-SC-26 | BD-1605031512 | 1-1.3 | 5/3/2016 | | | | | | | 0.55 | U | 90.42 | |
| SD-SC-26 | SD-SC-26-160503-0.8-1 | 0.8-1 | 5/3/2016 | | | | | | | 0.56 | U | 88.52 | |
| SD-SC-26 | SD-SC-26-160503-0-0.2 | 0-0.2 | 5/3/2016 | | | | | | | 0.60 | U | 83.05 | |
| SD-SC-26 | SD-SC-26-160503-1-1.3 | 1-1.3 | 5/3/2016 | | | | | | | 0.56 | U | 89.19 | |
| SD-SC-27 | SD-SC-27-160503-0.8-1 | 0.8-1 | 5/3/2016 | | | | | | | 0.52 | J | 87.43 | |
| SD-SC-27 | SD-SC-27-160503-0-0.2 | 0-0.2 | 5/3/2016 | | | | | | | 0.59 | U | 84.08 | |
| SD-SC-27 | SD-SC-27-160503-1-1.3 | 1-1.3 | 5/3/2016 | | | | | | | 0.56 | U | 88.89 | |
| SD-SC-27 | SD-SC-27-160503-1-1.3-LR | 1-1.3 | 5/3/2016 | | | | | | | 0.56 | U | 89.60 | |

# Attachment A.6
# Mercury Data Report

| | | | | ALPHA Analytics | | | | | | Orrington Field Lab | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Mercury | | Total Organic Carbon | | Total Solids | | Mercury (DMA) | | Total Solids | |
| **Location ID** | **Sample ID** | **Depth (feet)** | **Sample Date** | ***Concentration*** | ***Lab qualifiers*** | ***Concentration*** | ***Lab qualifiers*** | ***Concentration*** | ***Lab qualifiers*** | ***Concentration*** | ***Lab qualifiers*** | ***Concentration*** | ***Lab qualifiers*** |
| SD-SC-28 | SD-SC-28-160504-0.8-1 | 0.8-1 | 5/4/2016 | | | | | | | 43.68 | | 51.27 | |
| SD-SC-28 | SD-SC-28-160504-0-0.2 | 0-0.2 | 5/4/2016 | | | | | | | 1.36 | | 39.52 | |
| SD-SC-28 | SD-SC-28-160504-1-1.4 | 1-1.4 | 5/4/2016 | 110.00 | | | | 39.80 | | 105.84 | | 40.24 | |
| SD-SC-29 | BD-1605040940 | 0-0.2 | 5/4/2016 | 2.10 | | | | 29.60 | | | | | |
| SD-SC-29 | SD-SC-29-160504-0.8-1 | 0.8-1 | 5/4/2016 | | | | | | | 3.69 | | 30.36 | |
| SD-SC-29 | SD-SC-29-160504-0-0.2 | 0-0.2 | 5/4/2016 | 2.00 | | | | 29.20 | | 2.22 | | 29.76 | |
| SD-SC-29 | SD-SC-29-160504-1-1.5 | 1-1.5 | 5/4/2016 | | | | | | | 23.15 | | 39.91 | |
| SD-SC-30 | SD-SC-30-160504-0.8-1 | 0.8-1 | 5/4/2016 | | | | | | | 22.13 | | 34.04 | |
| SD-SC-30 | SD-SC-30-160504-0-0.2 | 0-0.2 | 5/4/2016 | | | | | | | 1.09 | J | 28.63 | |
| SD-SC-30 | SD-SC-30-160504-1-1.3 | 1-1.3 | 5/4/2016 | | | | | | | 43.71 | | 46.60 | |
| SD-SC-30 | SD-SC-30-160504-1-1.3-LR | 1-1.3 | 5/4/2016 | | | | | | | 32.87 | | 44.00<br>42.12 | |
| SD-SC-31 | SD-SC-31-160503-0.5-1 | 0.5-1 | 5/3/2016 | | | | | | | 0.58 | U | 86.12 | |
| SD-SC-31 | SD-SC-31-160503-0.5-1-LR | 0.5-1 | 5/3/2016 | | | | | | | | | 86.57 | |
| SD-SC-31 | SD-SC-31-160503-0-0.5 | 0-0.5 | 5/3/2016 | | | | | | | 0.52 | J | 64.45 | |
| SD-SC-31 | SD-SC-31-160503-1.5-2 | 1.5-2 | 5/3/2016 | | | | | | | 0.57 | U | 88.18 | |
| SD-SC-31 | SD-SC-31-160503-1-1.5 | 1-1.5 | 5/3/2016 | | | | | | | 0.56 | U | 89.74 | |
| SD-SC-32 | SD-SC-32-160503-0.5-1 | 0.5-1 | 5/3/2016 | | | | | | | 0.66 | U | 75.59 | |
| SD-SC-32 | SD-SC-32-160503-0-0.5 | 0-0.5 | 5/3/2016 | | | | | | | 0.44 | J | 70.40 | |
| SD-SC-32 | SD-SC-32-160503-1-1.5 | 1-1.5 | 5/3/2016 | | | | | | | 0.67 | U | 74.86 | |
| SD-SC-33 | SD-SC-33-160503-0.5-1 | 0.5-1 | 5/3/2016 | | | | | | | 0.58 | U | 86.16 | |
| SD-SC-33 | SD-SC-33-160503-0-0.5 | 0-0.5 | 5/3/2016 | | | | | | | 1.29 | | 52.33 | |
| SD-SC-33 | SD-SC-33-160503-1.5-2 | 1.5-2 | 5/3/2016 | | | | | | | 0.56 | U | 88.67 | |
| SD-SC-33 | SD-SC-33-160503-1-1.5 | 1-1.5 | 5/3/2016 | | | | | | | 0.56 | U | 88.67 | |
| SD-SC-33 | SD-SC-33-160503-2-2.5 | 2-2.5 | 5/3/2016 | | | | | | | 0.56 | U | 89.32 | |
| SD-SC-33 | SD-SC-33-160503-2-2.5-LR | 2-2.5 | 5/3/2016 | | | | | | | 0.56 | U | 88.82 | |
| SD-SC-34 | SD-SC-34-160503-0.5-1 | 0.5-1 | 5/3/2016 | | | | | | | 6.05 | | 68.82 | |
| SD-SC-34 | SD-SC-34-160503-0-0.5 | 0-0.5 | 5/3/2016 | | | | | | | 5.25 | | 61.04 | |
| SD-SC-34 | SD-SC-34-160503-1-1.5 | 1-1.5 | 5/3/2016 | | | | | | | 3.77 | | 88.79 | |
| SD-SC-35 | SD-SC-35-160503-0.5-1 | 0.5-1 | 5/3/2016 | | | | | | | 0.59 | U | 85.25 | |
| SD-SC-35 | SD-SC-35-160503-0-0.5 | 0-0.5 | 5/3/2016 | | | | | | | 0.58 | U | 86.44 | |
| SD-SC-35 | SD-SC-35-160503-1.5-2 | 1.5-2 | 5/3/2016 | | | | | | | 0.64 | U | 77.61 | |
| SD-SC-35 | SD-SC-35-160503-1-1.5 | 1-1.5 | 5/3/2016 | | | | | | | 0.61 | U | 82.30 | |
| SD-SC-35 | SD-SC-35-160503-2-2.5 | 2-2.5 | 5/3/2016 | | | | | | | 0.65 | U | 76.96 | |
| SD-SC-36 | SD-SC-36-160504-0.8-1 | 0.8-1 | 5/4/2016 | | | | | | | 31.85 | | 41.73 | |
| SD-SC-36 | SD-SC-36-160504-0-0.2 | 0-0.2 | 5/4/2016 | | | | | | | 1.32 | J | 33.98 | |
| SD-SC-36 | SD-SC-36-160504-1-1.2 | 1-1.2 | 5/4/2016 | | | | | | | 4.38 | | 31.27 | |
| SD-SC-36 | SD-SC-36-160504-1-1.2-LR | 1-1.2 | 5/4/2016 | | | | | | | 4.15 | | | |
| SD-SC-37 | SD-SC-37-160504-0.8-1 | 0.8-1 | 5/4/2016 | | | | | | | 5.21 | | 37.22 | |
| SD-SC-37 | SD-SC-37-160504-0-0.2 | 0-0.2 | 5/4/2016 | | | | | | | 0.81 | J | 47.37 | |
| SD-SC-37 | SD-SC-37-160504-1-1.5 | 1-1.5 | 5/4/2016 | | | | | | | 108.63 | | 45.78 | |

# Attachment A.6
# Mercury Data Report

| | | | | ALPHA Analytics | | | | | | Orrington Field Lab | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Mercury | | Total Organic Carbon | | Total Solids | | Mercury (DMA) | | Total Solids | |
| **Location ID** | **Sample ID** | **Depth (feet)** | **Sample Date** | ***Concentration*** | ***Lab qualifiers*** | ***Concentration*** | ***Lab qualifiers*** | ***Concentration*** | ***Lab qualifiers*** | ***Concentration*** | ***Lab qualifiers*** | ***Concentration*** | ***Lab qualifiers*** |
| SD-SC-38 | SD-SC-38-160504-0.2-0.5 | 0.2-0.5 | 5/4/2016 | | | | | | | 2.46 | | 52.87 | |
| SD-SC-38 | SD-SC-38-160504-0-0.2 | 0-0.2 | 5/4/2016 | | | | | | | 1.21 | | 48.31 | |
| SD-SC-39 | SD-SC-39-160504-0.8-1 | 0.8-1 | 5/4/2016 | | | | | | | 3.10 | | 42.73 | |
| SD-SC-39 | SD-SC-39-160504-0.8-1-LR | 0.8-1 | 5/4/2016 | | | | | | | | | 40.43<br>42.37 | |
| SD-SC-39 | SD-SC-39-160504-0-0.2 | 0-0.2 | 5/4/2016 | | | | | | | 1.97 | | 33.92 | |
| SD-SC-40 | BD-1605041515 | 0-0.2 | 5/4/2016 | | | | | | | 1.53 | J | 28.69 | |
| SD-SC-40 | SD-SC-40-160504-0.8-1 | 0.8-1 | 5/4/2016 | | | | | | | 0.89 | U | 56.13 | |
| SD-SC-40 | SD-SC-40-160504-0.8-1-LR | 0.8-1 | 5/4/2016 | | | | | | | | | 56.52 | |
| SD-SC-40 | SD-SC-40-160504-0-0.2 | 0-0.2 | 5/4/2016 | | | | | | | 1.55 | J | 28.14 | |

# A.7: Data Usability Assessment

# DATA USABILITY ASSESSMENT
# ORRINGTON SOUTHERN COVE
# PRE-DESIGN ACTIVITIES

**Prepared for**

Southern Cove
Orrington Remediation Site
Maine

**Prepared by**

Anchor QEA, LLC
9 Water Street
Amesbury, Massachusetts 01913

**June 2016**

# TABLE OF CONTENTS

## List of Tables

# LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| Alpha | Alpha Analytical |
| COC | chain-of-custody |
| DQO | data quality objective |
| DUA | Data Usability Assessment |
| DVR | data validation report |
| Geosyntec | Geosyntec Consultants Field Direct Mercury Analyzer-80 Laboratory |
| LCS/LCSD | laboratory control sample/laboratory control sample duplicate |
| MDL | method detection limit |
| MS/MSD | matrix spike/matrix spike duplicate |
| PARCCS | precision, accuracy, representativeness, comparability, completeness, and sensitivity |
| PQL | project quantitation limit |
| QAPP | Quality Assurance Project Plan |
| QC | quality control |
| RPD | relative percent difference |
| SDG | sample delivery group |
| SM | Standard Method |
| TCLP | Toxicity Characteristic Leaching Procedure |
| USEPA | U.S. Environmental Protection Agency |

# EXECUTIVE SUMMARY

The laboratory analytical data assessed for this Data Usability Assessment (DUA) were collected by Anchor QEA, LLC, during three sampling events in June 2015, September 2015, and May 2016 to support pre-design activities for remediation of the Southern Cove at the Orrington Remediation Site. Data were assessed during this process, and results were qualified as necessary based on the laboratory information provided and per the guidance referenced by the following:

- Orrington Remediation Site Quality Assurance Project Plan (Woodard & Curran 2014)
- U.S. Environmental Protection Agency (USEPA) New England Environmental Data Review Supplement for Region l, Data Review Elements and Superfund Specific Guidance (USEPA 2013)
- USEPA National Functional Guidelines for Organic and Inorganic Data Review (2014a, 2014b)

Samples collected in 2015 were analyzed by Alpha Analytical (Alpha) located in Westborough, Massachusetts, and samples collected in 2016 were analyzed by Geosyntec Consultants Field Direct Mercury Analyzer-80 Laboratory (Geosyntec) located at the Orrington Remediation Site, with duplicate samples submitted to Alpha. Analytical reports and associated electronic data deliverables for the fixed base and field laboratory analyses of the data for the project are included in the project database managed by Anchor QEA. Some sample data were qualified due to non-conformances in the associated laboratory and field quality control (QC) results. These non-conformances and the data qualifiers applied are detailed in the data validation reports. No overall directional bias was evident in the QC samples associated with the laboratory analytical results, and none of the data were rejected. Qualifications of the data are listed and discussed in the following sections. Sample-specific result concentrations and qualifications for each result are contained in the project database. The data reported in the sample delivery groups listed in the following sections are adequate for their intended purposes, as reported or as qualified.

# 1 INTRODUCTION

The Data Usability Assessment (DUA) is an evaluation to determine if the analytical data are of sufficient quality for the intended purpose. The DUA uses the results of the data validation reports (DVRs) and evaluates the quality of the analytical data in relation to the project-specific data quality objectives (DQOs) and the intended use of the data. One of the primary purposes of the DUA is to determine if any bias that might be present in the analytical results, as identified in the DVRs, affects the usability of the data for the intended purpose.

Laboratory data quality was assessed using the DQOs and performance criteria detailed in the Quality Assurance Project Plan (QAPP) and U.S. Environmental Protection Agency (USEPA) guidance documents listed in the previous section. Data were assessed using the specifications for Tier 1 Plus validation listed in the USEPA New England Environmental Data Review Supplement (USEPA 2013). Analytical DQOs and performance criteria are used to standardize the minimum quality assurance/quality control and reporting documentation expected for analytical laboratory data. The specifications of the Work Plan, Southern Cove, Orrington Remediation Site (Work Plan; Anchor QEA and CDM Smith 2015) and adherence to the QAPP result in samples that have been collected properly and are representative of the site location to the greatest extent possible. Laboratory data that conform to analytical performance criteria and the DQOs specified by the QAPP provide confidence that data are of known and documented quality. Laboratory and field QC samples were assessed and qualifications were applied to the associated sample data when objectives were not met.

Alpha Analytical (Alpha) in Westborough, Massachusetts, and Geosyntec Consultants Field Direct Mercury Analyzer-80 Laboratory (Geosyntec) analyzed the samples and provided analytical reports and associated electronic data deliverables for the fixed base and field laboratory analyses of the data for the project. Alpha sample delivery group (SDG) numbers L1513997, L1523582, L1613439, L1613456, and L1613587, and Geosyntec SDG numbers 05032016, 05042016, and 05052016, were reviewed in the DVRs, and results are summarized in this DUA. The samples were analyzed for the following parameters:

- Mercury by USEPA methods 7473, 7471B, and 7470A
- Chloropicrin by USEPA method 8260C

- Total organic carbon by USEPA method 9060A
- Total solids by Standard Method (SM) 2540G
- Reactive sulfide and cyanide by USEPA SW846 Chapter 7.3
- Flash point by USEPA method 1010
- Sulfate by USEPA method 9038
- Chloride by USEPA method 9251
- pH by USEPA method 9045D
- Toxicity Characteristic Leaching Procedure (TCLP) metals by USEPA methods 6010C and 7470A
- TCLP semivolatile organic compounds by USEPA method 8270D
- TCLP volatile organic compounds by USEPA method 8260C
- TCLP pesticides by USEPA method 8081B
- TCLP herbicides by USEPA method 8151A

Sample IDs, matrices, and analyses conducted are presented in Table 1.1

**Table 1.1**

**Sample IDs, Matrices, and Analyses**

| Sample ID | Lab Sample ID[1] | Matrix | Analyses Conducted |
|---|---|---|---|
| RB-1506192258 | L1513997-01, -03 | Water | Mercury, chloropicrin |
| RB-1506192259 | L1513997-02, -04 | Water | Mercury, chloropicrin |
| SD-SC-07-150618-0-24 | L1513997-05 | Sediment | TS, FP, metals, mercury, TCLP pesticides, TCLP herbicides, TCLP VOCs, TCLP SVOCs, $S^{2-}$ and CN, $SO_4^{2-}$, pH, TOC, $Cl^-$ |
| SD-SC-07-150618-30-36 | L1513997-06 | Sediment | TS, mercury |
| SD-SC-07A-150618-0.9-1 | L1513997-07 | Sediment | TS, chloropicrin |
| SD-SC-07B-150618-1-1.5 | L1513997-08 | Sediment | TS, chloropicrin |
| SD-SC-07C-150619-1-1.5 | L1513997-09 | Sediment | TS, chloropicrin |
| SD-SC-07D-150618-1-1.5 | L1513997-10 | Sediment | TS, chloropicrin |
| SD-SC-07E-150618-1-1.5 | L1513997-11 | Sediment | TS, chloropicrin |
| SD-SC-08-150618-0-24 | L1513997-12 | Sediment | TS, FP, metals, mercury, TCLP pesticides, TCLP herbicides, TCLP VOCs, TCLP SVOCs, $S^{2-}$ and CN, $SO_4^{2-}$, pH, TOC, $Cl^-$ |
| SD-SC-08-150618-30-36 | L1513997-13 | Sediment | TS, mercury |

| Sample ID | Lab Sample ID[1] | Matrix | Analyses Conducted |
|---|---|---|---|
| SD-SC-09-150616-0-25 | L1513997-14 | Sediment | TS, FP, metals, mercury, TCLP pesticides, TCLP herbicides, TCLP VOCs, TCLP SVOCs, $S^{2-}$ and CN, $SO_4^{2-}$, pH, TOC, $Cl^-$ |
| SD-SC-09-150616-30-33 | L1513997-15 | Sediment | TS, mercury |
| BD-1506191325 | L1513997-16 | Sediment | TS, FP, metals, mercury, TCLP pesticides, TCLP herbicides, TCLP VOCs, TCLP SVOCs, $S^{2-}$ and CN, $SO_4^{2-}$, pH, TOC, $Cl^-$ |
| SD-SC-10-150619-0-18 | L1513997-17 | Sediment | TS, FP, metals, mercury, TCLP pesticides, TCLP herbicides, TCLP VOCs, TCLP SVOCs, $S^{2-}$ and CN, $SO_4^{2-}$, pH, TOC, $Cl^-$ |
| SD-SC-10-150619-18-20 | L1513997-18 | Sediment | TS, mercury |
| SD-SC-11-150616-0.2-1 | L1513997-19 | Sediment | TS, mercury |
| SD-SC-12-150616-0.8-1 | L1513997-20 | Sediment | TS, mercury |
| SD-SC-13-150616-0.8-1 | L1513997-21 | Sediment | TS, mercury |
| SD-SC-14-150616-0.8-1 | L1513997-22 | Sediment | TS, mercury |
| SD-SC-15-150619-0-0.2 | L1513997-23 | Sediment | TS, mercury |
| SD-SC-16-150619-0-0.2 | L1513997-24 | Sediment | TS, mercury |
| BD-1506191340 | L1513997-25 | Sediment | TS, mercury |
| SD-SC-17-150619-0-0.2 | L1513997-26 | Sediment | TS, mercury |
| BD-1506191341 | L1513997-27 | Sediment | TS, mercury |
| SD-SC-18-150619-0-0.2 | L1513997-28 | Sediment | TS, mercury |
| SD-SC-19-150617-0.2-0.8 | L1513997-29 | Sediment | TS, mercury |
| TB-150619 | L1513997-30 | Water | Chloropicrin |
| RB-1509220000 | L1523582-01 | Water | Mercury |
| RB-1509220001 | L1523582-02 | Water | Mercury |
| SD-SC-20-150922-0-0.2 | L1523582-03 | Sediment | Mercury, TS |
| BD-1509220000 | L1523582-04 | Sediment | Mercury, TS |
| SD-SC-22-150922-0-0.2 | L1523582-05 | Sediment | Mercury, TS |
| SD-SC-22-150922-0.8-1 | L1523582-06 | Sediment | Mercury, TS |
| SD-SC-23-150922-0.8-1 | L1523582-07 | Sediment | Mercury, TS |
| SD-SC-24-150922-0.8-1 | L1523582-09 | Sediment | Mercury, TS |
| SD-SC-25-150922-0.8-1 | L1523582-11 | Sediment | Mercury, TS |
| RB-1605031535 | L1613439-01 | Water | Mercury, TS |
| RB-1605031540 | L1613439-02 | Water | Mercury, TS |
| SD-SC-34-160503-0-0.5 | -- | Sediment | Mercury, TS |
| SD-SC-34-160503-0.5-1 | -- | Sediment | Mercury, TS |
| SD-SC-34-160503-1-1.5 | -- | Sediment | Mercury, TS |
| SD-SC-35-160503-0-0.5 | -- | Sediment | Mercury, TS |

| Sample ID | Lab Sample ID[1] | Matrix | Analyses Conducted |
|---|---|---|---|
| SD-SC-35-160503-0.5-1 | -- | Sediment | Mercury, TS |
| SD-SC-35-160503-1-1.5 | -- | Sediment | Mercury, TS |
| SD-SC-35-160503-1.5-2 | -- | Sediment | Mercury, TS |
| SD-SC-35-160503-2-2.5 | -- | Sediment | Mercury, TS |
| SD-SC-31-160503-0-0.5 | -- | Sediment | Mercury, TS |
| SD-SC-31-160503-0.5-1 | -- | Sediment | Mercury, TS |
| SD-SC-31-160503-1-1.5 | -- | Sediment | Mercury, TS |
| SD-SC-31-160503-1.5-2 | -- | Sediment | Mercury, TS |
| SD-SC-32-160503-0-0.5 | -- | Sediment | Mercury, TS |
| SD-SC-32-160503-0.5-1 | -- | Sediment | Mercury, TS |
| SD-SC-32-160503-1-1.5 | -- | Sediment | Mercury, TS |
| SD-SC-33-160503-0-0.5 | -- | Sediment | Mercury, TS |
| SD-SC-33-160503-0.5-1 | -- | Sediment | Mercury, TS |
| SD-SC-33-160503-1-1.5 | -- | Sediment | Mercury, TS |
| SD-SC-33-160503-1.5-2 | -- | Sediment | Mercury, TS |
| SD-SC-33-160503-2-2.5 | -- | Sediment | Mercury, TS |
| SD-SC-26-160503-0-0.2 | -- | Sediment | Mercury, TS |
| SD-SC-26-160503-0.8-1 | -- | Sediment | Mercury, TS |
| SD-SC-26-160503-1-1.3 | -- | Sediment | Mercury, TS |
| BD-1605031500 | -- | Sediment | Mercury, TS |
| BD-1605031512 | -- | Sediment | Mercury, TS |
| SD-SC-27-160503-0-0.2 | -- | Sediment | Mercury, TS |
| SD-SC-27-160503-0.8-1 | -- | Sediment | Mercury, TS |
| SD-SC-27-160503-1-1.3 | -- | Sediment | Mercury, TS |
| BD-1605040940 | L1613587-02 | Sediment | Mercury, TS |
| RB-1605041020 | L1613456-01 | Water | Mercury, TS |
| SD-SC-28-160504-1-1.4 | L1613587-01 | Sediment | Mercury, TS |
| SD-SC-29-160504-0-0.2 | L1613587-03 | Sediment | Mercury, TS |
| SD-SC-28-160504-0-0.2 | -- | Sediment | Mercury, TS |
| SD-SC-28-160504-0.8-1 | -- | Sediment | Mercury, TS |
| SD-SC-29-160504-0.8-1 | -- | Sediment | Mercury, TS |
| SD-SC-30-160504-0-0.2 | -- | Sediment | Mercury, TS |
| SD-SC-30-160504-0.8-1 | -- | Sediment | Mercury, TS |
| SD-SC-29-160504-1-1.5 | -- | Sediment | Mercury, TS |
| SD-SC-30-160504-1-1.3 | -- | Sediment | Mercury, TS |
| SD-SC-37-160504-0-0.2 | -- | Sediment | Mercury, TS |

| Sample ID | Lab Sample ID[1] | Matrix | Analyses Conducted |
|---|---|---|---|
| SD-SC-37-160504-0.8-1 | -- | Sediment | Mercury, TS |
| SD-SC-37-160504-1-1.5 | -- | Sediment | Mercury, TS |
| SD-SC-38-160504-0-0.2 | -- | Sediment | Mercury, TS |
| SD-SC-38-160504-0.2-0.5 | -- | Sediment | Mercury, TS |
| SD-SC-39-160504-0-0.2 | -- | Sediment | Mercury, TS |
| SD-SC-39-160504-0.8-1 | -- | Sediment | Mercury, TS |
| SD-SC-40-160504-0-0.2 | -- | Sediment | Mercury, TS |
| SD-SC-40-160504-0.8-1 | -- | Sediment | Mercury, TS |
| BD-1605041515 | -- | Sediment | Mercury, TS |
| SD-SC-36-160504-0-0.2 | -- | Sediment | Mercury, TS |
| SD-SC-36-160504-0.8-1 | -- | Sediment | Mercury, TS |
| SD-SC-36-160504-1-1.2 | -- | Sediment | Mercury, TS |

Notes:
1. Lab Sample IDs were not reported for the on-site Direct Mercury Analyzer laboratory.
-- = not applicable
$Cl^-$ = chloride
CN = cyanide
FP = flash point
$S^{2-}$ = reactive sulfide
$SO_4^{2-}$ = sulfate
SVOC = semivolatile organic compound
TCLP = Toxicity Characteristic Leaching Procedure
TOC = total organic carbon
TS = total solid
VOC = volatile organic compound

# 2 DATA USABILITY ASSESSMENT

Precision, accuracy, representativeness, comparability, completeness, and sensitivity (PARCCS) parameters are used to describe the quality of analytical data in quantitative and qualitative terms using the information provided by the laboratory QC information. Each of the PARCCS parameters as they relate to the data is discussed in the following sections.

Validation qualifiers were applied to the data to reflect the limitations of the data usability based on precision and accuracy, as follows:

- U = The analyte was analyzed but was not detected above the reported practical quantitation limit.
- J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
- UJ = The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

Qualifications of the data were applied per the cited guidance, are shown in the tables in Sections 2.1, 2.2, 2.3, and 2.5, and have also been incorporated into the project database.

The overall precision, accuracy, and sensitivity of the analytical data is discussed in the following sections.

## 2.1 Precision

Precision is defined as a measure of the reproducibility of individual measurements of the same property under a given set of conditions. It is a qualitative measure of the variability of a group of data compared to their average value. Precision is measured through the calculation of the relative percent difference (RPD) of two data sets generated from a similar source or percent relative standard deviation from multiple sets of data. These calculated precision measurements increase with decreasing sample concentrations. When the sample or duplicate result was less than five times the project quantitation limit (PQL), results were evaluated using the difference between the sample and duplicate results. Measurement of precision is achieved by the analyses of laboratory duplicates, laboratory control sample/laboratory control sample duplicate pairs (LCS/LCSD), matrix spike/matrix spike duplicate pairs (MS/MSD) and field duplicate pairs. Field and laboratory duplicate imprecision are likely due to non-homogeneity of the sample matrix but may reflect imprecision in the sampling method or in the processing and analyses of the samples.

Field and laboratory duplicates were analyzed at the frequency specified by the QAPP and analytical method. Non-detected results associated with RPD outliers were not qualified. No other RPD value outliers were reported for LCS/LCSD pairs, and no data were qualified in association with these results. Most other duplicate results were within project-required control limits. Qualifications applied due to laboratory duplicate, field duplicate, and MS/MSD RPD outliers are summarized in Tables 2.1.1 to 2.1.3.

### Table 2.1.1
### Qualifiers Applied Due to Laboratory Duplicate Outliers

| Sample ID | Parameter | Analyte | Reported | Qualified |
|---|---|---|---|---|
| BD-1506191325 | Metals | Mercury | 12 mg/kg | 12J mg/kg |
| SD-SC-07-150618-0-24 | Metals | Mercury | 2.1 mg/kg | 2.1J mg/kg |
| SD-SC-07-150618-30-36 | Metals | Mercury | 13 mg/kg | 13J mg/kg |
| SD-SC-08-150618-0-24 | Metals | Mercury | 24 mg/kg | 24J mg/kg |
| SD-SC-09-150616-0-25 | Metals | Mercury | 15 mg/kg | 15J mg/kg |
| SD-SC-19-150617-0.2-0.8 | Metals | Mercury | 2.3 mg/kg | 2.3J mg/kg |
| SD-SC-28-160504-0.8-1 | Metals | Mercury | 43.68 mg/kg | 43.68J mg/kg |
| SD-SC-28-160504-0-0.2 | Metals | Mercury | 1.36 mg/kg | 1.36J mg/kg |
| SD-SC-28-160504-1-1.4 | Metals | Mercury | 105.8 mg/kg | 105.8J mg/kg |
| SD-SC-29-160504-0.8-1 | Metals | Mercury | 3.69 mg/kg | 3.69J mg/kg |
| SD-SC-29-160504-0-0.2 | Metals | Mercury | 2.22 mg/kg | 2.22J mg/kg |
| SD-SC-29-160504-1-1.5 | Metals | Mercury | 23.15 mg/kg | 23.15J mg/kg |
| SD-SC-30-160504-0.8-1 | Metals | Mercury | 22.13 mg/kg | 22.13J mg/kg |
| SD-SC-30-160504-0-0.2 | Metals | Mercury | 1.09J mg/kg | 1.09J mg/kg |

Notes:
J = estimated result
mg/kg = milligram per kilogram

## Table 2.1.2
## Qualifiers Applied Due to Field Duplicate Outliers

| Sample ID | Parameter | Analyte | Reported Result | Qualified Result |
|---|---|---|---|---|
| BD-1506191325 | Metals | Mercury | 12 mg/kg | 12J mg/kg |
| BD-1506191325 | Conventionals | Chloride | 320 mg/kg | 320J mg/kg |
| SD-SC-07-150618-0-24 | Conventionals | Chloride | 13 mg/kg | 13J mg/kg |
| SD-SC-08-150618-0-24 | Conventionals | Chloride | 38 mg/kg | 38J mg/kg |
| SD-SC-09-150616-0-25 | Conventionals | Chloride | 430 mg/kg | 430J mg/kg |
| SD-SC-10-150619-0-18 | Conventionals | Chloride | 170 mg/kg | 170J mg/kg |
| SD-SC-10-150619-0-18 | Metals | Mercury | 4 mg/kg | 4J mg/kg |

Notes:
J = estimated
mg/kg = milligram per kilogram

## Table 2.1.3
## Qualifiers Applied Due to MS/MSD RPD Outliers

| Sample ID | Parameter | Analyte | Reported Result | Qualified Result |
|---|---|---|---|---|
| BD-1605040940 | Metals | Mercury | 2.1 mg/kg | 2.1J mg/kg |
| SD-SC-36-160504-0.8-1 | Metals | Mercury | 31.85 mg/kg | 31.85J mg/kg |
| SD-SC-36-160504-0-0.2 | Metals | Mercury | 1.32J mg/kg | 1.32J mg/kg |
| SD-SC-36-160504-1-1.2 | Metals | Mercury | 4.38 mg/kg | 4.38J mg/kg |
| SD-SC-37-160504-0.8-1 | Metals | Mercury | 5.21 mg/kg | 5.21J mg/kg |
| SD-SC-37-160504-0-0.2 | Metals | Mercury | 0.81J mg/kg | 0.81J mg/kg |
| SD-SC-37-160504-1-1.5 | Metals | Mercury | 108.6 mg/kg | 108.6J mg/kg |
| SD-SC-38-160504-0.2-0.5 | Metals | Mercury | 2.46 mg/kg | 2.46J mg/kg |
| SD-SC-38-160504-0-0.2 | Metals | Mercury | 1.21 mg/kg | 1.21J mg/kg |
| SD-SC-39-160504-0.8-1 | Metals | Mercury | 3.10 mg/kg | 3.10J mg/kg |
| SD-SC-39-160504-0-0.2 | Metals | Mercury | 1.97 mg/kg | 1.97J mg/kg |
| SD-SC-40-160504-0-0.2 | Metals | Mercury | 1.55J mg/kg | 1.55J mg/kg |

Notes:
J = estimated result
mg/kg = milligram per kilogram
MS/MSD = matrix spike/matrix spike duplicate
RPD = relative percent difference

Laboratory and field duplicates met project requirements and support the DQOs.

## 2.2 Accuracy

Accuracy is used to describe the agreement between an observed value and an accepted reference or true value. Accuracy is measured through the calculation of the percent recovery of the measured value against the expected value of initial and continuing calibration standards, internal and surrogate standards (as applicable to the method), MS samples, and LCSs.

The associated QC data did not indicate an evident high or low concentration trend. For validation purposes, the limits presented in the project-specific QAPP (Tables 7-1 through 7-14, as applicable) and validation guidance regarding control limits were used to assess the data.

Only qualified data are listed in the summary tables that follow and not all non-conformances are discussed in this DUA. If a recovery value was outside of control limits and did not result in qualification of the data, it was not included. For instance, high recoveries of compounds in MS/MSD samples or LCS/LCSDs associated with non-detect results for those compounds were not qualified. Additional details of QC non-conformances are discussed in the DVRs.

The frequencies of all accuracy measurements met the project requirements with the exception of MS/MSD analyses. No MS/MSD analyses were conducted on project samples reported in the data sets from Alpha. Geosyntec conducted MS/MSD analyses at the required frequency. All analyses were conducted within required hold times. Instances where accuracy exceeded acceptance criteria are listed in Tables 2.2.1 and 2.2.2. Applied qualifiers have been incorporated into the final database.

**Table 2.2.1**

**Qualifiers Applied Due to Continuing Calibration Verification Outliers**

| Sample ID | Parameter | Analyte | Reported Result | Qualified Result |
|---|---|---|---|---|
| BD-1506191325 | TCLP Pesticides | Methoxychlor | 1U µg/L | 1UJ µg/L |
| BD-1506191325 | TCLP VOCs | Vinyl chloride | 10U µg/L | 10UJ µg/L |
| SD-SC-07-150618-0-24 | TCLP Pesticides | Methoxychlor | 1U µg/L | 1UJ µg/L |
| SD-SC-07-150618-0-24 | TCLP VOCs | Vinyl chloride | 10U µg/L | 10UJ µg/L |

| Sample ID | Parameter | Analyte | Reported Result | Qualified Result |
|---|---|---|---|---|
| SD-SC-08-150618-0-24 | TCLP Pesticides | Methoxychlor | 1U µg/L | 1UJ µg/L |
| SD-SC-08-150618-0-24 | TCLP VOCs | Vinyl chloride | 10U µg/L | 10UJ µg/L |
| SD-SC-09-150616-0-25 | TCLP Pesticides | Methoxychlor | 1U µg/L | 1UJ µg/L |
| SD-SC-09-150616-0-25 | TCLP VOCs | Vinyl chloride | 10U µg/L | 10UJ µg/L |
| SD-SC-10-150619-0-18 | TCLP Pesticides | Methoxychlor | 1U µg/L | 1UJ µg/L |
| SD-SC-10-150619-0-18 | TCLP VOCs | Vinyl chloride | 10U µg/L | 10UJ µg/L |

Notes:
µg/L = microgram per liter
TCLP = Toxicity Characteristic Leaching Procedure
U = Analyte not detected at or above specified limit.
UJ = Analyte not detected at or above estimated limit.
VOC = volatile organic compound

**Table 2.2.2**

**Qualifiers Applied Due to Laboratory Control Sample Outliers**

| Sample ID | Parameter | Analyte | Reported Result | Qualified Result |
|---|---|---|---|---|
| BD-1506191325 | TCLP SVOCs | Nitrobenzene | 10U µg/L | 10UJ µg/L |
| SD-SC-10-150619-0-18 | TCLP SVOCs | Nitrobenzene | 10U µg/L | 10UJ µg/L |
| BD-1605040940 | Metals | Mercury | 2.1 mg/kg | 2.1J mg/kg |
| SD-SC-28-160504-1-1.4 | Metals | Mercury | 110 mg/kg | 110J mg/kg |
| SD-SC-29-160504-0-0.2 | Metals | Mercury | 2.0 mg/kg | 2.0J mg/kg |

Notes:
µg/L = microgram per liter
J = estimated result
mg/kg = milligram per kilogram
TCLP = Toxicity Characteristic Leaching Procedure
SVOC = semivolatile organic compound
U = Analyte not detected at or above specified limit.
UJ = Analyte not detected at or above estimated limit.

## 2.3 Representativeness and Comparability

Representativeness is a qualitative measurement that describes how well the analytical data characterizes an area of concern. Many factors can influence how representative the analytical results are for an area sampled. These factors include the selection of appropriate analytical procedures, the sampling plan, matrix heterogeneity, and the procedures and protocols used to collect, preserve, and transport samples.

Comparability refers to the equivalency of sets of data. This goal is achieved through the use of standard or similar techniques to collect and analyze representative samples. The three elements evaluated for comparability are analytical methods, data quality, and the sampling design. For the purposes of this DUA, the data are considered representative and comparable based on the analytical methodologies employed by the laboratories and based on the approved field sample collection and processing techniques. USEPA SW846 and SM methodology for sample preparation and analyses were listed in the laboratory reports, and the laboratory standards are traceable to known and USEPA-approved sources.

High moisture sediments may or may not be successfully analyzed by routine analytical methods. To be considered as representing soil/sediment matrices, samples should have percent solids greater than 30%. Qualifications applied due to samples that were less than 30% solids are summarized in Table 2.3.1.

**Table 2.3.1**
**Qualifiers Applied Due to Low Percent Solids**

| Sample ID | Parameter | Analyte | Reported Result | Qualified Result |
|---|---|---|---|---|
| BD-1506191340 | Metals | Mercury | 1.5 mg/kg | 1.5J mg/kg |
| BD-1506191341 | Metals | Mercury | 0.81 mg/kg | 0.81J mg/kg |
| SD-SC-15-150619-0-0.2 | Metals | Mercury | 1.1 mg/kg | 1.1J mg/kg |
| SD-SC-16-150619-0-0.2 | Metals | Mercury | 1.5 mg/kg | 1.5J mg/kg |
| SD-SC-17-150619-0-0.2 | Metals | Mercury | 1.6 mg/kg | 1.6J mg/kg |
| SD-SC-18-150619-0-0.2 | Metals | Mercury | 1.1 mg/kg | 1.1J mg/kg |
| BD-1509220000 | Metals | Mercury | 0.91 mg/kg | 0.91J mg/kg |
| SD-SC-20-150922-0-0.2 | Metals | Mercury | 0.75 mg/kg | 0.75J mg/kg |
| SD-SC-22-150922-0-0.2 | Metals | Mercury | 1.0 mg/kg | 1.0J mg/kg |
| BD-1605040940 | Metals | Mercury | 2.1 mg/kg | 2.1J mg/kg |
| BD-1605041515 | Metals | Mercury | 1.53J mg/kg | 1.53J mg/kg |
| SD-SC-29-160504-0-0.2 | Metals | Mercury | 2.22 mg/kg | 2.22J mg/kg |
| SD-SC-29-160504-0-0.2 | Metals | Mercury | 2.0 mg/kg | 2.0J mg/kg |
| SD-SC-30-160504-0-0.2 | Metals | Mercury | 1.09J mg/kg | 1.09J mg/kg |
| SD-SC-40-160504-0-0.2 | Metals | Mercury | 1.55J mg/kg | 1.55J mg/kg |

Notes:
J = estimated result
mg/kg = milligram per kilogram

## 2.4 Completeness

Completeness is a quantitative measure that is used to evaluate how many valid analytical results were obtained in comparison to the amount that were requested. Completeness is expressed as a percentage of usable analytical data. Per the project-specific QAPP, the completeness percentage goal is 90%. The completeness percentage includes data that are J and UJ qualified as estimated and U qualified as elevated to the PQL, but not R qualified as rejected. Completeness was 100% for analytical data for the Southern Cove Area.

## 2.5 Sensitivity

Sensitivity is related to the project PQLs and method detection limits (MDLs). In this context, sensitivity refers to the capability of a method or instrument to detect a given analyte at a given concentration and reliably quantitate the analyte at that concentration.

In general, the MDLs and/or the PQLs were less than the levels listed in Tables 6-1 through 6-6 (as applicable) in the QAPP. PQLs for results below detection were above the QAPP limits for TCLP metals and some mercury analyses; however, PQLs were below regulatory limits so DQOs are considered to be met for these analyses.

Sensitivity can be measured through the analyses of MDL studies and low-level calibration and check standards. Sensitivity can be affected by detections in method blanks, calibration blanks, field blanks, and trip blanks. Detections in the blanks indicate background contamination introduced either in the field or in the lab that can affect the ability to evaluate results to required MDLs and PQLs. Sample results are compared to associated calibration blank, method blank, trip blank, and rinse blank results; detected sample results determined to be affected by detections in these blanks are qualified as non-detects.
Table 2.5.1 summarizes results qualified due to blank contamination.

**Table 2.5.1**
**Qualifiers Applied Due to Method Blank Contamination**

| Sample ID | Parameter | Analyte | Reported Result | Qualified Result |
|---|---|---|---|---|
| BD-1506191325 | TCLP metals | Barium | 0.08J mg/L | 0.50U mg/L |
| SD-SC-07-150618-0-24 | TCLP metals | Barium | 0.1J mg/L | 0.50U mg/L |

| Sample ID | Parameter | Analyte | Reported Result | Qualified Result |
|---|---|---|---|---|
| SD-SC-08-150618-0-24 | TCLP metals | Barium | 0.12J mg/L | 0.50U mg/L |
| SD-SC-09-150616-0-25 | TCLP metals | Barium | 0.06J mg/L | 0.50U mg/L |
| SD-SC-10-150619-0-18 | TCLP metals | Barium | 0.09J mg/L | 0.50U mg/L |

Notes:
J = estimated result
mg/L = milligram per liter
TCLP = Toxicity Characteristic Leaching Procedure
U = Analyte not detected at or above specified limit.

Calibration, method, field, and trip blanks were analyzed at the required frequencies.

## 3 CHAIN-OF-CUSTODY AND SAMPLE RECEIPT

The chain-of-custody (COC) form is an important legal document that tracks the samples from collection through shipping and handling, preparation and analysis, and disposal. During the validation process, the COC forms associated with the data were reviewed for completeness and accuracy. The COC forms were signed by the appropriate personnel when samples were relinquished and received. No documentation issues were noted with the following exceptions:

- Two rinse blanks were collected with one sample set and they arrived at the laboratory with identical labels, so one set could not be distinguished from the other. The laboratory arbitrarily divided the containers into two sample sets and analyzed them as instructed.
- The trip blank was not included on the COC forms but was logged in and analyzed per instructions.
- TCLP pesticides were not requested on the COC forms but were analyzed on the samples designated for TCLP analyses as requested.

Data are not expected to be impacted by these anomalies and no data were qualified. Samples were received at the laboratory intact and within the recommended temperature range for transport and storage.

# 4 OVERALL ASSESSMENT

As was determined by this DUA, the samples were collected, processed, transported, and analyzed in accordance with the Work Plan and the QAPP. All data are acceptable as reported or as qualified and DQOs for this data set have been met.

# 5 REFERENCES

Anchor QEA and CDM Smith, 2015. *Work Plan, Southern Cove, Orrington Remediation Site, Orrington, Maine*. March 2015.

USEPA (U.S. Environmental Protection Agency), 2013. *EPA New England Environmental Data Review Supplement for Regional Data Review Elements and Superfund Specific Guidance/Procedures*. Quality Assurance Unit, Office of Environmental Measurement and Evaluation. April 2013.

USEPA, 2014a. *National Functional Guidelines for Inorganic Superfund Data Review*. OSWER 9355.0-131. EPA-540-R-013-001. August 2014.

USEPA, 2014b. *National Functional Guidelines for Superfund Organic Methods Data Review*. OSWER 9355.0-132. EPA-540-R-014-002. August 2014.

Woodard & Curran, 2014. *Quality Assurance Project Plan, Orrington Remediation Site, Orrington, Maine*. May 2014.

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# DATA VALIDATION REVIEW REPORT – EPA STAGE 2B

| | |
|---|---|
| **Project:** | Orrington Southern Cove PDI |
| **Project Number:** | 140617-01.01 |
| **Date:** | July 23, 2015 |

This report summarizes the review of analytical results for 22 sediment samples, 3 field duplicates, 2 rinse blanks, and one trip blank collected June 16-19, 2015. The samples were collected by Anchor QEA, LLC and submitted to Alpha Analytical (Alpha). Samples were analyzed for the following:

- Mercury (Hg) by United States Environmental Protection Agency (USEPA) methods 7471B and 7470A
- Chloropicrin by USEPA method 8260C
- Total organic carbon (TOC) by USEPA method 9060A
- Total solids (TS) by Standard Method (SM) 2540G
- Reactive sulfide and cyanide ($S^{2-}$ and CN) by SW846 Chapter 7.3
- Flash point (FP) by USEPA method 1010
- Sulfate ($SO_4^{2-}$) by USEPA method 9038
- Chloride ($Cl^-$) by USEPA method 9251
- pH by USEPA method 9045D
- Toxicity Characteristic Leaching Procedure (TCLP) metals by USEPA methods 6010C and 7470A
- TCLP semivolatile organic compounds (SVOCs) by USEPA method 8270D
- TCLP volatile organic compounds (VOCs) by USEPA method 8260C
- TCLP pesticides by USEPA method 8081B
- TCLP herbicides by USEPA method 8151A

Alpha sample data group (SDG) number L1513997 was reviewed in this report. Sample IDs, matrices, and analyses are presented in Table 1.

### Table 1
### Sample IDs, Matrices, and Analyses

| Sample ID | Lab Sample ID | Matrix | Analyses Conducted |
|---|---|---|---|
| RB-1506192258 | L1513997-01, -03 | Water | Hg, chloropicrin |
| RB-1506192259 | L1513997-02, -04 | Water | Hg, chloropicrin |
| SD-SC-07-150618-0-24 | L1513997-05 | Sediment | TS, FP, metals, Hg, TCLP pesticides, TCLP herbicides, TCLP VOCs, TCLP SVOCs, S2- and CN, SO42-, pH, TOC, Cl- |
| SD-SC-07-150618-30-36 | L1513997-06 | Sediment | TS, Hg |
| SD-SC-07A-150618-0.9-1 | L1513997-07 | Sediment | TS, chloropicrin |
| SD-SC-07B-150618-1-1.5 | L1513997-08 | Sediment | TS, chloropicrin |
| SD-SC-07C-150619-1-1.5 | L1513997-09 | Sediment | TS, chloropicrin |
| SD-SC-07D-150618-1-1.5 | L1513997-10 | Sediment | TS, chloropicrin |
| SD-SC-07E-150618-1-1.5 | L1513997-11 | Sediment | TS, chloropicrin |
| SD-SC-08-150618-0-24 | L1513997-12 | Sediment | TS, FP, metals, Hg, TCLP pesticides, TCLP herbicides, TCLP VOCs, TCLP SVOCs, S2- and CN, SO42-, pH, TOC, Cl- |
| SD-SC-08-150618-30-36 | L1513997-13 | Sediment | TS, Hg |
| SD-SC-09-150616-0-25 | L1513997-14 | Sediment | TS, FP, metals, Hg, TCLP pesticides, TCLP herbicides, TCLP VOCs, TCLP SVOCs, S2- and CN, SO42-, pH, TOC, Cl- |
| SD-SC-09-150616-30-33 | L1513997-15 | Sediment | TS, Hg |
| BD-1506191325 | L1513997-16 | Sediment | TS, FP, metals, Hg, TCLP pesticides, TCLP herbicides, TCLP VOCs, TCLP SVOCs, S2- and CN, SO42-, pH, TOC, Cl- |
| SD-SC-10-150619-0-18 | L1513997-17 | Sediment | TS, FP, metals, Hg, TCLP pesticides, TCLP herbicides, TCLP VOCs, TCLP SVOCs, S2- and CN, SO42-, pH, TOC, Cl- |
| SD-SC-10-150619-18-20 | L1513997-18 | Sediment | TS, Hg |
| SD-SC-11-150616-0.2-1 | L1513997-19 | Sediment | TS, Hg |
| SD-SC-12-150616-0.8-1 | L1513997-20 | Sediment | TS, Hg |
| SD-SC-13-150616-0.8-1 | L1513997-21 | Sediment | TS, Hg |
| SD-SC-14-150616-0.8-1 | L1513997-22 | Sediment | TS, Hg |
| SD-SC-15-150619-0-0.2 | L1513997-23 | Sediment | TS, Hg |
| SD-SC-16-150619-0-0.2 | L1513997-24 | Sediment | TS, Hg |
| BD-1506191340 | L1513997-25 | Sediment | TS, Hg |
| SD-SC-17-150619-0-0.2 | L1513997-26 | Sediment | TS, Hg |
| BD-1506191341 | L1513997-27 | Sediment | TS, Hg |
| SD-SC-18-150619-0-0.2 | L1513997-28 | Sediment | TS, Hg |
| SD-SC-19-150617-0.2-0.8 | L1513997-29 | Sediment | TS, Hg |
| TB-150619 | L1513997-30 | Water | chloropicrin |

## Data Validation and Qualifications

The following comments refer to the laboratory's performance in meeting the quality assurance/quality control (QA/QC) guidelines outlined in the analytical procedures and data quality objective sections of the Work Plan (Anchor QEA and CDM Smith, 2015) and Quality Assurance Project Plan (QAPP; Woodard & Curran, 2014). Laboratory results were reviewed using the following guidelines:

- *USEPA New England Environmental Data Review Supplement for Regional Data Review Elements and Superfund Specific Guidance/Procedures* (USEPA, 2013)
- *USEPA National Functional Guidelines for Superfund Inorganics Data Review* (USEPA 2014a)
- *USEPA National Functional Guidelines for Superfund Organic Methods Data Review* (USEPA 2014b)

And also by using laboratory and method QC criteria as stated in USEPA (1986; SW 846, Third Edition), *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*, update 1, July 1992; update IIA, August 1993; update II, September 1994; update IIB, January 1995; update III, December 1996; update IIIA, April 1998. Unless noted in this report, laboratory results for the samples listed above were within QC criteria.

## Field Documentation

Field documentation was checked for completeness and accuracy. The chain-of-custody (COC) forms were signed by Alpha at the time of sample receipt; the samples were received within the recommended temperature range and in good condition. The COC forms were correct with the following non-conformances:

- Two rinse blanks were collected with this sample set and they arrived at the laboratory with identical labels so one set could not be distinguished from the other. The laboratory arbitrarily divided the containers into two sample sets and analyzed them as instructed.
- The trip blank was not included on the COC forms but was logged in and analyzed per instructions.
- TCLP pesticides was not requested on the COC forms but was conducted on the samples designated for TCLP analyses as requested.

## Holding Times and Sample Preservation

Samples were appropriately preserved and analyzed within holding times.

## Laboratory Method and Calibration Blanks

Laboratory method and calibration blanks were analyzed at the required frequencies. All blanks were free of target analytes with the following exceptions:

- TCLP VOCs – 2-Butanone was detected in the method blank at a level between the method detection limit (MDL) and the method reporting limit (MRL). Associated sample results were below detection so no data were qualified.
- TCLP Pesticides – Chlordane was detected in one of the method blanks between the MDL and the MRL. Associated sample results were below detection so no data were qualified.
- TCLP Metals – Chromium and barium were detected in the method blank at levels between the MDLs and MRLs. Associated detected results that were not significantly greater than (>5x) the levels detected in the method blank have been qualified as non-detects. Arsenic was detected in one of the associated continuing calibration blanks (CCBs). Sample results were either below detection or significantly greater than (>5x) the level detected in the CCB so no data were qualified.
- Conventionals – Sulfate was detected in the method blank and CCBs at levels between the MDL and the MRL. Associated sample results were significantly greater than (>5x) the levels detected in the blanks so no data were qualified.

## Field Quality Control

### *Trip Blanks*

One trip blank was included and analyzed for chloropicrin. The result was below detection.

### *Rinse Blanks*

Two rinse blanks were collected with these sample sets and analyzed for mercury and chloropicrin. Results were below detection except for mercury in one of the blanks that was detected at a level between the MDL and the MRL. The result was much lower than any of the detected sample results so results are not expected to be impacted and no data were qualified.

### *Field Duplicates*

One field duplicate was collected in association with these sample sets. Detected results are summarized in Table 2.

## Table 2
## Field Duplicate Summary

| Analyte | SD-SC-10-150619-0-18 | BD-1506191325 | RPD | Difference |
|---|---|---|---|---|
| Arsenic | 0.05J mg/L | 0.04J mg/L | -- | 0.01 |
| Barium | 0.09J mg/L | 0.08J mg/L | -- | 0.01 |
| Chloride | 170 mg/kg | 320 mg/kg | 61% | -- |
| Lead | 0.5U mg/L | 0.03J mg/L | -- | 0.03 |
| Mercury | 4 mg/kg | 12 mg/kg | 100% | -- |
| pH | 5.8 SU | 5.6 SU | 4% | -- |
| Sulfate | 670 mg/kg | 960 mg/kg | 36% | -- |
| Total organic carbon | 7.16% | 4.69% | 42% | -- |
| Total solids | 44.4% | 35.2% | 23% | -- |

| Analyte | SD-SC-17-150619-0-0.2 | BD-1506191340 | RPD |
|---|---|---|---|
| Total solids | 26.7% | 29.9% | 11% |
| Mercury | 1.6 mg/kg | 1.5 mg/kg | 6% |

| Analyte | SD-SC-18-150619-0-0.2 | BD-1506191341 | RPD |
|---|---|---|---|
| Total solids | 24.4% | 29.6% | 19% |
| Mercury | 1.1 mg/kg | 0.81 mg/kg | 30% |

If the sample or duplicate result was < 5x MRL, the difference between the results was calculated and results were evaluated using the control limits of the difference < ± MRL for aqueous samples and ± 2x MRL for solid samples. Relative percent difference (RPD) values or difference results were within control limits with the exceptions of chloride and mercury in the first duplicate pair. Since two more duplicate pairs were analyzed for mercury, only the parent and duplicate result with the high RPD value were qualified “J” as estimated. All associated batch sample results for chloride have been qualified “J” or “UJ” to indicate they are estimated.

## Instrument Performance Checks

Ion abundance criteria were met for VOC and SVOC methods.

## Initial Calibrations and Calibration Verifications

All initial calibrations and calibration verifications met method criteria with the following exceptions:

- TCLP SVOCs – The percent difference (%D) value for hexachlorobutadiene and hexachlorobenzene were above the criteria in the continuing calibration verification

(CCV) analyzed on June 30, 2015, however, no sample results were reported in association with this CCV.

- TCLP VOCs – The vinyl chloride %D value was below criteria in the CCV analyzed on June 25, 2015. Associated sample results have been qualified "UJ" to indicate a potentially low bias.
- TCLP Pesticides – %D values for heptachlor and methoxychlor in the opening CCV analyzed on the secondary column on June 30, 2015 were above criteria. Associated sample results were below detection so no data were qualified. The methoxychlor %D values were below criteria in the CCVs analyzed on the secondary column on July 2 and 3, 2015. Associated sample results have been qualified "UJ" to indicate a potentially low bias.

## Internal Standard and Surrogate Recoveries

All internal standard recoveries were within method control limits and surrogate recoveries were within the laboratory control limits.

## Compound Confirmation

Column confirmation of detected pesticide and PCB results met method criteria.

## Laboratory Control Sample and Laboratory Control Sample Duplicate

Laboratory control samples (LCSs) and laboratory control sample duplicates (LCSDs) were analyzed at the required frequencies and resulted in recoveries and/or RPD values within laboratory or validation control limits with the following exceptions:

- TCLP SVOCs – Nitrobenzene recovered below the control limit in one of the LCSs reported. The associated sample results have been qualified "UJ" to indicate a potentially low bias. The LCS/LCSD relative percent difference (RPD) values for all analytes were above the control limit, however, since all but one recovery were within the control limits and sample results were below detection, no additional data were qualified.
- TCLP Pesticides – Endrin recovered above the control limit in of the LCSDs. Associated sample results were below detection so no data were qualified.

- TCLP Herbicides – One set of LCS/LCSD RPD values for 2,4-D and 2,4,5-TP were above the control limit. Since recoveries were within control limits and sample results were below detection, no data were qualified.

## Matrix Spike and Matrix Spike Duplicate

Matrix spike (MS) and matrix spike duplicate (MSD) samples were not requested and so were not analyzed on project samples in association with any analyses. LCS and/or LCSD analyses were conducted in place of MS/MSDs for these analyses. MS/MSD results were reported for some non-project samples and results were outside of control limits. No data were qualified in these instances.

## Standard Reference Material

Standard reference materials were analyzed in place of LCSs for some analyses and resulted in recoveries within specified limits.

## Laboratory Duplicates

Laboratory duplicates were analyzed at the required frequency and resulted in RPD values within required limits with the exception of the mercury duplicate analyzed on sample SD-SC-07-150618-0-24. Associated detected sample results have been qualified “J” to indicate they are estimated.

## Sample Percent Solids

Four samples and two field duplicate percent solid results were less than or equal to 30%. The samples were analyzed for mercury and those results have been qualified “J” to indicate they are estimated.

## Method Reporting Limits

Reporting limits were acceptable as reported. All values were reported using the laboratory reporting limits. Values were reported as undiluted, or when reported as diluted, the reporting limit accurately reflects the dilution factor.

## Overall Assessment

As was determined by this evaluation, the laboratory followed the specified analytical methods and all requested sample analyses were completed. Accuracy was acceptable as demonstrated by the calibration, internal standard, surrogate, SRM, and LCS/LCSD recovery values, with the exceptions noted above. Precision was also acceptable as demonstrated by the calibration relative standard deviation and %D values and the laboratory and field duplicate and LCS/LCSD RPD values, with the exceptions noted above. Most data were acceptable as reported; all other data are acceptable as qualified. Table 3 summarizes the qualifiers applied to sample results reviewed in this report.

## Data Qualifier Definitions

| | |
|---|---|
| U | Indicates the compound or analyte was analyzed for but not detected at or above the specified limit. |
| J | Indicates an estimated value. |
| UJ | Indicates the compound or analyte was analyzed for but not detected and the specified limit reported is estimated |

**Table 3**
**Data Qualification Summary**

| Sample ID | Parameter | Analyte | Reported | Qualified | Reason |
|---|---|---|---|---|---|
| BD-1506191325 | Conventionals | Chloride | 320 mg/kg | 320J mg/kg | Field duplicate RPD value above control limit |
| | Metals | Mercury | 12 mg/kg | 12J mg/kg | Field and laboratory duplicate RPD value above control limit |
| | | Barium | 0.08J mg/L | 0.50U mg/L | Method blank contamination |
| | Pesticides | Methoxychlor | 1U µg/L | 1UJ µg/L | CCV %D below criterion |
| | SVOCs | Nitrobenzene | 10U µg/L | 10UJ µg/L | LCS %R below control limit |
| | VOCs | Vinyl chloride | 10U µg/L | 10UJ µg/L | CCV %D below criterion |
| BD-1506191340 | Metals | Mercury | 1.5 mg/kg | 1.5J mg/kg | TS ≤ 30% |
| BD-1506191341 | Metals | Mercury | 0.81 mg/kg | 0.81J mg/kg | TS ≤ 30% |
| SD-SC-07-150618-0-24 | Conventionals | Chloride | 13 mg/kg | 13J mg/kg | Field duplicate RPD value above control limit |
| | Metals | Barium | 0.1J mg/L | 0.50U mg/L | Method blank contamination |
| | | Mercury | 2.1 mg/kg | 2.1J mg/kg | Laboratory duplicate RPD above control limit |

| Sample ID | Parameter | Analyte | Reported | Qualified | Reason |
|---|---|---|---|---|---|
| | Pesticides | Methoxychlor | 1U µg/L | 1UJ µg/L | CCV %D below criterion |
| | VOCs | Vinyl chloride | 10U µg/L | 10UJ µg/L | CCV %D below criterion |
| SD-SC-07-150618-30-36 | Metals | Mercury | 13 mg/kg | 13J mg/kg | Laboratory duplicate RPD above control limit |
| SD-SC-08-150618-0-24 | Conventionals | Chloride | 38 mg/kg | 38J mg/kg | Field duplicate RPD value above control limit |
| | Metals | Barium | 0.12J mg/L | 0.50U mg/L | Method blank contamination |
| | | Mercury | 24 mg/kg | 24J mg/kg | Laboratory duplicate RPD above control limit |
| | Pesticides | Methoxychlor | 1U µg/L | 1UJ µg/L | CCV %D below criterion |
| | VOCs | Vinyl chloride | 10U µg/L | 10UJ µg/L | CCV %D below criterion |
| SD-SC-09-150616-0-25 | Conventionals | Chloride | 430 mg/kg | 430J mg/kg | Field duplicate RPD value above control limit |
| | Metals | Barium | 0.06J mg/L | 0.50U mg/L | Method blank contamination |
| | | Mercury | 15 mg/kg | 15J mg/kg | Laboratory duplicate RPD above control limit |
| | Pesticides | Methoxychlor | 1U µg/L | 1UJ µg/L | CCV %D below criterion |
| | VOCs | Vinyl chloride | 10U µg/L | 10UJ µg/L | CCV %D below criterion |
| SD-SC-10-150619-0-18 | Conventionals | Chloride | 170 mg/kg | 170J mg/kg | Field duplicate RPD value above control limit |
| | Metals | Mercury | 4 mg/kg | 4J mg/kg | Field duplicate RPD value above control limit |
| | | Barium | 0.09J mg/L | 0.50U mg/L | Method blank contamination |
| | Pesticides | Methoxychlor | 1U µg/L | 1UJ µg/L | CCV %D below criterion |
| | SVOCs | Nitrobenzene | 10U µg/L | 10UJ µg/L | LCS %R below control limit |
| | VOCs | Vinyl chloride | 10U µg/L | 10UJ µg/L | CCV %D below criterion |
| SD-SC-16-150619-0-0.2 | Metals | Mercury | 1.5 mg/kg | 1.5J mg/kg | TS ≤ 30% |
| SD-SC-15-150619-0-0.2 | Metals | Mercury | 1.1 mg/kg | 1.1J mg/kg | TS ≤ 30% |
| SD-SC-17-150619-0-0.2 | Metals | Mercury | 1.6 mg/kg | 1.6J mg/kg | TS ≤ 30% |
| SD-SC-18-150619-0-0.2 | Metals | Mercury | 1.1 mg/kg | 1.1J mg/kg | TS ≤ 30% |
| SD-SC-19-150617-0.2-0.8 | Metals | Mercury | 2.3 mg/kg | 2.3J mg/kg | Laboratory duplicate RPD above control limit |

## REFERENCES

Anchor QEA and CDM Smith. 2015. Work Plan, Southern Cove, Orrington Remediation Site, Orrington, Maine. March.

USEPA. 1986. Test methods for Evaluating Solid Waste: Physical/Chemical Methods. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. EPA 530/SW-846.

USEPA. 2013. EPA New England Environmental Data Review Supplement for Regional Data Review Elements and Superfund Specific Guidance/Procedures. Quality Assurance Unit, Office of Environmental Measurement and Evaluation. April.

USEPA. 2014a. National Functional Guidelines for Inorganic Superfund Data Review. OSWER 9355.0-131. EPA-540-R-013-001. August.

USEPA. 2014b. National Functional Guidelines for Superfund Organic Methods Data Review. OSWER 9355.0-132. EPA-540-R-014-002. August.

Woodard & Curran. 2014. Draft Quality Assurance Project Plan, Orrington Remediation Site, Orrington Maine. May.

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# DATA VALIDATION REVIEW REPORT – EPA STAGE 2B

| | |
|---|---|
| **Project:** | Orrington Southern Cove PDI |
| **Project Number:** | 140617-01.01 |
| **Date:** | October 2, 2015 |

This report summarizes the review of analytical results for six sediment samples, one field duplicate, and two rinse blanks collected September 22, 2015. The samples were collected by Anchor QEA, LLC and submitted to Alpha Analytical (Alpha) in Westborough, Massachusetts. Samples were analyzed for mercury (Hg) by United States Environmental Protection Agency (USEPA) methods 7471B and 7470A and total solids (TS) by Standard Method (SM) 2540G.

Alpha sample data group (SDG) number L1523582 was reviewed in this report. Sample IDs, matrices, and analyses are presented in Table 1.

**Table 1**
**Sample IDs, Matrices, and Analyses**

| Sample ID | Lab Sample ID | Matrix | Analyses Conducted |
|---|---|---|---|
| RB-1509220000 | L1523582-01 | Water | Mercury |
| RB-1509220001 | L1523582-02 | Water | Mercury |
| SD-SC-20-150922-0-0.2 | L1523582-03 | Sediment | Mercury, total solids |
| BD-1509220000 | L1523582-04 | Sediment | Mercury, total solids |
| SD-SC-22-150922-0-0.2 | L1523582-05 | Sediment | Mercury, total solids |
| SD-SC-22-150922-0.8-1 | L1523582-06 | Sediment | Mercury, total solids |
| SD-SC-23-150922-0.8-1 | L1523582-07 | Sediment | Mercury, total solids |
| SD-SC-24-150922-0.8-1 | L1523582-09 | Sediment | Mercury, total solids |
| SD-SC-25-150922-0.8-1 | L1523582-11 | Sediment | Mercury, total solids |

## Data Validation and Qualifications

The following comments refer to the laboratory's performance in meeting the quality assurance/quality control (QA/QC) guidelines outlined in the analytical procedures and data quality objective sections of the Work Plan (Anchor QEA and CDM Smith, 2015) and Quality Assurance Project Plan (QAPP; Woodard & Curran, 2014). Laboratory results were reviewed using the following guidelines:

- *USEPA New England Environmental Data Review Supplement for Regional Data Review Elements and Superfund Specific Guidance/Procedures* (USEPA, 2013)
- *USEPA National Functional Guidelines for Superfund Inorganics Data Review* (USEPA 2014)

And also by using laboratory and method QC criteria as stated in USEPA (1986; SW 846, Third Edition), *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*, update 1, July 1992; update IIA, August 1993; update II, September 1994; update IIB, January 1995; update III, December 1996; update IIIA, April 1998. Unless noted in this report, laboratory results for the samples listed above were within QC criteria.

## Field Documentation

Field documentation was checked for completeness and accuracy. The chain-of-custody (COC) forms were signed by Alpha at the time of sample receipt; the samples were received within the recommended temperature range and in good condition.

## Holding Times and Sample Preservation

Samples were appropriately preserved and analyzed within holding times.

## Laboratory Method and Calibration Blanks

Laboratory method and calibration blanks were analyzed at the required frequencies. All blanks were free of target analytes.

## Field Quality Control

### *Rinse Blanks*

Two rinse blanks were collected with these sample sets and were analyzed for mercury. Both rinse blank results were below detection.

### *Field Duplicates*

One field duplicate was collected in association with these sample sets. Results are summarized in Table 2.

**Table 2**
**Field Duplicate Summary**

| Analyte | SD-SC-22-150922-0-0.2 | BD-1509220000 | RPD | Difference |
|---|---|---|---|---|
| Mercury | 1.0 mg/kg | 0.91 mg/kg | -- | 0.09 |
| Total solids | 23.3% | 24.8% | 6% | |

The mercury sample and duplicate results were < 5x MRL so results were evaluated using the control limits of the difference ± 2x MRL.  Relative percent difference (RPD) values or difference results were within control limits.

## Initial Calibrations and Calibration Verifications

All initial calibrations and calibration verifications met method criteria.

## Laboratory Control Sample

A laboratory control sample (LCS) was analyzed at the required frequency and resulted in a recovery within project-required control limits.

## Matrix Spike and Matrix Spike Duplicate

Matrix spike (MS) and matrix spike duplicate (MSD) samples were analyzed on a non-project sample at the required frequency and resulted in recoveries and an RPD value within the project-required control limits.

## Laboratory Duplicates

Laboratory duplicates were analyzed at the required frequency and resulted in RPD values within project-required control limits.

## Sample Percent Solids

Two samples and one field duplicate percent solid results were less than or equal to 30%. The samples were analyzed for mercury and those results have been qualified “J” to indicate they are estimated.

## Method Reporting Limits

Reporting limits were acceptable as reported. All values were reported using the laboratory reporting limits. Values were reported as undiluted. The mercury reporting limit for one non-detected sample result was elevated above the project-specified limit, however, it was below the project action limit so meets project requirements.

## Overall Assessment

As was determined by this evaluation, the laboratory followed the specified analytical methods and all requested sample analyses were completed. Accuracy was acceptable as demonstrated by the calibration, LCS, and MS/MSD recovery values. Precision was also acceptable as demonstrated by the calibration correlation coefficients and percent recoveries, and the field duplicate and MS/MSD RPD values. Most data are acceptable as reported. Three results were qualified due to low percent solids and results are acceptable as qualified.

## Data Qualifier Definitions

J Indicates an estimated value.

**Table 3**
**Data Qualification Summary**

| Sample ID | Parameter | Analyte | Reported | Qualified | Reason |
|---|---|---|---|---|---|
| BD-1509220000 | Metals | Mercury | 0.91 mg/kg | 0.91J mg/kg | TS ≤ 30% |
| SD-SC-20-150922-0-0.2 | Metals | Mercury | 0.75 mg/kg | 0.75J mg/kg | TS ≤ 30% |
| SD-SC-22-150922-0-0.2 | Metals | Mercury | 1.0 mg/kg | 1.0J mg/kg | TS ≤ 30% |

## REFERENCES

Anchor QEA and CDM Smith. 2015. Work Plan, Southern Cove, Orrington Remediation Site, Orrington, Maine. March.

USEPA. 1986. Test methods for Evaluating Solid Waste: Physical/Chemical Methods. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. EPA 530/SW-846.

USEPA. 2004. USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review. U.S. Environmental Protection Agency, Office of Superfund Remediation and Technology Innovation (OSRTI). EPA 540-R-04-004. October.

# DATA VALIDATION REVIEW REPORT: USEPA STAGE 2B

# PENOBSCOT RIVER — ORRINGTON

**Prepared for**

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**June 2016**

# TABLE OF CONTENTS

## List of Tables

# LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| Alpha | Alpha Analytical Laboratories |
| COC | chain-of-custody |
| Geosyntec | Geosyntec Consultants Field DMA-80 Laboratory |
| LCS | laboratory control sample |
| MRL | method reporting limit |
| MS | matrix spike |
| MSD | matrix spike duplicate |
| QC | quality control |
| RPD | relative percent difference |
| SDG | sample data group |
| USEPA | U.S. Environmental Protection Agency |

# 1 INTRODUCTION

This report summarizes the review of analytical results for 47 sediment samples, four field duplicates, and three rinse blanks collected May 3 through 5, 2016. The samples were collected by Anchor QEA, LLC, and submitted to Geosyntec Consultants Field DMA-80 Laboratory (Geosyntec). Two split samples, one duplicate, and the three rinse blanks were sent to Alpha Analytical Laboratories (Alpha) in Mansfield, Massachusetts. Samples were analyzed for mercury by U.S. Environmental Protection Agency (USEPA) methods 7473, 7471B, and 7470A and total solids by Standard Method 2540G.

Geosyntec sample data group (SDG) numbers 05032016, 05042016, and 05052016 and Alpha SDGs L1613439, L1613456, and L1613587 are reviewed in this report. Sample IDs, matrices, and analyses are presented in Table 1.

**Table 1**
**Sample IDs, Matrices, and Analyses**

| Sample ID | Lab Sample ID | Matrix | Analyses Conducted |
|---|---|---|---|
| RB-1605031535 | L1613439-01 | Water | Mercury |
| RB-1605031540 | L1613439-02 | Water | Mercury |
| SD-SC-34-160503-0-0.5 | -- | Sediment | Mercury, total solids |
| SD-SC-34-160503-0.5-1 | -- | Sediment | Mercury, total solids |
| SD-SC-34-160503-1-1.5 | -- | Sediment | Mercury, total solids |
| SD-SC-35-160503-0-0.5 | -- | Sediment | Mercury, total solids |
| SD-SC-35-160503-0.5-1 | -- | Sediment | Mercury, total solids |
| SD-SC-35-160503-1-1.5 | -- | Sediment | Mercury, total solids |
| SD-SC-35-160503-1.5-2 | -- | Sediment | Mercury, total solids |
| SD-SC-35-160503-2-2.5 | -- | Sediment | Mercury, total solids |
| SD-SC-31-160503-0-0.5 | -- | Sediment | Mercury, total solids |
| SD-SC-31-160503-0.5-1 | -- | Sediment | Mercury, total solids |
| SD-SC-31-160503-1-1.5 | -- | Sediment | Mercury, total solids |
| SD-SC-31-160503-1.5-2 | -- | Sediment | Mercury, total solids |
| SD-SC-32-160503-0-0.5 | -- | Sediment | Mercury, total solids |
| SD-SC-32-160503-0.5-1 | -- | Sediment | Mercury, total solids |
| SD-SC-32-160503-1-1.5 | -- | Sediment | Mercury, total solids |
| SD-SC-33-160503-0-0.5 | -- | Sediment | Mercury, total solids |
| SD-SC-33-160503-0.5-1 | -- | Sediment | Mercury, total solids |
| SD-SC-33-160503-1-1.5 | -- | Sediment | Mercury, total solids |

| Sample ID | Lab Sample ID | Matrix | Analyses Conducted |
|---|---|---|---|
| SD-SC-33-160503-1.5-2 | -- | Sediment | Mercury, total solids |
| SD-SC-33-160503-2-2.5 | -- | Sediment | Mercury, total solids |
| SD-SC-26-160503-0-0.2 | -- | Sediment | Mercury, total solids |
| SD-SC-26-160503-0.8-1 | -- | Sediment | Mercury, total solids |
| SD-SC-26-160503-1-1.3 | -- | Sediment | Mercury, total solids |
| BD-1605031500 | -- | Sediment | Mercury, total solids |
| BD-1605031512 | -- | Sediment | Mercury, total solids |
| SD-SC-27-160503-0-0.2 | -- | Sediment | Mercury, total solids |
| SD-SC-27-160503-0.8-1 | -- | Sediment | Mercury, total solids |
| SD-SC-27-160503-1-1.3 | -- | Sediment | Mercury, total solids |
| BD-1605040940 | L1613587-02 | Sediment | Mercury, total solids |
| RB-1605041020 | L1613456-01 | Water | Mercury, total solids |
| SD-SC-28-160504-1-1.4 | L1613587-01 | Sediment | Mercury, total solids |
| SD-SC-29-160504-0-0.2 | L1613587-03 | Sediment | Mercury, total solids |
| SD-SC-28-160504-0-0.2 | -- | Sediment | Mercury, total solids |
| SD-SC-28-160504-0.8-1 | -- | Sediment | Mercury, total solids |
| SD-SC-29-160504-0.8-1 | -- | Sediment | Mercury, total solids |
| SD-SC-30-160504-0-0.2 | -- | Sediment | Mercury, total solids |
| SD-SC-30-160504-0.8-1 | -- | Sediment | Mercury, total solids |
| SD-SC-29-160504-1-1.5 | -- | Sediment | Mercury, total solids |
| SD-SC-30-160504-1-1.3 | -- | Sediment | Mercury, total solids |
| SD-SC-37-160504-0-0.2 | -- | Sediment | Mercury, total solids |
| SD-SC-37-160504-0.8-1 | -- | Sediment | Mercury, total solids |
| SD-SC-37-160504-1-1.5 | -- | Sediment | Mercury, total solids |
| SD-SC-38-160504-0-0.2 | -- | Sediment | Mercury, total solids |
| SD-SC-38-160504-0.2-0.5 | -- | Sediment | Mercury, total solids |
| SD-SC-39-160504-0-0.2 | -- | Sediment | Mercury, total solids |
| SD-SC-39-160504-0.8-1 | -- | Sediment | Mercury, total solids |
| SD-SC-40-160504-0-0.2 | -- | Sediment | Mercury, total solids |
| SD-SC-40-160504-0.8-1 | -- | Sediment | Mercury, total solids |
| BD-1605041515 | -- | Sediment | Mercury, total solids |
| SD-SC-36-160504-0-0.2 | -- | Sediment | Mercury, total solids |
| SD-SC-36-160504-0.8-1 | -- | Sediment | Mercury, total solids |
| SD-SC-36-160504-1-1.2 | -- | Sediment | Mercury, total solids |

# 2 DATA VALIDATION AND REVIEW

## 2.1 Data Validation and Qualifications

The following comments refer to the laboratory's performance in meeting the quality assurance/quality control (QA/QC) guidelines outlined in the analytical procedures and data quality objective sections of the Southern Cove Orrington Remediation Site Work Plan (Anchor QEA and CDM Smith 2015) and Quality Assurance Project Plan (Woodard and Curran 2014). Laboratory results were reviewed using the following guidelines:

- *USEPA New England Environmental Data Review Supplement for Regional Data Review Elements and Superfund Specific Guidance/Procedures* (USEPA 2013)
- *USEPA National Functional Guidelines for Superfund Inorganics Data Review* (USEPA 2014)

Performance was also measured by using laboratory and method QC criteria as stated in USEPA (1986; SW 846, Third Edition), *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*, update 1, July 1992; update IIA, August 1993; update II, September 1994; update IIB, January 1995; update III, December 1996; update IIIA, April 1998. Unless noted in this report, laboratory results for the samples listed above were within QC criteria.

## 2.2 Field Documentation

Field documentation was checked for completeness and accuracy. The chain-of-custody (COC) forms for the samples analyzed by Geosyntec were relinquished and received electronically. The COC forms sent to Alpha were signed by the laboratory receipt technician at the time of sample receipt. No temperature was recorded for the samples transferred to Geosyntec; however, samples were received on the same day as collection and stored with sufficient ice, so data should not be impacted. All samples received at Alpha were within the recommended temperature range and in good condition.

## 2.3 Holding Times and Sample Preservation

Samples were appropriately preserved and analyzed within holding times.

## 2.4 Laboratory Method and Calibration Blanks

Laboratory method and calibration blanks were analyzed at the required frequencies. All blanks were free of target analytes or significantly lower than (less than five times) the associated sample concentrations.

## 2.5 Field Quality Control

### *2.5.1 Rinse Blanks*

Three rinse blanks were collected with these sample sets and analyzed for mercury. All rinse blank results were below detection.

### *2.5.2 Field Duplicates*

Four field duplicates were collected in association with these sample sets. Detected results are summarized in Table 2.

**Table 2**
**Field Duplicate Summary**

| Analyte | SD-SC-26-160503-0-0.2 | BD-1605031500 | RPD | Difference |
|---|---|---|---|---|
| Total Solids | 83.046% | 85.024% | 2% | -- |
| **Analyte** | **SD-SC-26-160503-1-1.3** | **BD-1605031512** | **RPD** | **Difference** |
| Total Solids | 89.187% | 90.415% | 1% | -- |
| **Analyte** | **SD-SC-29-160504-0-0.2** | **BD-1605040940** | **RPD** | **Difference** |
| Mercury | 2.0 mg/kg | 2.1 mg/kg | 5% | -- |
| Total solids | 29.2% | 29.6% | 1% | -- |
| **Analyte** | **SD-SC-40-160504-0-0.2** | **BD-1605041515** | **RPD** | **Difference** |
| Mercury | 1.552 mg/kg | 1.528 mg/kg | -- | 0.024 |
| Total Solids | 28.139% | 28.685% | 2% | -- |

Notes:
mg/kg = milligram per kilogram
RPD = relative percent difference

The mercury sample and duplicate results that were less than four times the method reporting limit (MRL) were evaluated using the control limits of the difference between plus or minus two times the MRL. Relative percent difference (RPD) values or difference results were within project-required control limits.

## 2.6 Split Sample Analyses

Two samples analyzed by Geosyntec were sent to Alpha for split sample analyses. Detected results are summarized in Table 3.

**Table 3**

**Split Sample Analyses Summary**

| **SD-SC-28-160504-1-1.4** | | | |
|---|---|---|---|
| **Analyte** | **Geosyntec** | **Alpha** | **RPD** |
| Mercury | 106 mg/kg | 110 mg/kg | 4% |
| Total Solids | 40.244% | 39.8% | 1% |
| **SD-SC-29-160504-0-0.2** | | | |
| **Analyte** | **Geosyntec** | **Alpha** | **RPD** |
| Mercury | 2.22 mg/kg | 2.0 mg/kg | 11% |
| Total Solids | 29.762% | 29.2% | 2% |

Notes:
mg/kg = milligram per kilogram
RPD = relative percent difference

No control limits were established for split sample results, so no data were qualified.

## 2.7 Initial Calibrations and Calibration Verifications

All initial calibrations and calibration verification results were within method or laboratory standard operating procedure criteria.

## 2.8 Laboratory Control Sample

A laboratory control sample (LCS) was analyzed at the required frequency and resulted in a recovery within project-required control limits with the exception of the mercury LCS reported in SDG L1613587. Associated sample results have been qualified “J” to indicate a potentially low bias.

## 2.9 Matrix Spike and Matrix Spike Duplicate

Matrix spike (MS) and matrix spike duplicate (MSD) samples were analyzed at the required frequency and resulted in recoveries or RPD values within project-required control limits with one exception. The MS/MSD analyzed on sample SD-SC-36-160504-0.8-1 resulted in a RPD value above the control limit. Associated detected sample results have been qualified "J" to indicate they are estimated. No data were qualified in association with MS/MSD outliers from analyses conducted on non-project samples.

## 2.10 Laboratory Duplicates

Laboratory duplicates were analyzed at the required frequency and resulted in RPD values within project-required control limits with the exception of the mercury duplicate analyzed on sample SD-SC-30-160504-1-1.3. The RPD value was above the control limit and associated detected sample results have been qualified "J" to indicate they are estimated.

## 2.11 Sample Percent Solids

Three samples and two field duplicate percent solids results were less than or equal to 30%. The samples were analyzed for mercury, and those results have been qualified "J" to indicate they are estimated.

## 2.12 Method Reporting Limits

Reporting limits were acceptable as reported. All values were reported using the laboratory reporting limits. Values were reported as undiluted or when diluted the reporting limit accurately reflected the dilution factor. The mercury reporting limit for some non-detected sample results were above the project-specified limit; however, they were below the project action limit and met project requirements.

## 3 OVERALL ASSESSMENT

As determined by this evaluation, the laboratory followed the specified analytical methods, and all requested sample analyses were completed. Accuracy was acceptable as demonstrated by the calibration, LCS, and MS/MSD recovery values. Precision was also acceptable as demonstrated by the calibration correlation coefficients and laboratory duplicate, field duplicate, and MS/MSD RPD values. Most data were acceptable as reported; all other data were acceptable as qualified. A data qualification summary is provided in Table 4.

**Table 4**
**Data Qualification Summary**

| Sample ID | Parameter | Analyte | Reported Result | Qualified Result | Reason |
|---|---|---|---|---|---|
| BD-1605040940 | Metals | Mercury | 2.1 mg/kg | 2.1J mg/kg | LCS %R below control limit; TS ≤30% |
| BD-1605041515 | Metals | Mercury | 1.53J mg/kg | 1.53J mg/kg | MS/MSD RPD value above control limit; TS ≤30% |
| SD-SC-28-160504-0.8-1 | Metals | Mercury | 43.68 mg/kg | 43.68J mg/kg | Laboratory duplicate RPD above control limit |
| SD-SC-28-160504-0-0.2 | Metals | Mercury | 1.36 mg/kg | 1.36J mg/kg | Laboratory duplicate RPD above control limit |
| SD-SC-28-160504-1-1.4 | Metals | Mercury | 110 mg/kg | 110J mg/kg | LCS %R below control limit |
| | | | 105.8 mg/kg | 105.8J mg/kg | Laboratory duplicate RPD above control limit |
| SD-SC-29-160504-0.8-1 | Metals | Mercury | 3.69 mg/kg | 3.69J mg/kg | Laboratory duplicate RPD above control limit |
| SD-SC-29-160504-0-0.2 | Metals | Mercury | 2.22 mg/kg | 2.22J mg/kg | Laboratory duplicate RPD above control limit; TS ≤30% |
| | | | 2 mg/kg | 2J mg/kg | LCS %R below control limit; TS ≤30% |
| SD-SC-29-160504-1-1.5 | Metals | Mercury | 23.15 mg/kg | 23.15J mg/kg | Laboratory duplicate RPD above control limit |
| SD-SC-30-160504-0.8-1 | Metals | Mercury | 22.13 mg/kg | 22.13J mg/kg | Laboratory duplicate RPD above control limit |
| SD-SC-30-160504-0-0.2 | Metals | Mercury | 1.09J mg/kg | 1.09J mg/kg | Laboratory duplicate RPD above control limit; TS ≤30% |

| Sample ID | Parameter | Analyte | Reported Result | Qualified Result | Reason |
|---|---|---|---|---|---|
| SD-SC-30-160504-1-1.3 | Metals | Mercury | 43.71 mg/kg | 43.71J mg/kg | Laboratory duplicate RPD above control limit |
| SD-SC-36-160504-0.8-1 | Metals | Mercury | 31.85 mg/kg | 31.85J mg/kg | MS/MSD RPD value above control limit |
| SD-SC-36-160504-0-0.2 | Metals | Mercury | 1.32J mg/kg | 1.32J mg/kg | MS/MSD RPD value above control limit |
| SD-SC-36-160504-1-1.2 | Metals | Mercury | 4.38 mg/kg | 4.38J mg/kg | MS/MSD RPD value above control limit |
| SD-SC-37-160504-0.8-1 | Metals | Mercury | 5.21 mg/kg | 5.21J mg/kg | MS/MSD RPD value above control limit |
| SD-SC-37-160504-0-0.2 | Metals | Mercury | 0.81J mg/kg | 0.81J mg/kg | MS/MSD RPD value above control limit |
| SD-SC-37-160504-1-1.5 | Metals | Mercury | 108.6 mg/kg | 108.6J mg/kg | MS/MSD RPD value above control limit |
| SD-SC-38-160504-0.2-0.5 | Metals | Mercury | 2.46 mg/kg | 2.46J mg/kg | MS/MSD RPD value above control limit |
| SD-SC-38-160504-0-0.2 | Metals | Mercury | 1.21 mg/kg | 1.21J mg/kg | MS/MSD RPD value above control limit |
| SD-SC-39-160504-0.8-1 | Metals | Mercury | 3.10 mg/kg | 3.10J mg/kg | MS/MSD RPD value above control limit |
| SD-SC-39-160504-0-0.2 | Metals | Mercury | 1.97 mg/kg | 1.97J mg/kg | MS/MSD RPD value above control limit |
| SD-SC-40-160504-0-0.2 | Metals | Mercury | 1.55J mg/kg | 1.55J mg/kg | MS/MSD RPD value above control limit; TS ≤30% |

Notes:
J = indicates an estimated value.
LCS = laboratory control sample
MS/MSD = matrix spike/matrix spike duplicate
mg/kg = milligram per kilogram
RPD = relative percent difference
TS = total solids

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# Appendix B

# Turbidity Control Evaluation Report

# DRAFT TURBIDITY CONTROL EVALUATION REPORT

## Southern Cove

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March 2016

# Table of Contents

# List of Tables

# List of Figures

# Acronyms

| | |
|---|---|
| 2-D | two-dimensional |
| ADCP | Acoustic Doppler Current Profiler |
| bgs | below ground surface |
| cfs | cubic feet per second |
| CMIP | Corrective Measures Implementation Plan |
| FEMA | Federal Emergency Management Agency |
| FIS | Flood Insurance Studies |
| ft/s | feet per second |
| kg/cm$^2$ | kilograms per square centimeter |
| MHHW | Mean Higher High Water |
| MHW | Mean High Water |
| MLLW | Mean Lower Low Water |
| MLW | Mean Low Water |
| MSL | Mean Sea Level |
| NAVD 88 | North American Vertical Datum 1988 |
| NOAA | National Oceanic and Atmospheric Administration |
| PDI | Pre-Design Investigation |
| Site | Orrington Remediation Site |
| ton/ft$^2$ | ton per square foot |
| USCS | Unified Soil Classification System |
| USGS | U.S. Geological Survey |

# Section 1. Introduction

This technical report presents hydrodynamic and geotechnical evaluations conducted to support design and implementation of measures to control turbidity during removal of sediment from the Southern Cove at the Orrington Remediation Site (Site) located in Orrington, Maine. The Southern Cove is on the east side of the Penobscot River, adjacent to the upland portions of the Site, as shown on **Figure 1**.

Resuspension of contaminated sediments during dredging and potential transport outside of the work area to downstream and upstream areas (during tidal swings) are a concern associated with environmental protection during construction; therefore, turbidity control measures are needed to minimize the transport of suspended sediments outside of the work area. Such measures may include flexible systems (such as silt curtains or air curtains) or fixed structures (such as sheetpile containments). For applications such as this Site, flexible silt curtains offer maximum operational flexibility while containing suspended sediments in the immediate vicinity of the dredging operation. However, their application in moderate- to high-energy areas, such as the Penobscot River, can be problematic, potentially requiring constant repair and maintenance (USACE 2008).

This technical report is divided into the following sections:

- Section 2 – Turbidity Control Design Approach
  - Description of the approach to evaluate the turbidity control
- Section 3 – Water Surface Elevation Analysis
  - Description of the range of water surface elevations at the Site
- Section 4 – Pre-Design Investigations
  - Description of the results from the hydrodynamic Pre-Design Investigation (PDI) work
- Section 5 – Hydrodynamic Model
  - Description of the model development and simulations of the extreme events
- Section 6 – Design Loadings and Manufacturer Recommendations
  - Descriptions of the hydrodynamic loading estimates and manufacturer's recommendations
- Section 7 – Geotechnical Evaluation
  - Description of the geotechnical data collected during the PDI
- Section 8 – References

# Section 2. Turbidity Control Design Approach

The Southern Cove lies to the south of the historical manufacturing plant area at the Site, on the eastern side of the main channel of the Penobscot River, as depicted in Figure 1. Average semi-diurnal tidal fluctuations of approximately 13 feet, with maximum fluctuations up to 16 feet, occur in the Southern Cove, and a portion of the cove is tidal mudflats exposed under low tide conditions. In addition, velocities in the Penobscot River can increase due to increases in upstream freshwater flows (due to dam releases, rainfall events, or the seasonal melting of snow).

Field data to support this analysis were collected as part of the PDI conducted in 2015. Bathymetry, tidal elevations, and velocity measurements were collected over typical tidal conditions. The full PDI Report is included as Appendix A of the Corrective Measures Implementation Plan (CMIP). Specific field data collection procedures are detailed in the CMIP.

During construction, when the turbidity control systems would be deployed, there could be increases in the velocities in the river as a result of increased freshwater flows. Therefore, a two-dimensional (2-D) hydrodynamic model was used to evaluate how much velocities and water depths may increase during higher flow events. The results of field data collection and modeling efforts were discussed with a turbidity curtain manufacturer to evaluate the hydrodynamic loads on a curtain.

# Section 3. Water Surface Elevation Analysis

To estimate the tidal range at the Site, tidal datums were estimated through linear interpolation between established tidal gages upstream and downstream of the Site in Bangor and Winterport, respectively (**Figure 2**). This was accomplished by first approximating river mile distances between Bangor and Winterport (12.9 miles), and then Bangor and the Site (4.4 miles), using Google Earth. Approximate site datums were then interpolated using published National Oceanic and Atmospheric Administration (NOAA) tidal statistics at Bangor and Winterport. Tidal statistics included Mean Higher High Water (MHHW), Mean High Water (MHW), Mean Sea Level (MSL), Mean Low Water (MLW), and Mean Lower Low Water (MLLW). **Table 1** summarizes the NOAA datums for Bangor and Winterport, as well as the interpolated results for the Site.

**Table 1: Tidal Datums (feet, NAVD 88)**

| Location | MHHW | MHW | MSL | MLW | MLLW |
|---|---|---|---|---|---|
| Bangor | 7.6 | 7.0 | 0.3 | -6.4 | -6.7 |
| Winterport | 6.3 | 5.9 | -0.1 | -5.9 | -6.3 |
| Site (interpolated) | 7.1 | 6.6 | 0.2 | -6.2 | -6.5 |

Note:
NAVD 88 – North American Vertical Datum of 1988

# Section 4. Pre-Design Investigations

Field data were collected during the PDI to support hydrodynamic analysis; methodology and results are presented in Appendix A of the CMIP. Bathymetry was mapped using multi beam technology in the Southern Cove up to the high tide line. Current velocities and direction were measured using Acoustic Doppler Current Profiler (ADCP) technology over a tidal cycle on August 3, 2015 (see PDI Report). Water velocity data were collected at 0.25-meter depth intervals, recorded every 6 to 10 feet along the survey vessel transects. Three transects across the river were surveyed every hour for 12 hours to capture an entire tidal cycle. The locations of the three ADCP transects are shown in Figure 1. **Table 2** shows the maximum measured surface and depth-averaged current velocities during the ebb and flood tides in the vicinity of the proposed dredging operations. Depth-averaged velocities were determined by summing up all of the recorded velocities in the water column, and dividing by the cumulative depth of the measured depth intervals. The table shows that the local velocities during ebb and flood tide were generally between 2 and 3.5 feet per second (ft/s). The cross-channel distributions of surface, bottom, and depth-averaged velocity magnitude at each transect over the measured tidal cycle are shown in **Figures 3a through 3m**.

**Table 2: Surface and Depth-Averaged Velocities**

| | Flood Tide | | | Ebb Tide | | |
|---|---|---|---|---|---|---|
| **ADCP Transect** | **Surface Velocity (ft/s)** | **Bottom Velocity (ft/s)** | **Depth-Averaged Velocity (ft/s)** | **Surface Velocity (ft/s)** | **Bottom Velocity (ft/s)** | **Depth-Averaged Velocity (ft/s)** |
| Upstream Transect | 3.5 | 2.5 | 2.6 | 3.2 | 2.2 | 2.7 |
| Middle Transect | 2.9 | 2.4 | 2.3 | 3.5 | 3.3 | 2.8 |
| Downstream Transect | 2.8 | 2.8 | 2.1 | 3.2 | 3.2 | 3.1 |

# Section 5. Hydrodynamic Model

A hydrodynamic model of the study area and vicinity was developed to characterize the current velocities and circulation patterns, particularly in response to tidal cycles and freshwater stream inputs. This was necessary to obtain a comprehensive understanding of the river dynamics to develop the design parameters for the turbidity control system. The hydrodynamic modeling was performed with the 2-D (depth-averaged) version of the Delft3D-FLOW model. The Delft3D-FLOW model simulates steady and non-steady flows in two dimensions (depth-averaged) or three dimensions and can incorporate effects of drying and flooding and hydraulic structures. The model was developed and supported by Deltares and validated for use in riverine, estuarine, and open coast hydrodynamic systems.

This section includes details on the model grid refinement, selected simulations, and the associated logic for their selection and use.

## 5.1 Data Sources and Model Development

Data required to develop a hydrodynamic model include bathymetry, topography, and bed roughness or land use data. Boundary conditions are developed using upstream flow and downstream water level data.

The domain of the Site model extends from Eddington to Winterport (Figure 2). The NOAA tide gage in Winterport (Station ID 8414781) is the nearest publicly available source for tide data downstream of the Site. For this reason, Winterport was chosen as the downstream extent of the model. To conserve the tidal prism of the Penobscot River, the model was extended upstream to the U.S. Geological Survey (USGS) water level gage in Eddington (Station ID 01036390), where the measured tidal fluctuations are minimal (**Figure 4**).

The model approximately spans the 100-year floodplain as defined by the Federal Emergency Management Agency (FEMA) National Flood Hazard Layer (http://hazards.fema.gov/gis/nfhl/rest/services). Bathymetry and topography data were obtained and compiled from a variety of sources. The June 2015 bathymetry survey was utilized to define the in-channel areas in the vicinity of the Site. Bed elevations upstream and downstream of the Site, from Bangor to Winterport, were taken from two NOAA surveys dated August 17, 1984, and October 4, 1984 (NOAA 1985a, 1985b). Bed elevations from Bangor to Eddington were approximated from thalweg elevations provided in the Eddington and Bangor Flood Insurance Studies (FIS) (FEMA 1978, 2002). Topography data to define model elevations in the floodplain were taken from the USGS Digital Elevation Model (http://ned.usgs.gov/).

Bed roughness coefficients for the channel and floodplain areas were obtained from the Bangor FIS (FEMA 2002). The channel and floodplain areas were delineated in the model by the MHHW line, which was obtained from NOAA (http://www.ngs.noaa.gov/NSDE/). In accordance with the FIS, in-channel model cells were assigned a Manning's roughness coefficient of 0.028 and floodplain cells were assigned a coefficient of 0.065.

## 5.2 Model Scenarios

### 5.2.1 Tidal Conditions (August 3, 2015)

To facilitate model development, an initial model scenario was created to simulate tidal conditions during the August ADCP survey. To approximate these conditions, the upstream boundary condition was taken as the estimated daily average flow rate at Eddington on August 3, 2015. The USGS gage at Eddington does not measure flow; therefore, a surrogate watershed analysis was conducted using the

West Enfield USGS gage, located approximately 42 miles upstream of the Site (Station ID 01034500; Figure 2), to estimate the daily average flow rate.

The surrogate watershed analysis was accomplished by dividing the daily average flow rate at West Enfield by the USGS-published drainage area at that gage to determine the unit flow rate in cubic feet per second (cfs) per square mile. The resultant unit flow rate was then multiplied by the published drainage area of the Eddington USGS water level gage to obtain an estimated daily average flow rate of 6,600 cfs at Eddington.

To account for tributary flow from Kenduskeag Stream, located approximately 5.3 miles upstream of the Site, an additional 100 cfs were added to the upstream boundary condition. This was determined by taking the daily average flow rate during the calibration period at the USGS gage in that stream (Station ID 01037000).

The downstream boundary condition was developed using NOAA-predicted water levels at the NOAA gages in Bar Harbor (Station ID 8413320) and Winterport (Station ID 8414781). Data from the Bar Harbor gage were transformed to predicted water levels in Winterport using NOAA subordinate gage conversion factors for Winterport. The high and low tide conversion factors from NOAA, which transform predicted Bar Harbor water levels to predicted Winterport water levels, are provided in **Table 3**. Linear interpolation was used to develop a 6-minute interval time series of predicted harmonic Winterport water levels for the downstream boundary condition.

**Table 3: NOAA Winterport Subordinate Gage Corrections from Bar Harbor**

| Tide Level | Phase Shift (minutes) | Amplitude Multiplier |
|---|---|---|
| High Tide | -9 | 1.11 |
| Low Tide | 4 | 0.92 |

Source:
http://tidesandcurrents.noaa.gov/noaatidepredictions/NOAATidesFacade.jsp?Stationid=8414781

Figure 4 shows a comparison between the predicted Bar Harbor water levels and the transformed Winterport water levels for August 3, 2015. The NOAA-predicted high and low tide levels at Winterport are also included, which show good correlation.

### 5.2.2 2-Year and 10-Year Return-Interval Flow Events

The scenarios selected for evaluation of the turbidity control system were the 2-year and 10-year return-interval floods. These return intervals were selected as they represent the higher end forcing that would likely be experienced within the expected project duration.

The water levels from Winterport during the August ADCP survey dates were selected for the downstream boundary condition because this time period corresponded to a spring tide, and thus was assumed to be a conservative representation of the tidal range at the Site.

The 2-year and 10-year return-interval flow rates were specified as the upstream boundary conditions. The 2-year upstream boundary condition was developed similarly to the tidal condition simulation. A return-interval analysis was performed to determine the 2-year flow rate at the West Enfield gage

(**Figure 5**). Through a surrogate watershed analysis, the resulting 2-year flow rate at Eddington was estimated to be 75,700 cfs.

The 10-year return-interval flow rate of 111,500 cfs was referenced from the Bangor FIS, downstream of the confluence with Kenduskeag Stream (FEMA 2002).

## 5.3 Results

### 5.3.1 Tidal Conditions (August 3, 2015)

Model results were compared to velocity data at the Site from the ADCP survey, as well as water levels at Bangor measured by USGS. **Figures 6a through 6m** shows a comparison of the measured and predicted cross-channel, depth-averaged velocities during the survey period. **Figure 7** provides a comparison of the measured and predicted water levels in Bangor during the survey period.

Generally, the model exhibits good agreement with measured depth-averaged velocities in the vicinity of the Site during ebb and flood tides. The model comparison shows some under-prediction of depth-averaged velocities around slack tide. Adjustments in model parameters did not improve the model to data comparisons, which suggests that the differences may be attributed to the estimates of the upstream and downstream bathymetry outside the area of interest. The predicted water levels in Bangor also showed good agreement with measured data during flood tide. The model shows some under-prediction of water levels during ebb tide as well as under-prediction of the tidal range by approximately 1 foot. This is considered a small difference given the water depths in the river are up to 56 feet at mid-tide.

Based on these results, the model was considered reliable in simulating and estimating the ranges of water depths and velocities near the Site during the August field survey. The model was thus determined to be sufficient to support an evaluation of the potential increases in velocities and water depths at the Site during extreme events.

### 5.3.2 2-Year and 10-Year Return-Interval Flow Events

Figures 6a through 6m show predicted, cross-channel current velocities from the 2-year and 10-year floods for each of the ADCP transects completed as part of the PDI. **Figures 8 and 9** show the local predicted depth-averaged velocity field at the time when velocities at the Site are maximum (ebb tide). For both model simulations, the maximum predicted velocity at the Site occurs during the peak of ebb tide. The highest velocities near the project area occur near the planned northern sediment removal areas in the Southern Cove, closest to the channel. Predicted velocities in this area are between 2 to 3 ft/s during the 2-year flood and 2.5 to 3.5 ft/s during the 10-year flood.

# Section 6. Design Loadings and Manufacturer Recommendations

As described in Francingues and Palermo (2005), turbidity curtains can lose their effectiveness and require additional anchoring techniques when velocities exceed 1 knot (approximately 1.7 ft/s). As can be seen from the ADCP measurements as well as the modeling results, velocities can routinely exceed this value outside the planned removal areas where a fixed turbidity curtain may be deployed.

As part of a constructability review, the ADCP measurements as well as the modeling results in this report were provided to SpillDam, Inc. (a turbidity curtain manufacturer) to evaluate potential loadings along the curtain and to provide general recommendations. Based on our simulations and discussions with SpillDam, there is concern for the loadings for a fixed turbidity curtain, specifically at the northern end of the Site where the velocities are high under both typical tidal and high flow events. In fact, because the model slightly under predicts the velocities for tidal conditions (based on the model-data comparisons), the loadings may even be higher. The following are conclusions based on discussions with SpillDam[1]; however, they should be considered as design considerations rather than recommendations:

- The measured ebb and flood velocities are high at the northern end of the Site. It would be a concern with traditional anchoring, but a pile-supported turbidity curtain in this area could be used. Additional pilings (closer spacing) would be required at the north end.
- The hydrodynamic loadings on a turbidity barrier due to currents during a 2-year return-interval flow event were estimated to be 268 pounds per linear foot. This loading is very high and would be a risk to the barriers' survival. For a short-duration event, the survival risk would be approximately 50%. After more than a few hours, the barriers would be expected to suffer significant damage.
- The hydrodynamic loadings due to currents during a 10-year return-interval flow event were estimated to be 350 pounds per linear foot. This loading would exceed the tensile strength of the materials. The curtains would need to be reefed or removed entirely, simply for preservation of the barriers.

Given these loadings and recommendations from the manufacturer, fixed turbidity curtains are not recommended for this Site.

Rather than a fixed turbidity curtain, a mobile turbidity control system is recommended at the Site. This would involve deploying a turbidity curtain closely encircling the dredge barge, allowing the turbidity control to be placed near the removal operations and away from the higher velocity areas in the river (see Section X of the CMIP). The turbidity curtain could be secured directly to the barges to be used for the removal or secured to a separate floating frame around the dredge equipment. Although the exact design of the mobile turbidity control system would be designed by the selected contractor based on their equipment, the system may include dual curtains as well as chains or equivalent ballast to minimize billowing of curtains.

Turbidity barriers would not be required for excavation in the dry. Excavation in the dry will be followed by approval and placement of backfill to final grades prior to the incoming tide.

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[1] These recommendations are based on discussions with SpillDam for the evaluation of the turbidity control system. SpillDam does not warrant this information.

# Section 7. Geotechnical Evaluation

A geotechnical investigation was performed in June 2015 to collect geotechnical field information and samples within the Penobscot River and the tidal flat. **Figure 10** shows the locations of the geotechnical borings; the boring logs are located in the PDI Report (Appendix A of the CMIP). **Figures 11 and 12** are generalized subsurface profiles based on the geotechnical explorations. Explorations were advanced using a drill rig, vibracore, and manual techniques (e.g., hand auger and shovels) to depths ranging from 1.5 to 22.5 feet below ground surface (bgs). Within the river, the explorations performed using a drill rig were terminated 10 feet below the depth at which a dense material was encountered. **Table 4** is a summary of the explorations. Testing results are presented in **Table 5**.

**Table 4: Explorations Summary**

| Exploration ID | Easting (x)[1] | Northing (y)[1] | Type of Exploration | Termination Depth (feet)[2] |
|---|---|---|---|---|
| SD-SC-01 | 898640.1 | 391223.3 | Soil Boring | 15 |
| SD-SC-02 | 898415.88 | 390788.97 | Soil Boring | 16.4 |
| SD-SC-02B | 898415.9 | 390779.6 | Soil Boring | 22.5 |
| SD-SC-03 | 898464.3 | 390354.1 | Soil Boring | 18 |
| SD-SC-04 | 898773 | 390946.9 | Hand Auger | 1.5 |
| SD-SC-05 | 898761.1 | 390667 | Soil Boring | 8 |
| SD-SC-06 | 898770.8 | 390259.1 | Vibracore | 1.9 |

Notes:
1 Horizontal datum is North American Datum of 1983 Maine State Plane East, U.S. Survey feet.
2 Termination depth is relative to the ground surface/mudline.

**Table 5: Geotechnical Laboratory Results Summary**

| | | Sample Depth (feet) | | | Atterberg Limits | | | Particle Size Summary | | | | Uncorrected Field Measurements | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Field Sample ID | Location ID | Top | Bottom | Moisture Content (%) | Liquid Limit | Plastic Limit | Plasticity Index | Gravel (%) | Sand (%) | Fines (%) | USCS Symbol | Pocket Penetrometer, Average (ton/ft$^2$) | Torvane Reading, Average (kg/cm$^2$) |
| SD-SC-01-150617-3.5-5 | SD-SC-01 | 3.5 | 5 | 13.5 | -- | -- | -- | 37.6 | 52.7 | 9.7 | SW-SM | -- | -- |
| SD-SC-01-150617-6-7.5 | SD-SC-01 | 6 | 7.5 | 10.6 | -- | -- | -- | 44.6 | 45.9 | 9.5 | SW-SM | -- | -- |
| SD-SC-01-150617-9-10.5 | SD-SC-01 | 9 | 10.5 | 11.5 | -- | -- | -- | 58.1 | 38.3 | 3.6 | GW | -- | -- |
| SD-SC-02-150620-6-7.5 | SD-SC-02 | 6 | 7.5 | 14.5 | -- | -- | -- | 20.2 | 70.0 | 9.8 | SW-SM | -- | -- |
| SD-SC-02-150620-8.5-10 | SD-SC-02 | 8.5 | 10 | 12.4 | -- | -- | -- | 37.8 | 58.6 | 3.6 | SP | -- | -- |
| SD-SC-02-150620-13.5-15 | SD-SC-02 | 13.5 | 15 | 13.4 | -- | -- | -- | 33.9 | 62.3 | 3.8 | SP | -- | -- |
| SD-SC-02-150620-21-22.5 | SD-SC-02 | 21 | 22.5 | 10.4 | NV | NP | NP | 36.8 | 46.3 | 16.9 | SM | -- | -- |
| SD-SC-03-150620-8.5-10 | SD-SC-03 | 8.5 | 10 | 13.7 | -- | -- | -- | 20.0 | 72.4 | 7.6 | SW-SM | -- | -- |
| SD-SC-03-150620-16-18 | SD-SC-03 | 17.6 | 18 | 15.2 | -- | -- | -- | 29.0 | 58.5 | 12.5 | SM | -- | -- |
| SD-SC-04-150617-1-1.5 | SD-SC-04 | 1 | 1.5 | 23.1 | -- | -- | -- | 9.8 | 86.6 | 3.6 | SP | -- | -- |
| SD-SC-05-150620-0-2 | SD-SC-05 | 0 | 2 | 130.1 | 139 | 69 | 70 | 0.0 | 10.6 | 89.4 | MH | -- | -- |
| SD-SC-05-150620-2.5-3.5 | SD-SC-05 | 2.5 | 3.5 | 16.8 | -- | -- | -- | 19.1 | 78.0 | 2.9 | SP | -- | -- |
| SD-SC-05-150620-3.5-4 | SD-SC-05 | 3.5 | 4 | 22.4 | -- | -- | -- | 7.5 | 80.4 | 12.1 | SM | -- | -- |
| SD-SC-05-150620-4-6 | SD-SC-05 | 4 | 6 | 16.8 | -- | -- | -- | 7.5 | 78.0 | 14.5 | SM | -- | -- |
| SD-SC-05-150620-6-8 | SD-SC-05 | 6 | 8 | 20.2 | 28 | 15 | 13 | 0.0 | 32.2 | 67.8 | CL | 1.3 | 2.0 |
| SD-SC-06-150620-6-23 | SD-SC-06 | 0.5 | 1.9 | 31.5 | 38 | 19 | 19 | 0.0 | 10.1 | 89.9 | CL | 0.7 | 2.8 |

Notes:
-- not analyzed/not tested
kg/cm$^2$ – kilograms per square centimeter
ton/ft$^2$ – tons per square foot
NP – non-plastic
NV – no value
USCS – Unified Soil Classification System per ASTM D 2487

## 7.1 Soils Encountered

Based on field characterization and laboratory results, the following soil units were encountered, described from the ground surface/mudline downward, and illustrated in Figures 11 and 12. USCS nomenclature is noted in parentheses.

### 7.1.1 Silt

This unit is very soft to soft, brown to dark brown, slightly sandy, clayey silt (MH) and was encountered to depths of 0.5 to 2 feet bgs in SD-SC-05 and SD-SC-06, respectively. This unit will likely be encountered during sediment dredging over most of the tidal flat area, though not uniformly in spatial distribution or layer thickness.

### 7.1.2 Sand and Gravel Alluvium

This soil unit is loose to very dense, gray, slightly silty to silty, slightly gravelly to gravelly sand (SW-SM/SP/SM) grading to dense to very dense, gray, sandy, fine to medium gravel (GW) with infrequent sub-rounded cobbles and angular rock fragments. The unit was encountered in all explorations except SD-SC-06. Within SD-SC-05, the unit was encountered layered between the silt layer and above the clay layer from 3.5 to 6 feet bgs. In SD-SC-01 to SD-SC-04, this soil unit was the only one encountered from the mudline to termination (1.5 feet to 22.5 feet bgs). In the river, it should be expected that this unit may extend deeper than the bottom of the explorations and that density will increase with depth.

### 7.1.3 Clay

This soil unit is soft to stiff, olive-gray to light gray, slightly sandy to very sandy, silty clay (CL). The unit was encountered only in SD-SC-05 from 6 to 8 feet bgs, and in SD-SC-06 from 1.5 to 2 feet bgs. This unit does not appear to consistently underlie the sand and gravel alluvium based on its absence from adjacent explorations SD-SC-08, SD-SC-09, and SD-SC-10.

### 7.1.4 Bedrock

Review of Maine geologic sources (MGS 1985) and information provided by CDM Smith, Inc. (CDM 1998) indicates that the Vassalboro Formation (metamorphic) underlies the Site. Our geotechnical explorations did not encounter bedrock; however, CDM Smith Inc.'s bedrock mapping notes steeply dipping contours at approximately the break between the beach and the underwater river slope, which is consistent with published geologic information of the area. Given the wide range of bedrock elevations mapped below the upland portion of the Site, depth to bedrock within Southern Cove cannot be estimated.

# Section 8. References

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NOAA, 1985b. Hydrographic Survey Descriptive Report, Penobscot River, Snub Point to Treat Hill. Field No. HFP-10-2-84. Office No. H-10146. October 7, 1985.

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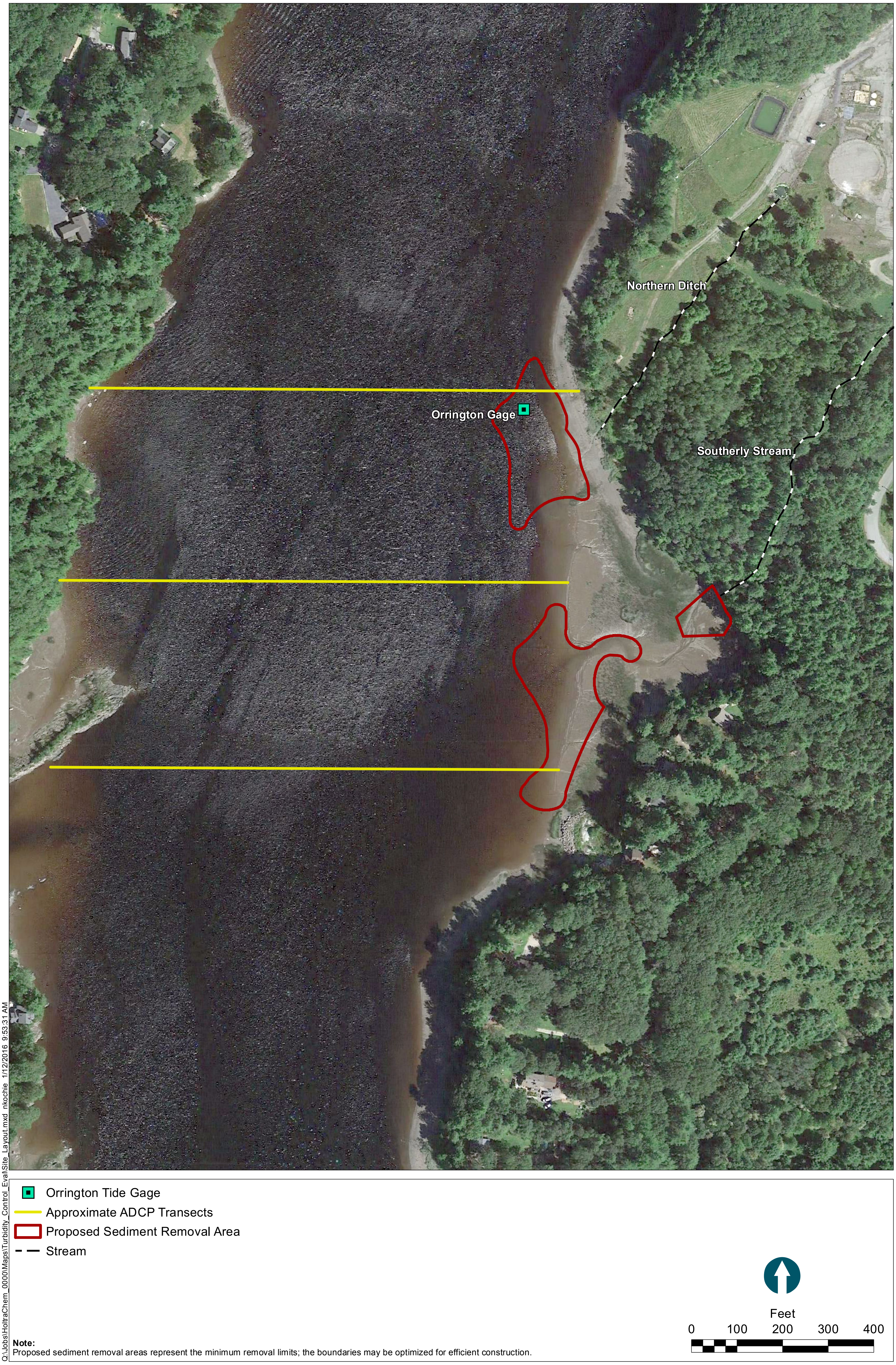
# FIGURES

DRAFT



**Note:**
Proposed sediment removal areas represent the minimum removal limits; the boundaries may be optimized for efficient construction.

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**Figure 1**
Site Layout
Turbidity Control Evaluation Report
Southern Cove, Orrington Remediation Site

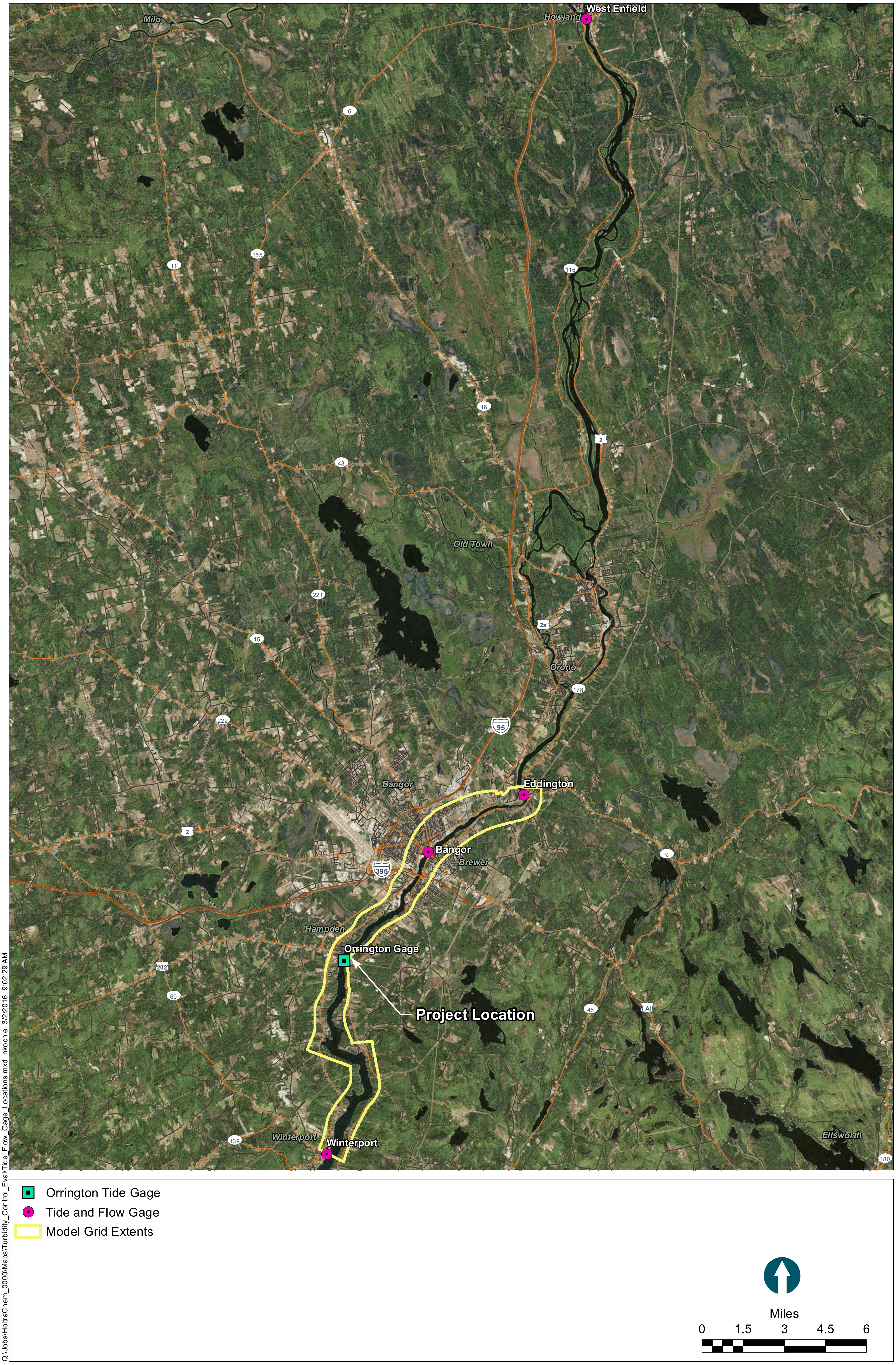

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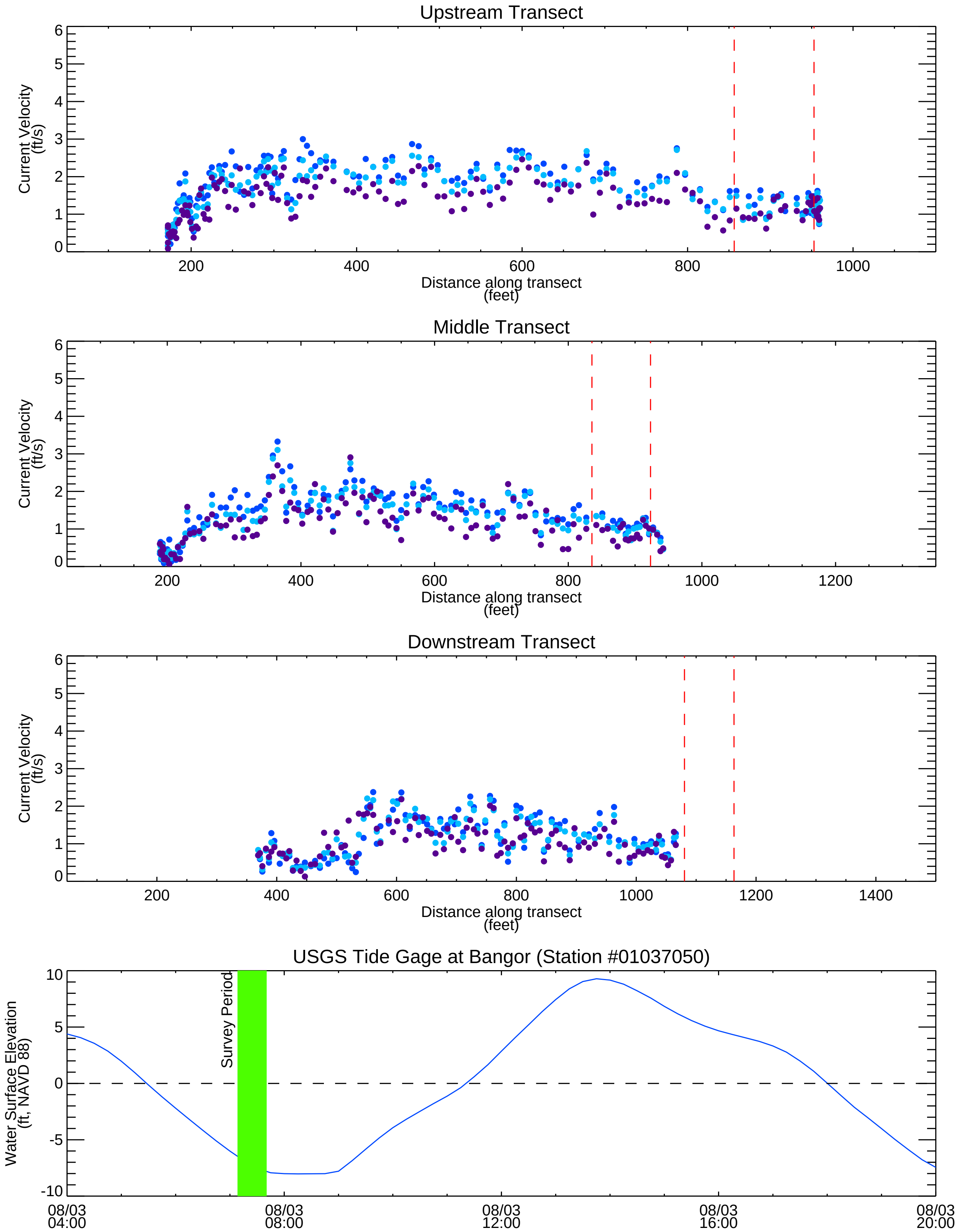
**Figure 2**
Tide and Flow Gage Locations
Turbidity Control Evaluation Report
Southern Cove, Orrington Remediation Site



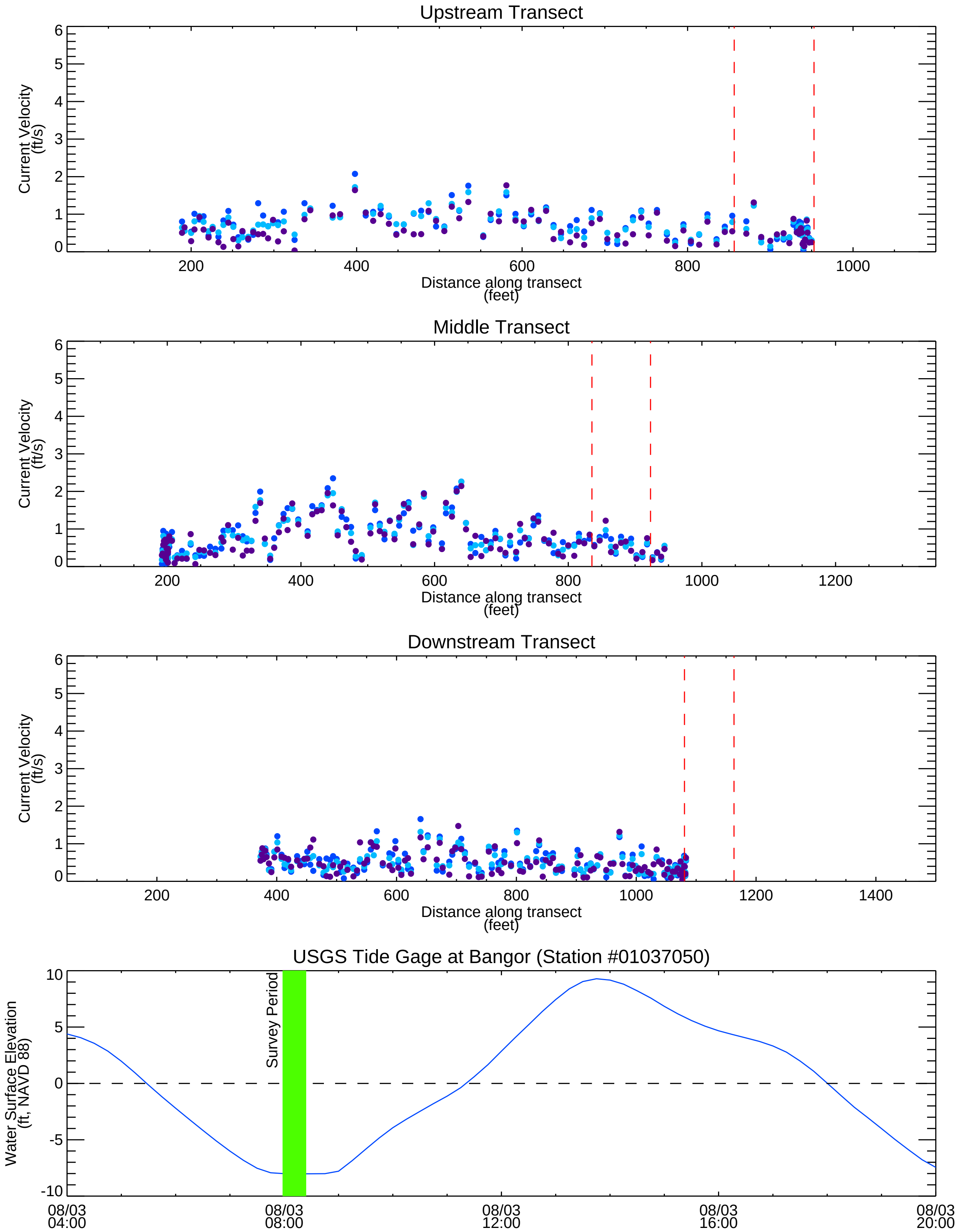
## Figure 3a

Cross-Channel Measured Velocity Distribution (August 3, 2015)
Transects 000, 001, and 002
Turbidity Control Evaluation Report
Southern Cove, Orrington Remediation Site

ANCHOR QEA

● Surface Velocity
● Bottom Velocity
● Depth-Averaged Velocity

*Note: Red dashed line indicates approximate placement range of turbidity control system.*

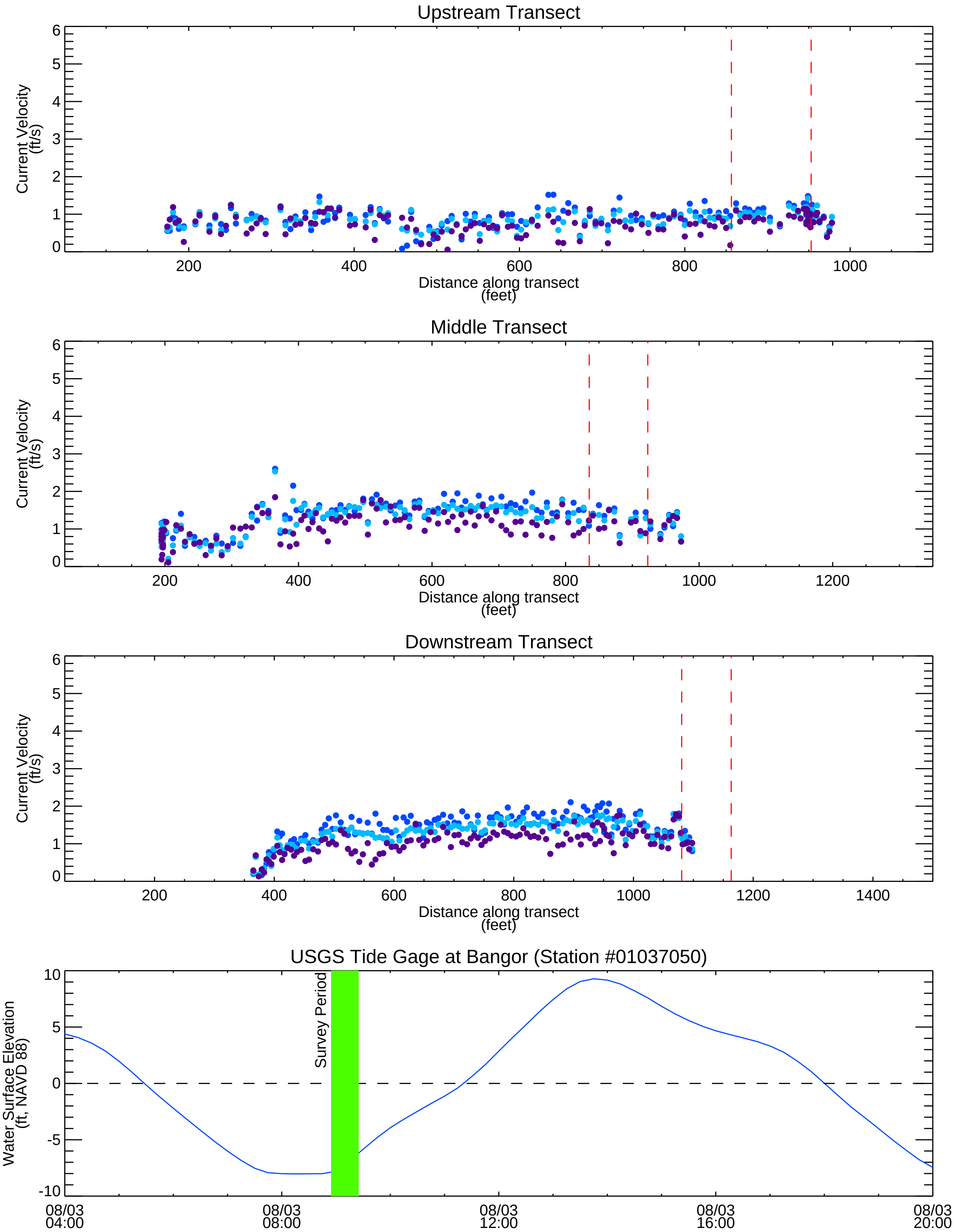


● Surface Velocity
● Bottom Velocity
● Depth-Averaged Velocity

**Figure 3b**

Cross-Channel Measured Velocity Distribution (August 3, 2015)
Transects 003, 004, and 005
Turbidity Control Evaluation Report
Southern Cove, Orrington Remediation Site

*Note: Red dashed line indicates approximate placement range of turbidity control system.*



● Surface Velocity
● Bottom Velocity
● Depth-Averaged Velocity

ANCHOR QEA

**Figure 3c**

Cross-Channel Measured Velocity Distribution (August 3, 2015)
Transects 006, 007, and 008
Turbidity Control Evaluation Report
Southern Cove, Orrington Remediation Site

*Note: Red dashed line indicates approximate placement range of turbidity control system.*

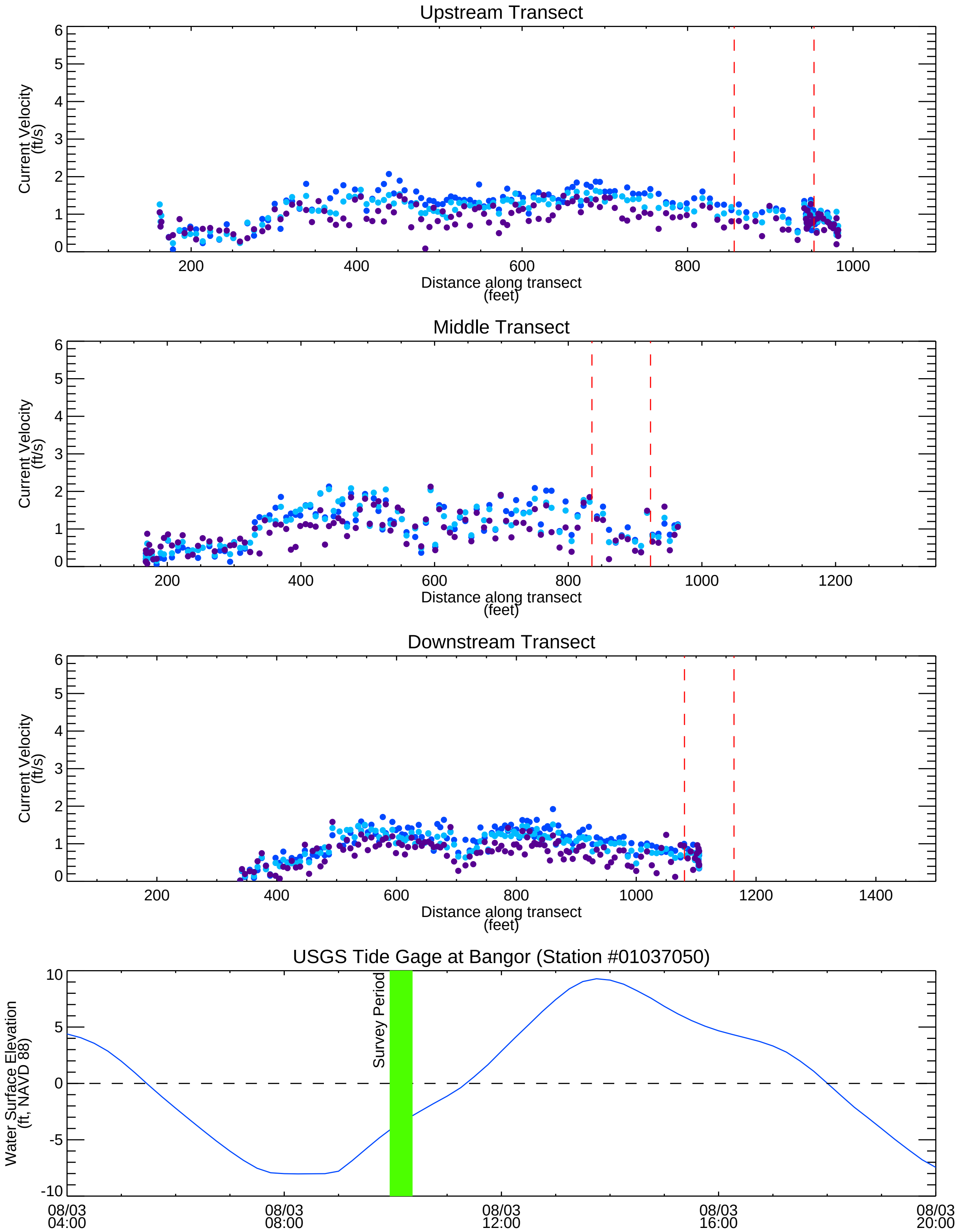


**Figure 3d**

Cross-Channel Measured Velocity Distribution (August 3, 2015)
Transects 009, 010, and 011
Turbidity Control Evaluation Report
Southern Cove, Orrington Remediation Site

● Surface Velocity
● Bottom Velocity
● Depth-Averaged Velocity

*Note: Red dashed line indicates approximate placement range of turbidity control system.*

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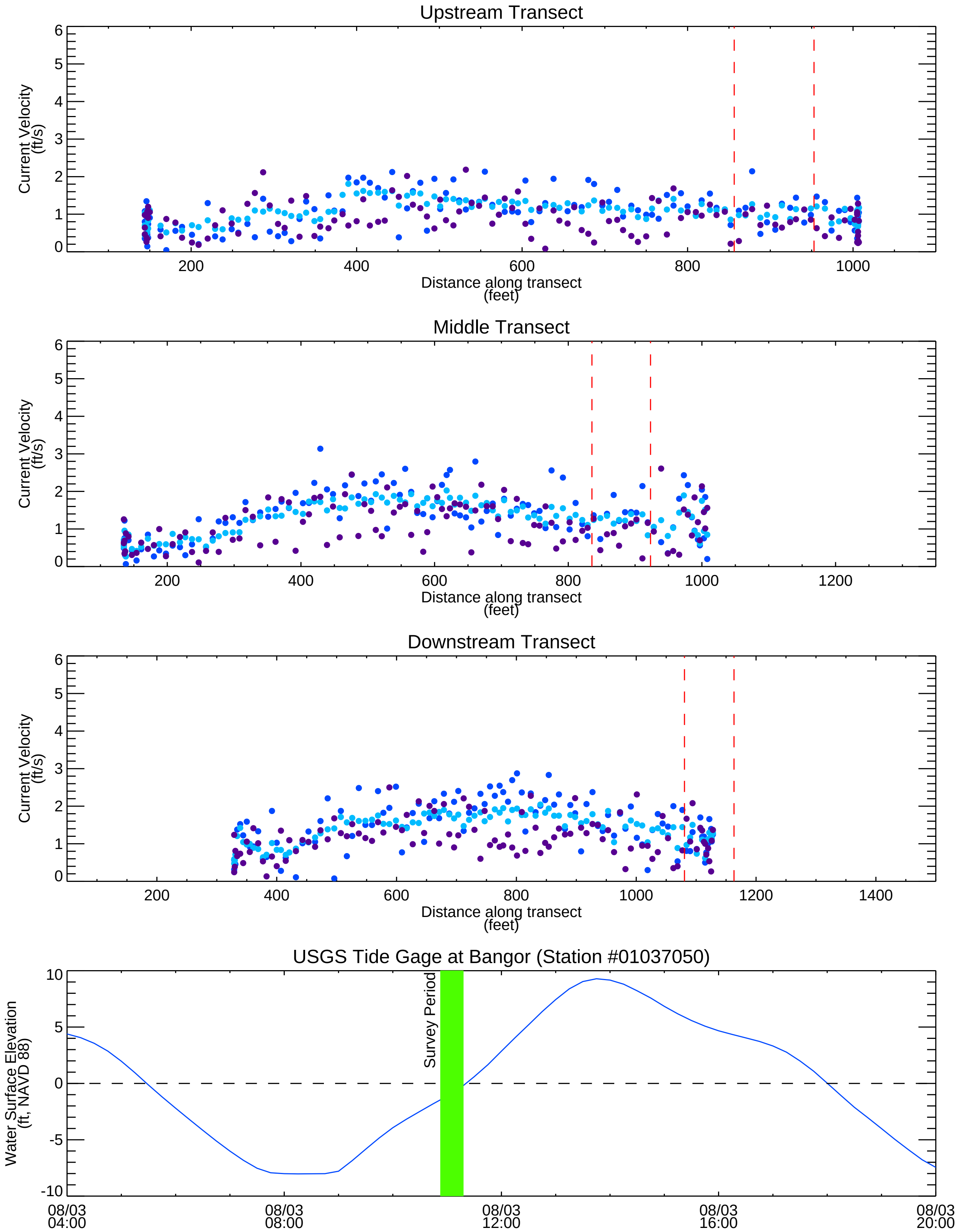

Upstream Transect

Middle Transect

Downstream Transect

USGS Tide Gage at Bangor (Station #01037050)

## Figure 3e

Cross-Channel Measured Velocity Distribution (August 3, 2015)
Transects 012, 013, and 014
Turbidity Control Evaluation Report
Southern Cove, Orrington Remediation Site

ANCHOR
QEA

● Surface Velocity
● Bottom Velocity
● Depth-Averaged Velocity

*Note: Red dashed line indicates approximate placement range of turbidity control system.*

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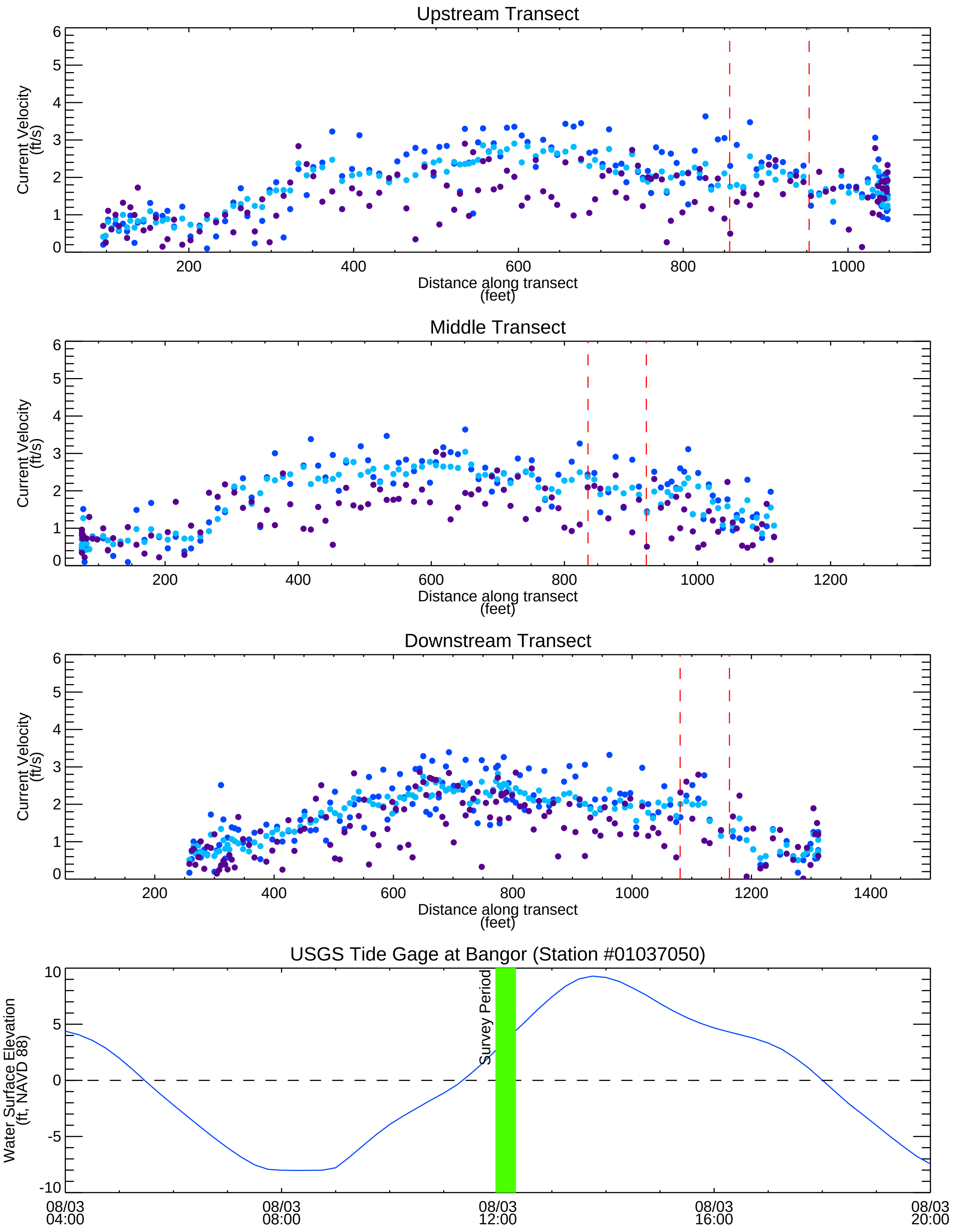

ANCHOR QEA

● Surface Velocity
● Bottom Velocity
● Depth-Averaged Velocity

**Figure 3f**

Cross-Channel Measured Velocity Distribution (August 3, 2015)
Transects 015, 016, and 017
Turbidity Control Evaluation Report
Southern Cove, Orrington Remediation Site

*Note: Red dashed line indicates approximate placement range of turbidity control system.*

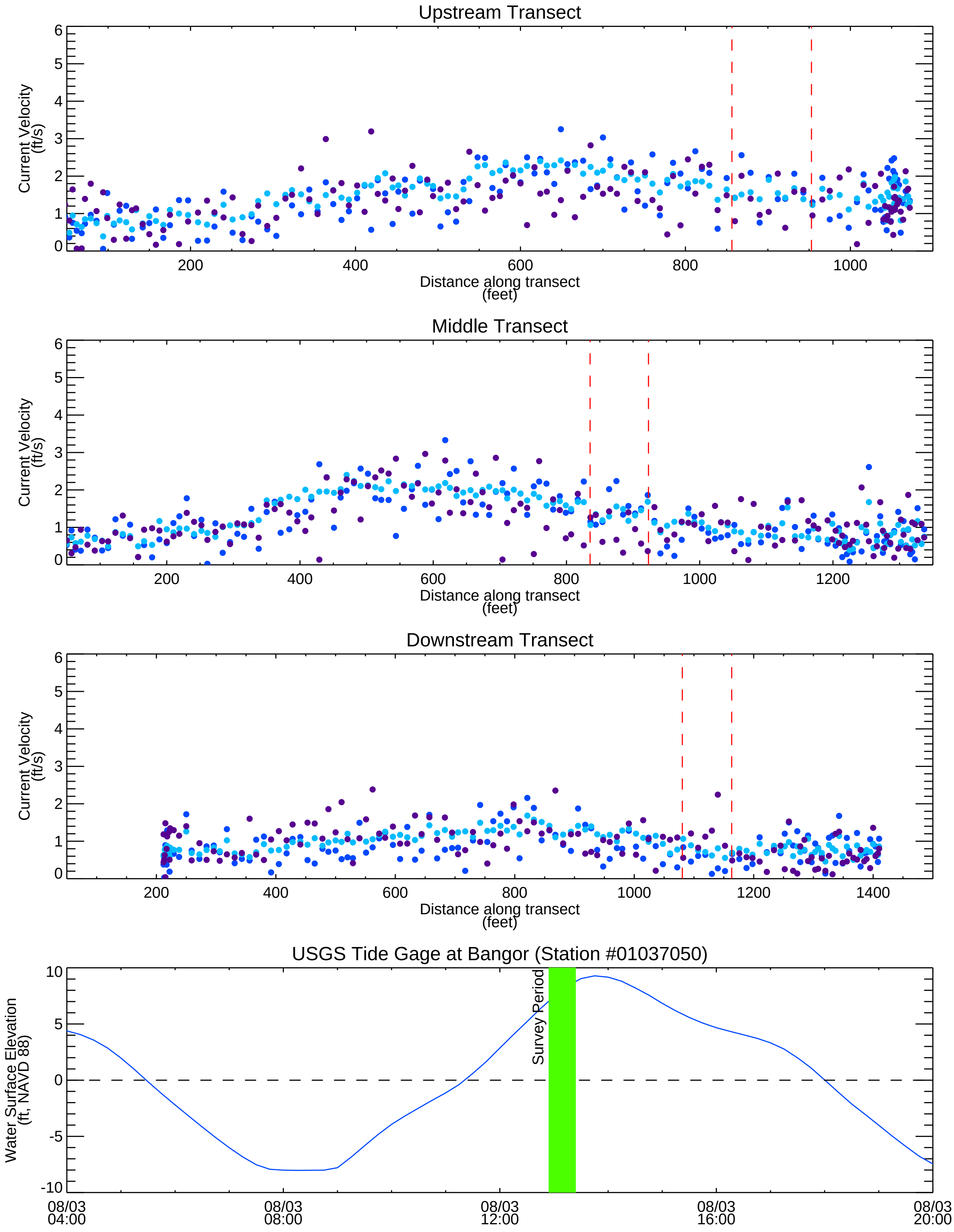

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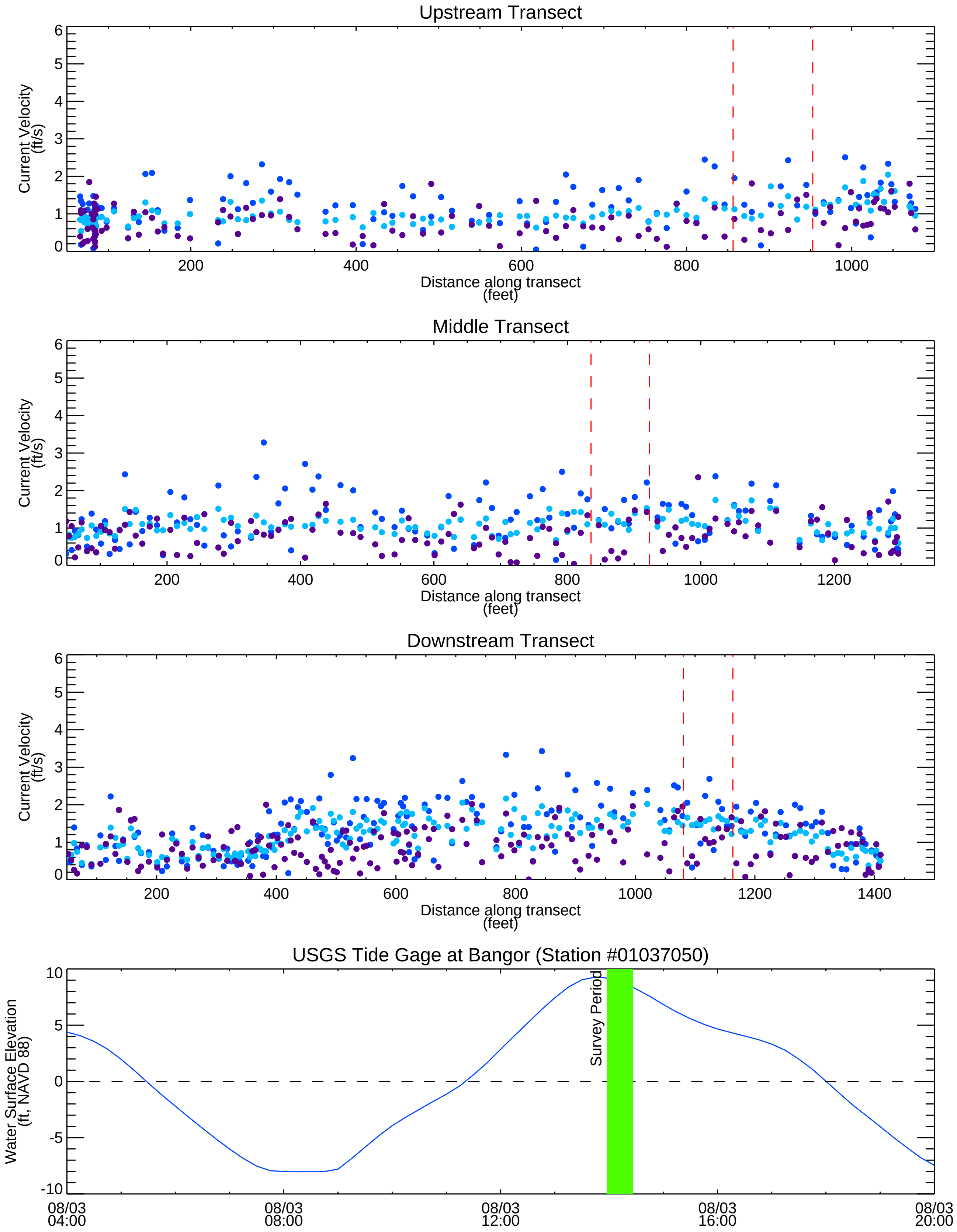
**Figure 3g**

Cross-Channel Measured Velocity Distribution (August 3, 2015)
Transects 018, 019, and 021
Turbidity Control Evaluation Report
Southern Cove, Orrington Remediation Site

*Note: Red dashed line indicates approximate placement range of turbidity control system.*



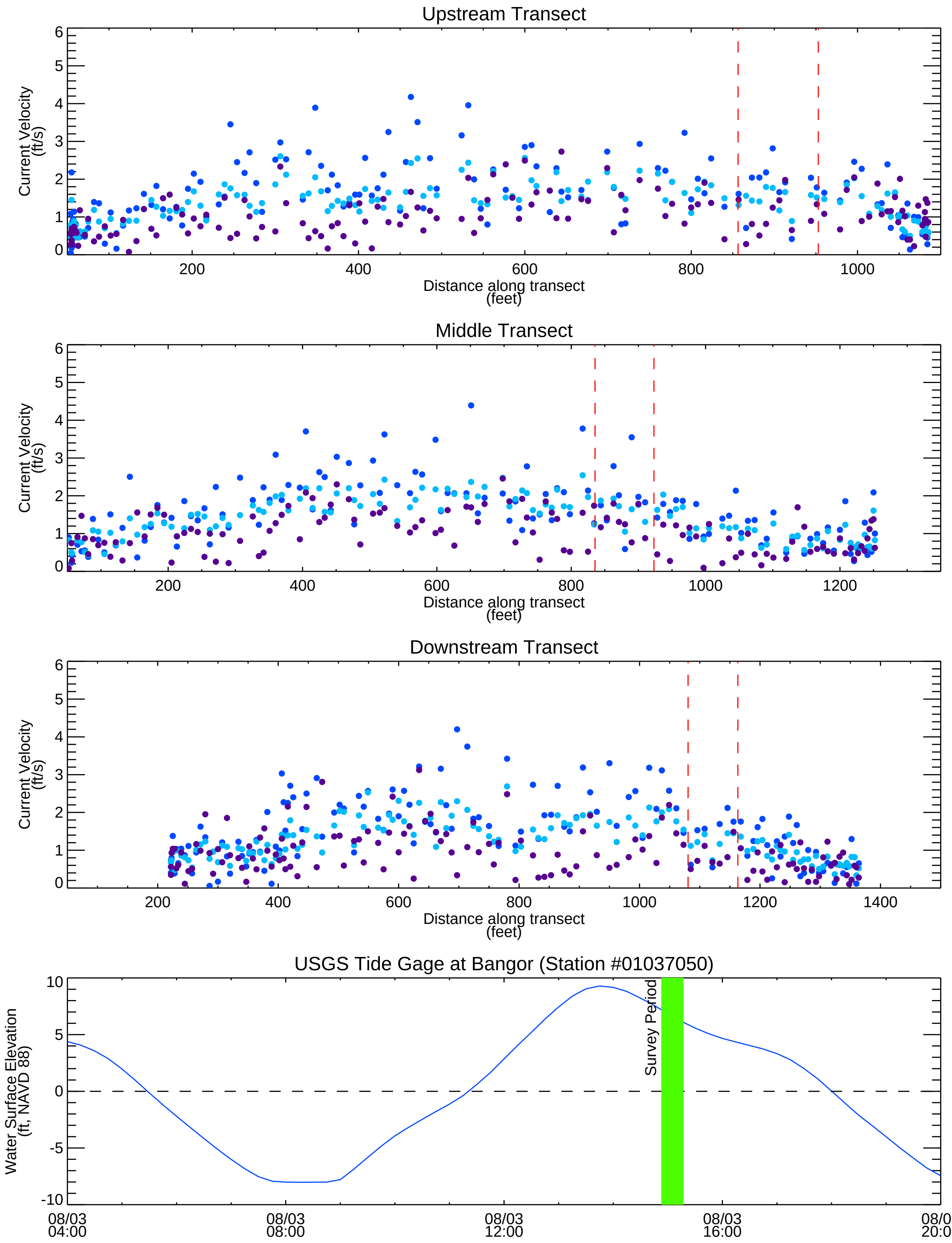
● Surface Velocity
● Bottom Velocity
● Depth-Averaged Velocity

ANCHOR QEA

## Figure 3h

Cross-Channel Measured Velocity Distribution (August 3, 2015)
Transects 022, 023, and 024
Turbidity Control Evaluation Report
Southern Cove, Orrington Remediation Site

*Note: Red dashed line indicates approximate placement range of turbidity control system.*

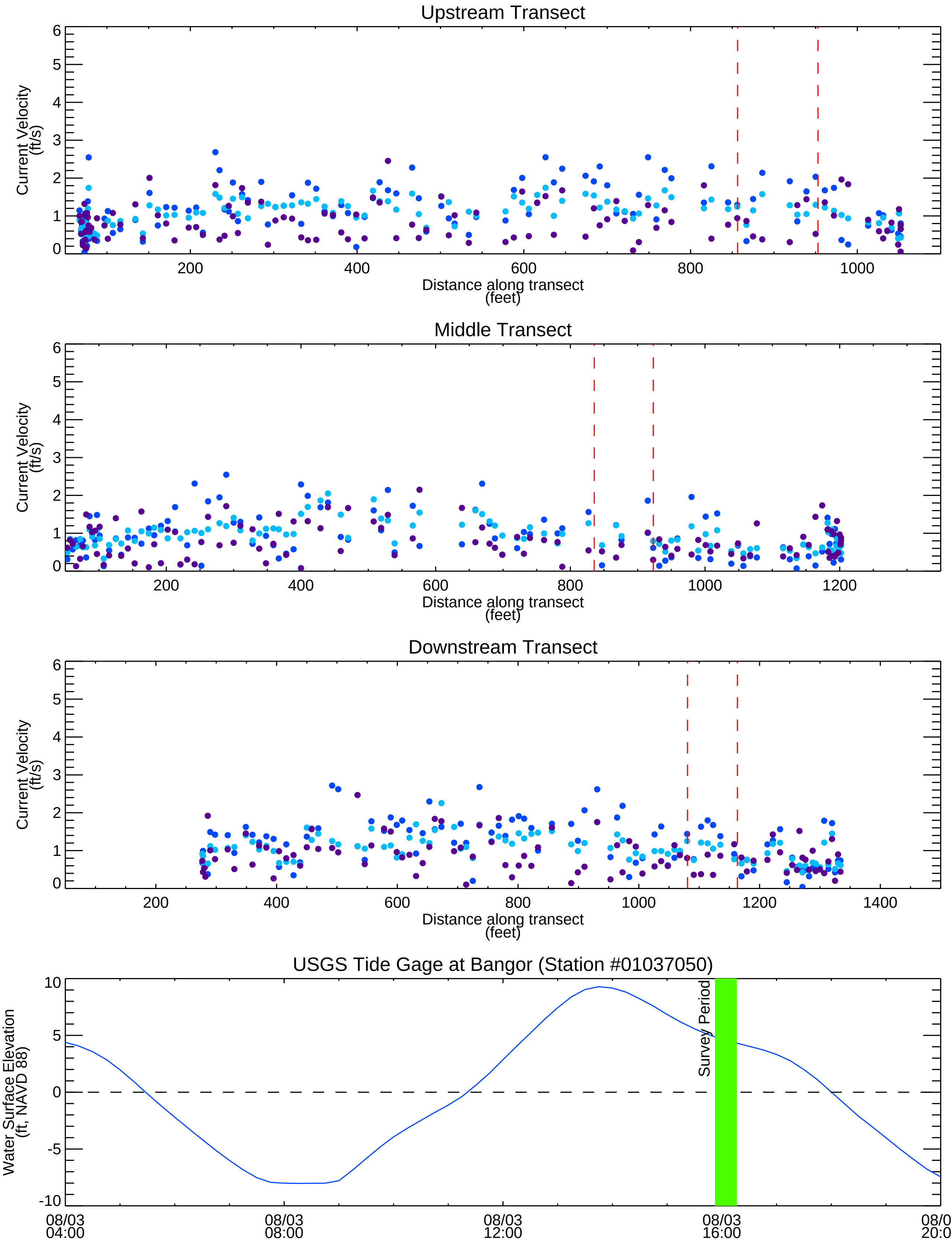


● Surface Velocity
● Bottom Velocity
● Depth-Averaged Velocity

**Figure 3i**

Cross-Channel Measured Velocity Distribution (August 3, 2015)
Transects 025, 026, and 027
Turbidity Control Evaluation Report
Southern Cove, Orrington Remediation Site

*Note: Red dashed line indicates approximate placement range of turbidity control system.*

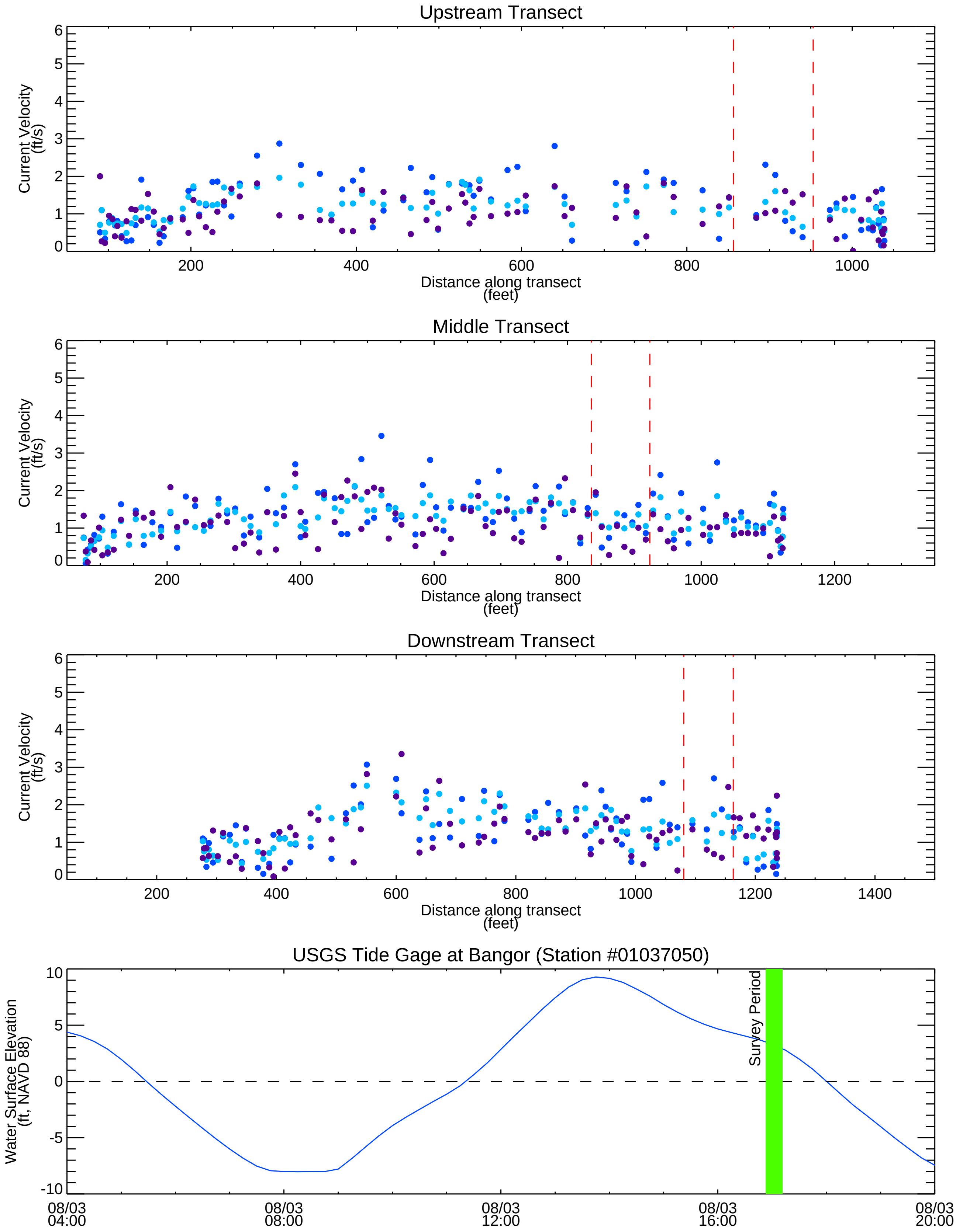


## Figure 3j

Cross-Channel Measured Velocity Distribution (August 3, 2015)
Transects 028, 029, and 030
Turbidity Control Evaluation Report
Southern Cove, Orrington Remediation Site

● Surface Velocity
● Bottom Velocity
● Depth-Averaged Velocity

*Note: Red dashed line indicates approximate placement range of turbidity control system.*



● Surface Velocity
● Bottom Velocity
● Depth-Averaged Velocity

**Figure 3k**

Cross-Channel Measured Velocity Distribution (August 3, 2015)
Transects 031, 032, and 033
Turbidity Control Evaluation Report
Southern Cove, Orrington Remediation Site

*Note: Red dashed line indicates approximate placement range of turbidity control system.*

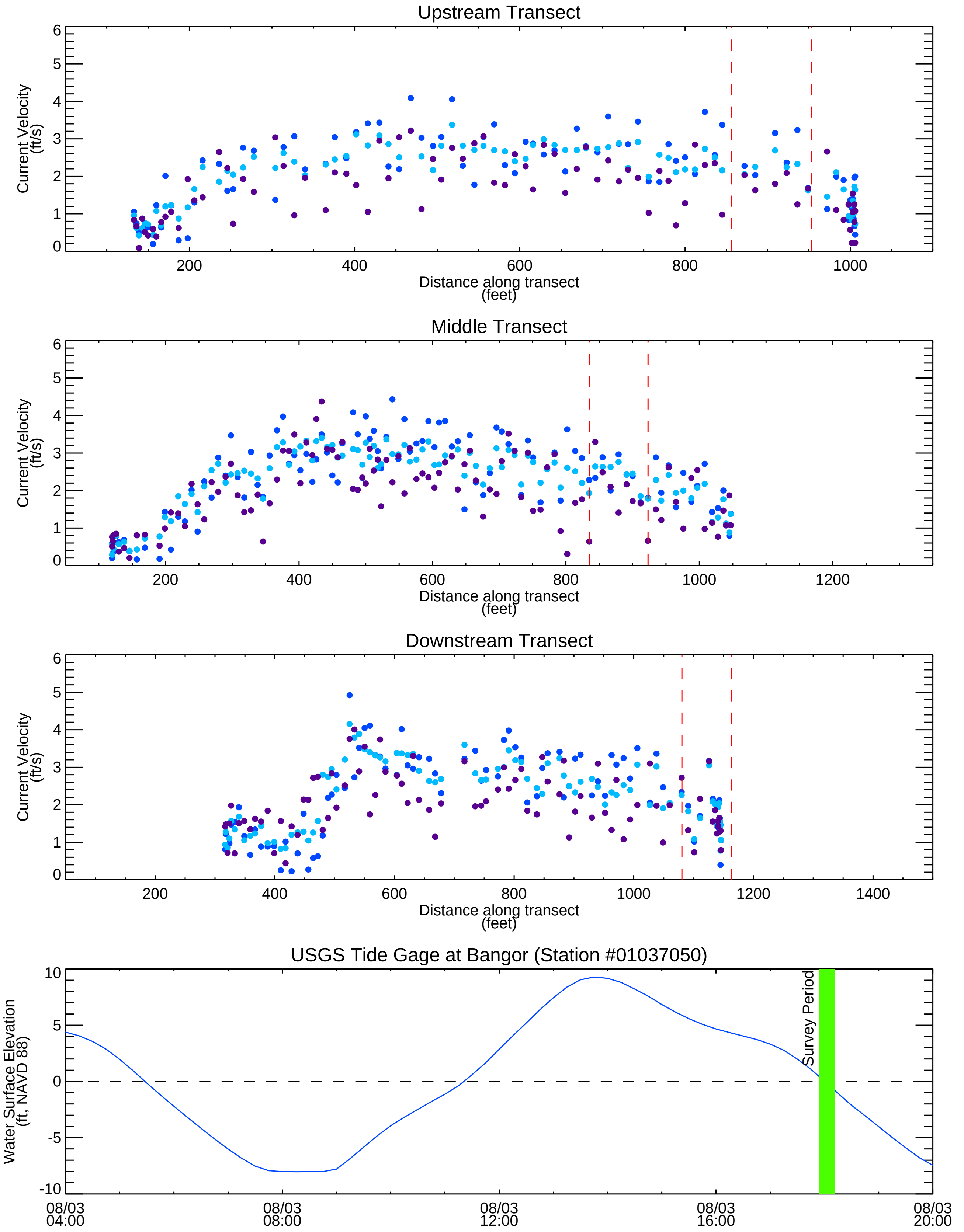


**Figure 3l**

Cross-Channel Measured Velocity Distribution (August 3, 2015)
Transects 034, 035, and 036
Turbidity Control Evaluation Report
Southern Cove, Orrington Remediation Site

- ● Surface Velocity
- ● Bottom Velocity
- ● Depth-Averaged Velocity

*Note: Red dashed line indicates approximate placement range of turbidity control system.*

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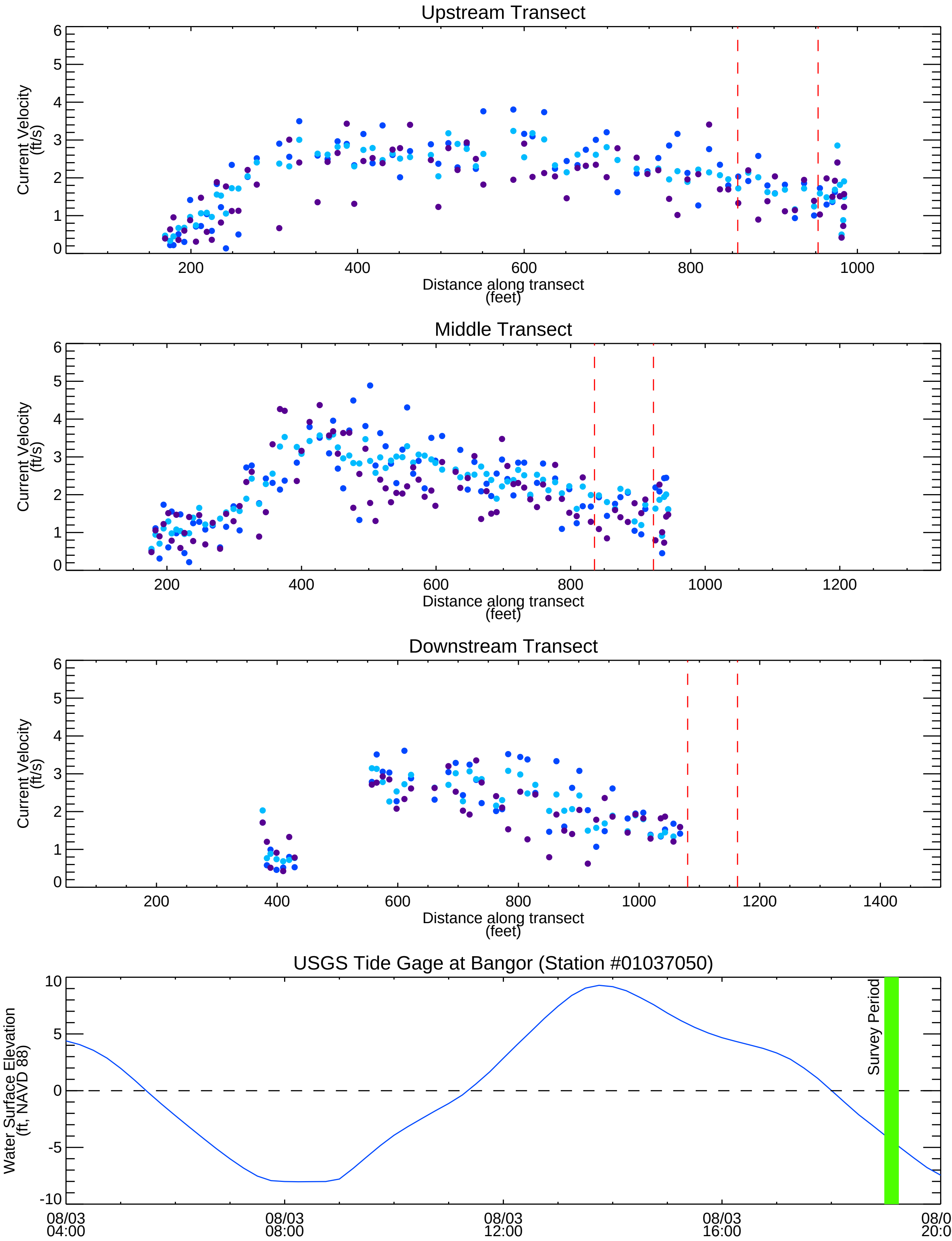


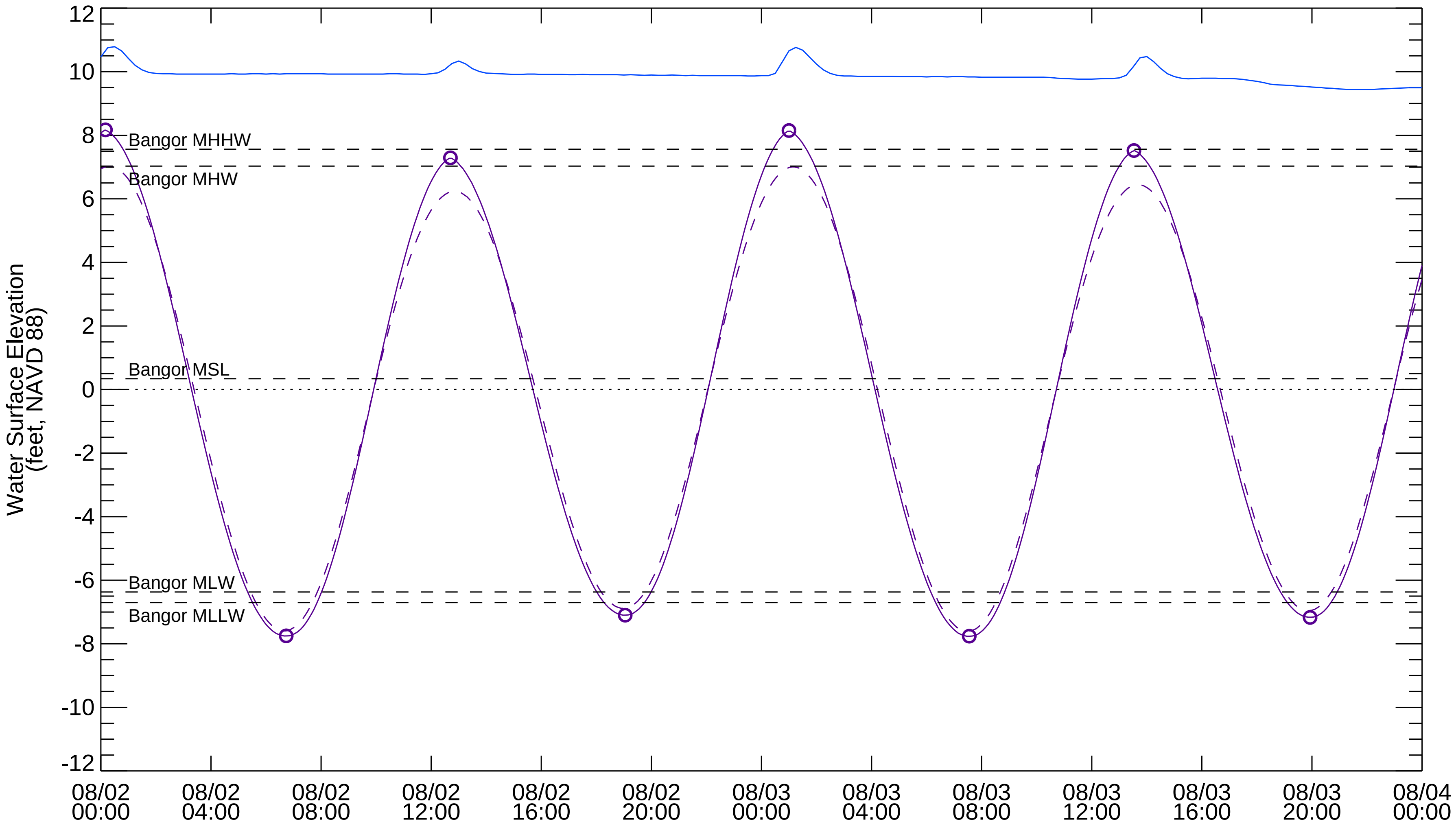
**Figure 3m**

Cross-Channel Measured Velocity Distribution (August 3, 2015)
Transects 037, 038, and 039
Turbidity Control Evaluation Report
Southern Cove, Orrington Remediation Site

ANCHOR QEA

- ● Surface Velocity
- ● Bottom Velocity
- ● Depth-Averaged Velocity

*Note: Red dashed line indicates approximate placement range of turbidity control system.*



○ NOAA Predicted Winterport High/Low Tides (NOAA Station 8414781)
— Predicted Winterport (interpolated)
– – Predicted Bar Harbor (NOAA Station 8413320)
— Measured Eddington (USGS Station 01036390)

**Figure 4**

Predicted Harmonic Water Levels at Winterport
Turbidity Control Evaluation Report
Southern Cove, Orrington Remediation Site

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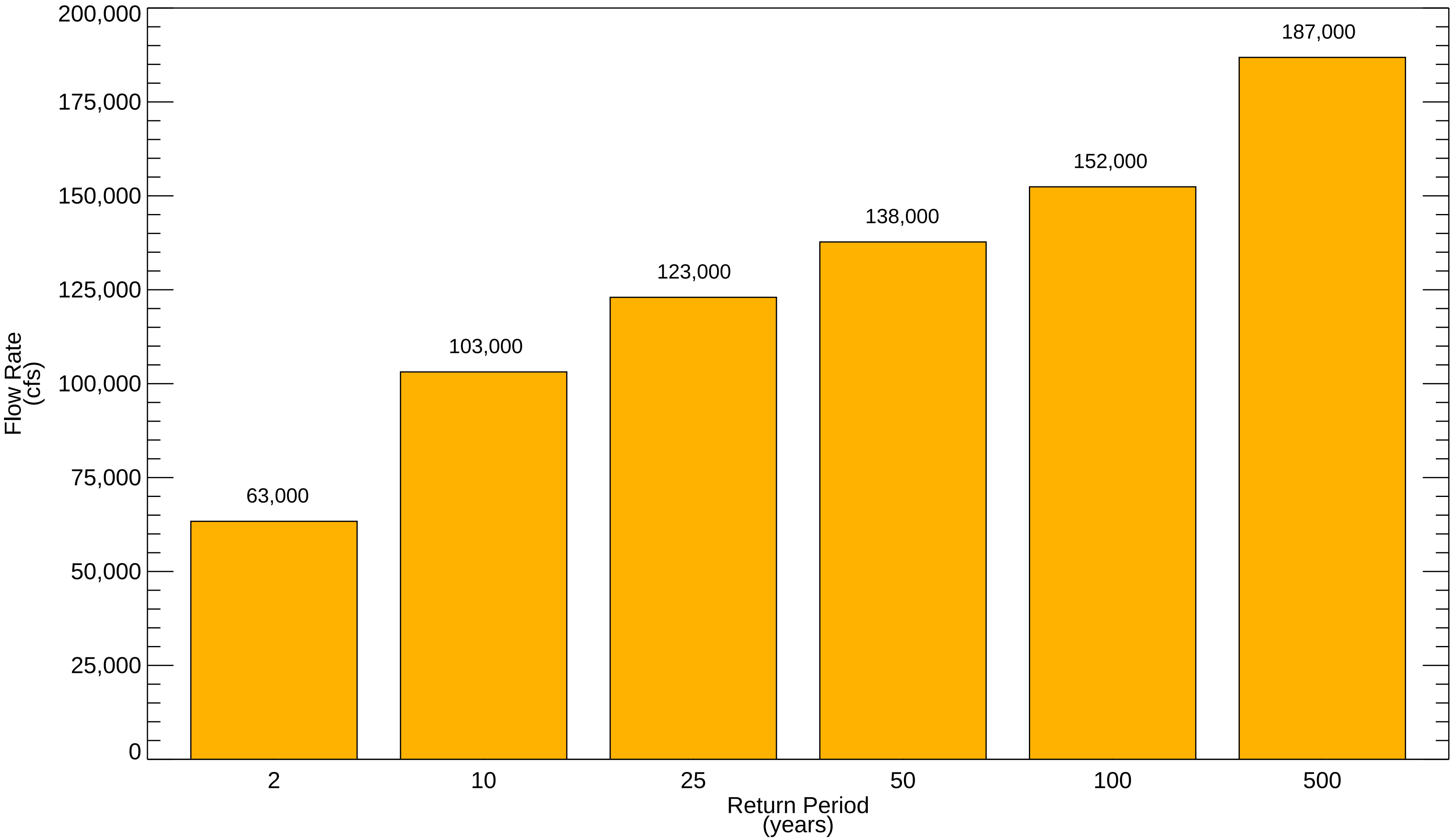

**Figure 5**

Flood Frequency Analysis for Penobscot River near West Enfield
Turbidity Control Evaluation Report
Southern Cove, Orrington Remediation Site

*Note: Flow data from USGS Station 01034500 West Enfield. Period of Record: 1902-2014*

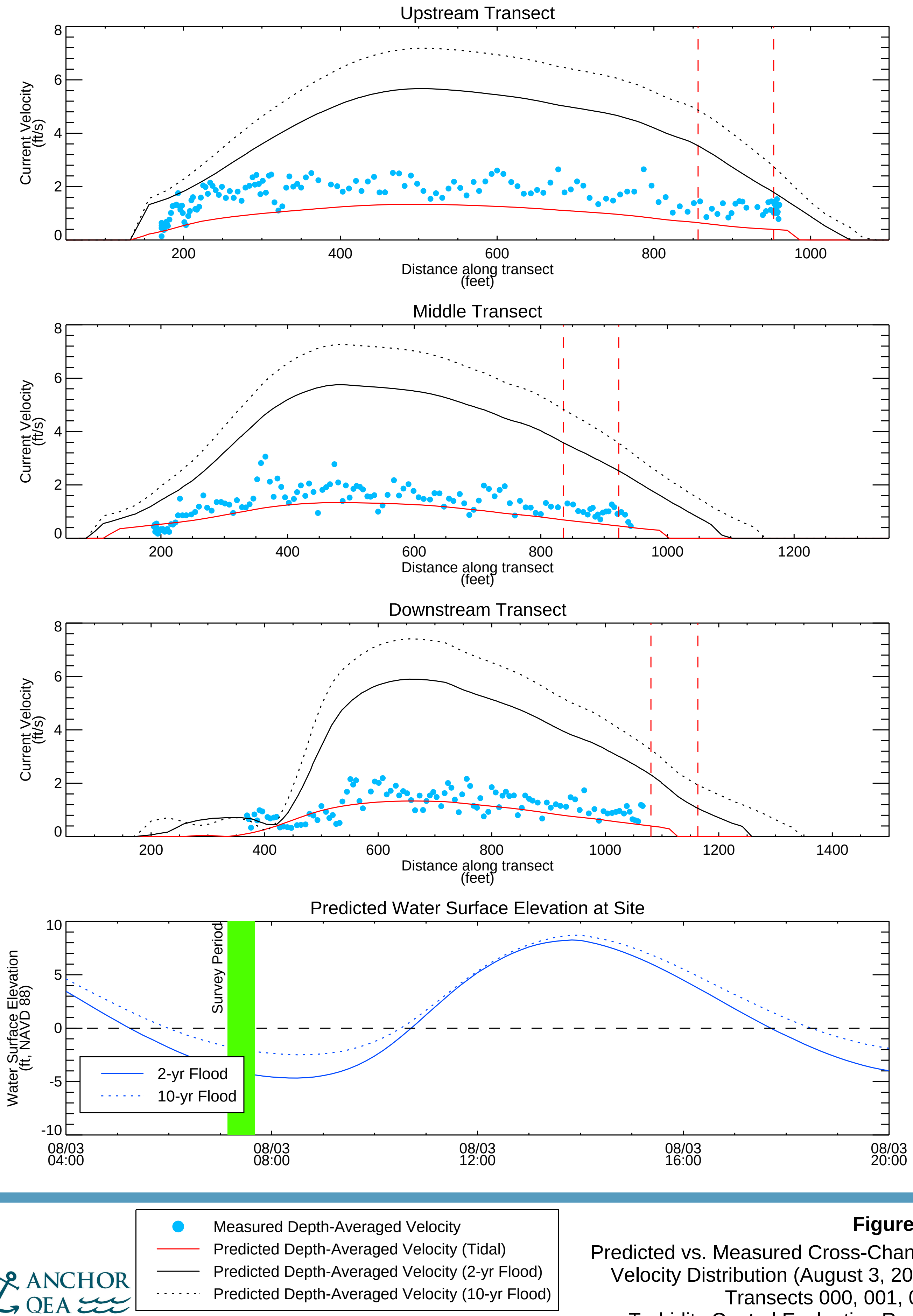

**Figure 6a**

Predicted vs. Measured Cross-Channel Velocity Distribution (August 3, 2015)
Transects 000, 001, 002
Turbidity Control Evaluation Report
Southern Cove, Orrington Remediation Site

*Note: Red dashed line indicates approximate placement range of silt curtain.*

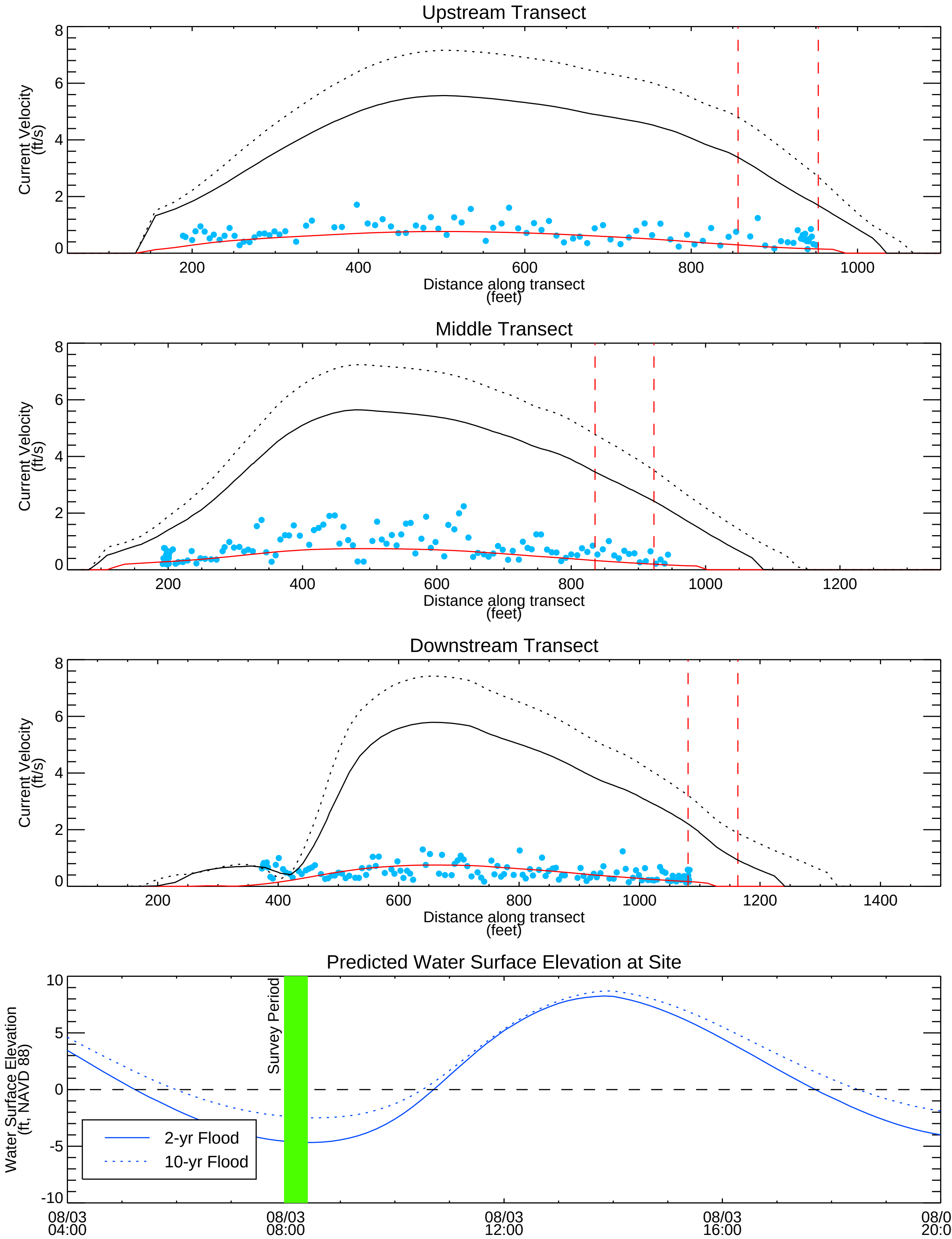

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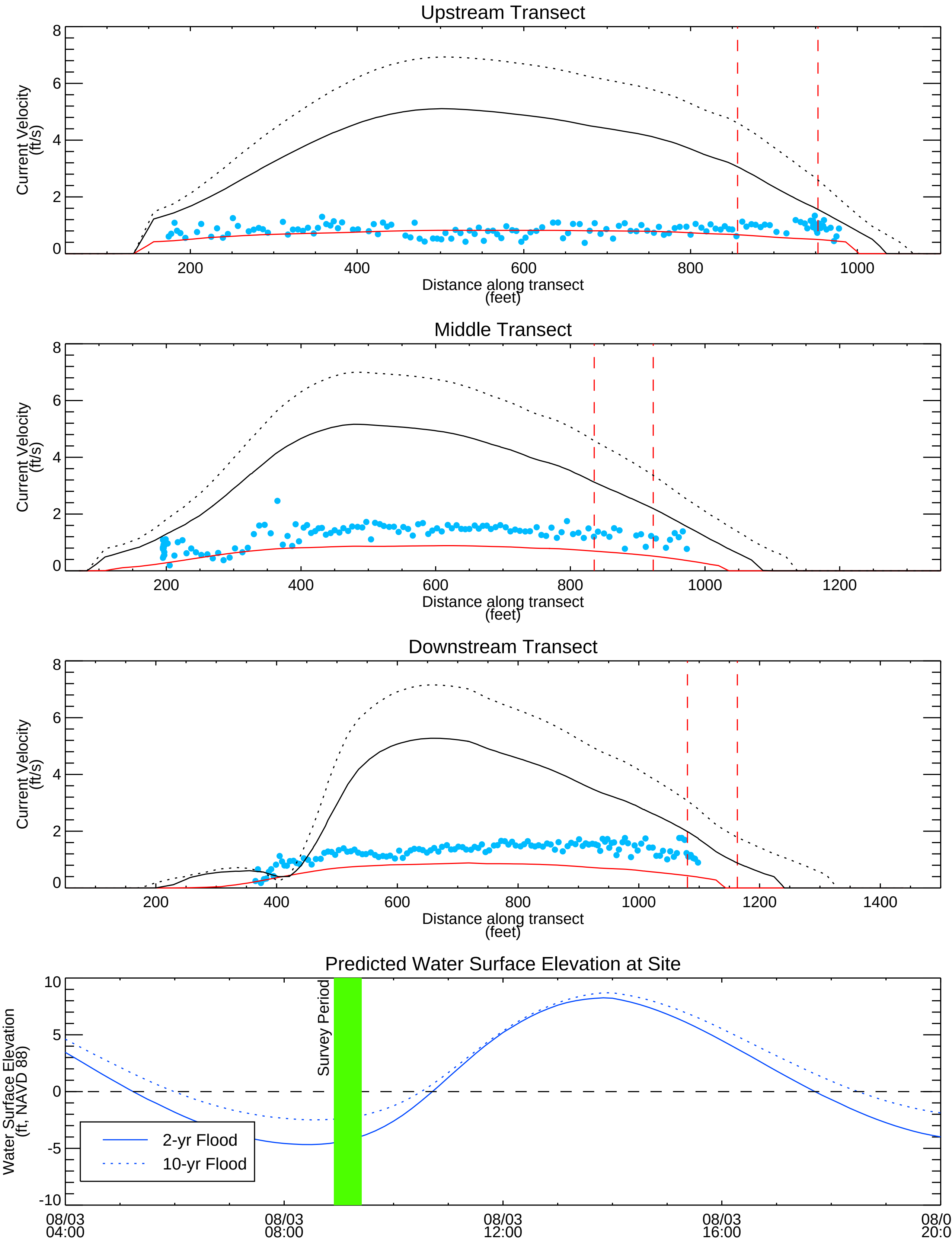
**Figure 6b**

Predicted vs. Measured Cross-Channel
Velocity Distribution (August 3, 2015)
Transects 003, 004, 005
Turbidity Control Evaluation Report
Southern Cove, Orrington Remediation Site

*Note: Red dashed line indicates approximate placement range of silt curtain.*



● Measured Depth-Averaged Velocity
Predicted Depth-Averaged Velocity (Tidal)
Predicted Depth-Averaged Velocity (2-yr Flood)
Predicted Depth-Averaged Velocity (10-yr Flood)

**Figure 6c**

Predicted vs. Measured Cross-Channel Velocity Distribution (August 3, 2015)
Transects 006, 007, 008
Turbidity Control Evaluation Report
Southern Cove, Orrington Remediation Site

*Note: Red dashed line indicates approximate placement range of silt curtain.*

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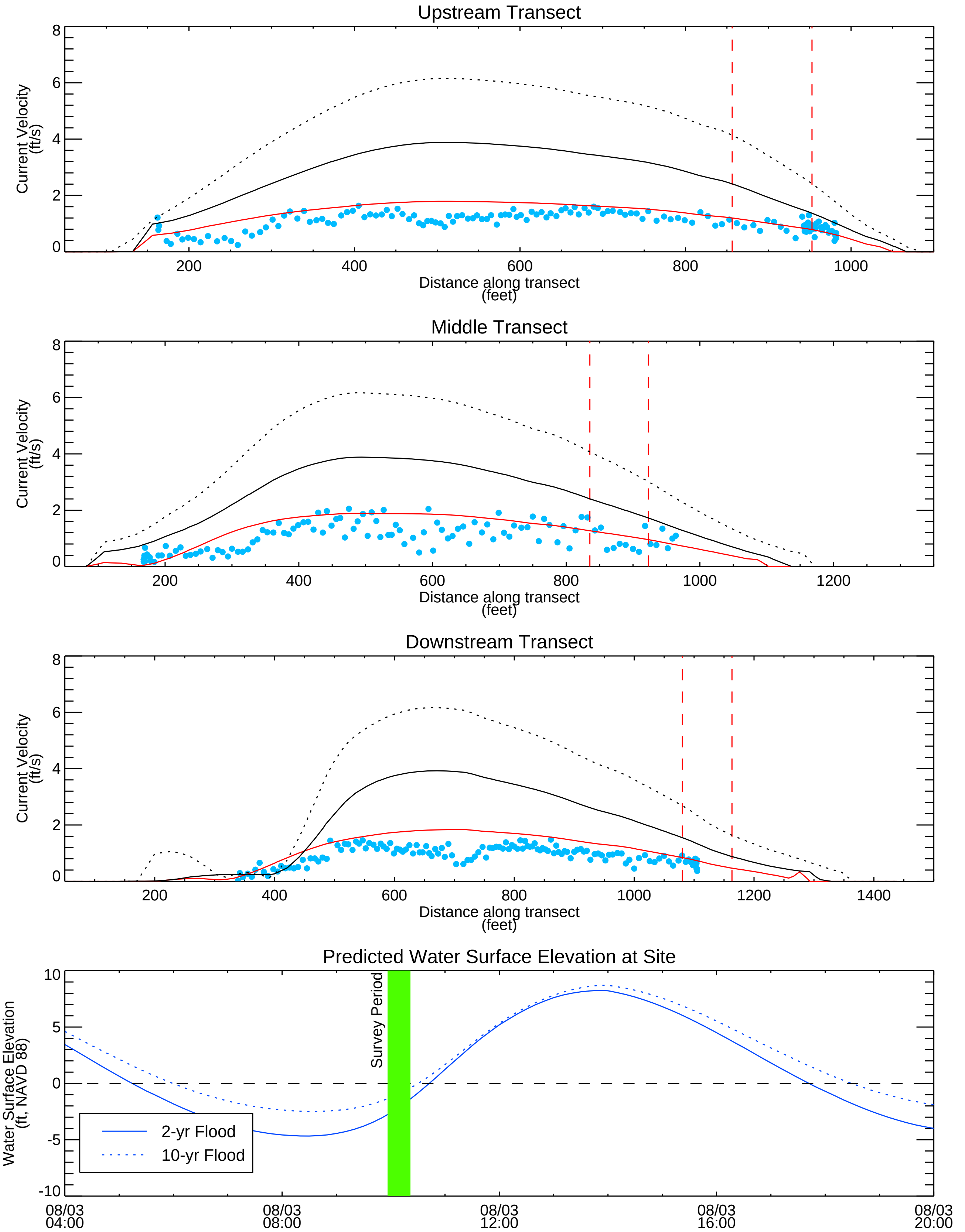

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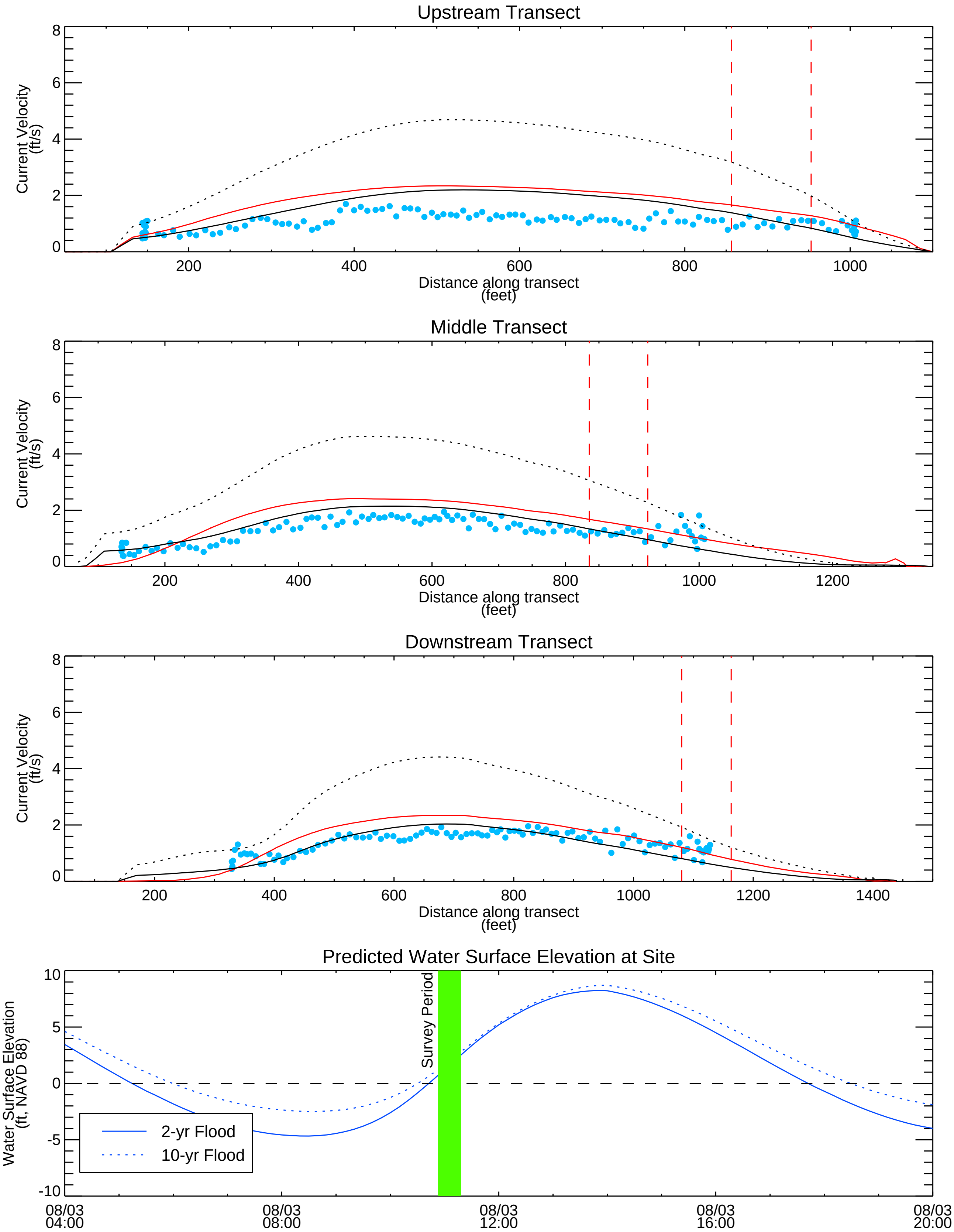
**Figure 6d**

Predicted vs. Measured Cross-Channel
Velocity Distribution (August 3, 2015)
Transects 009, 010, 011
Turbidity Control Evaluation Report
Southern Cove, Orrington Remediation Site

*Note: Red dashed line indicates approximate placement range of silt curtain.*



- ● Measured Depth-Averaged Velocity
- — Predicted Depth-Averaged Velocity (Tidal)
- — Predicted Depth-Averaged Velocity (2-yr Flood)
- ⋯ Predicted Depth-Averaged Velocity (10-yr Flood)

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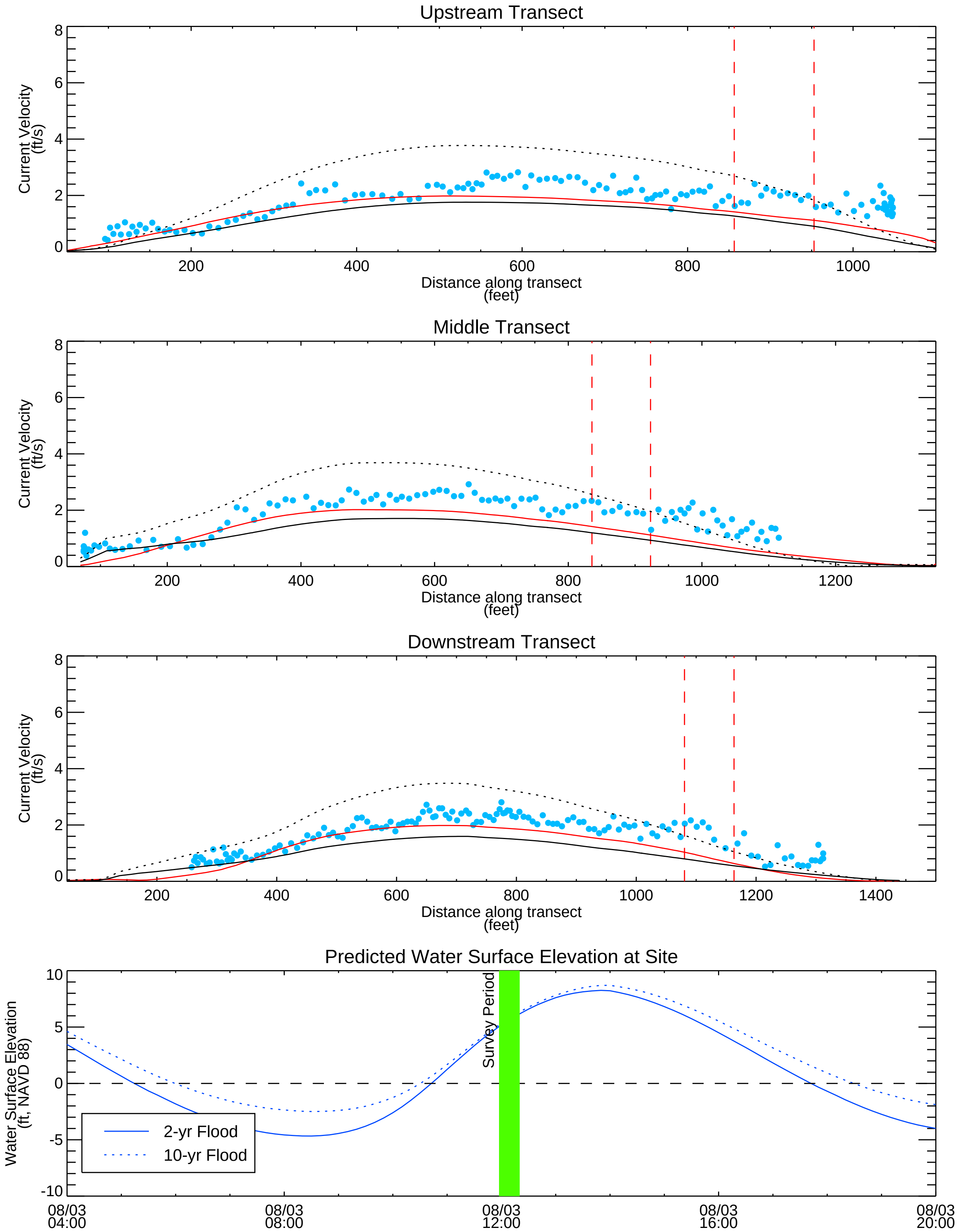
## Figure 6e

Predicted vs. Measured Cross-Channel Velocity Distribution (August 3, 2015)
Transects 012, 013, 014
Turbidity Control Evaluation Report
Southern Cove, Orrington Remediation Site

*Note: Red dashed line indicates approximate placement range of silt curtain.*



● Measured Depth-Averaged Velocity
Predicted Depth-Averaged Velocity (Tidal)
Predicted Depth-Averaged Velocity (2-yr Flood)
Predicted Depth-Averaged Velocity (10-yr Flood)

**Figure 6f**

Predicted vs. Measured Cross-Channel
Velocity Distribution (August 3, 2015)
Transects 015, 016, 017
Turbidity Control Evaluation Report
Southern Cove, Orrington Remediation Site

*Note: Red dashed line indicates approximate placement range of silt curtain.*

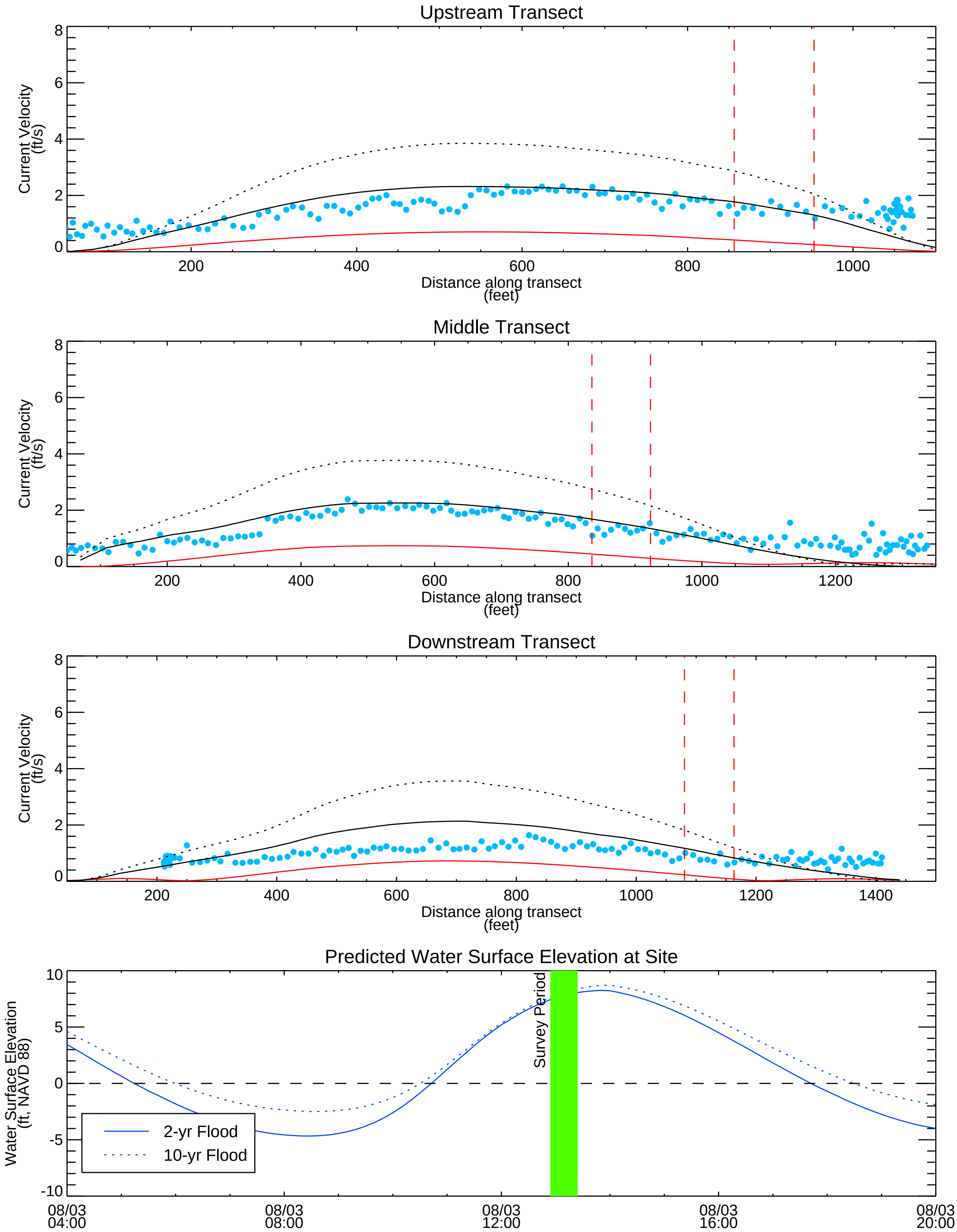
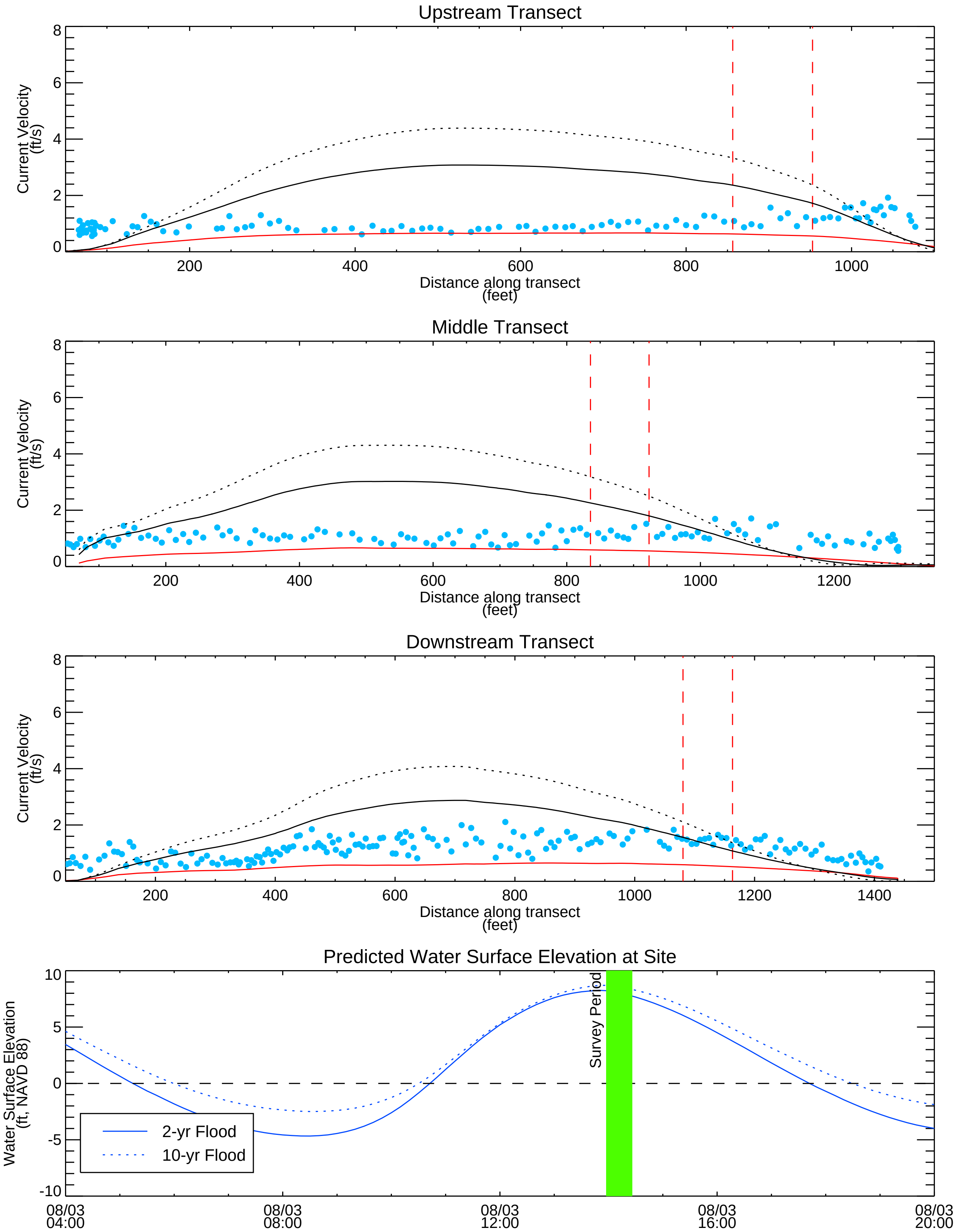


**Figure 6g**

Predicted vs. Measured Cross-Channel
Velocity Distribution (August 3, 2015)
Transects 018, 019, 021
Turbidity Control Evaluation Report
Southern Cove, Orrington Remediation Site

*Note: Red dashed line indicates approximate placement range of silt curtain.*



| | |
|---|---|
| ● | Measured Depth-Averaged Velocity |
| ─ | Predicted Depth-Averaged Velocity (Tidal) |
| ─ | Predicted Depth-Averaged Velocity (2-yr Flood) |
| ⋯ | Predicted Depth-Averaged Velocity (10-yr Flood) |

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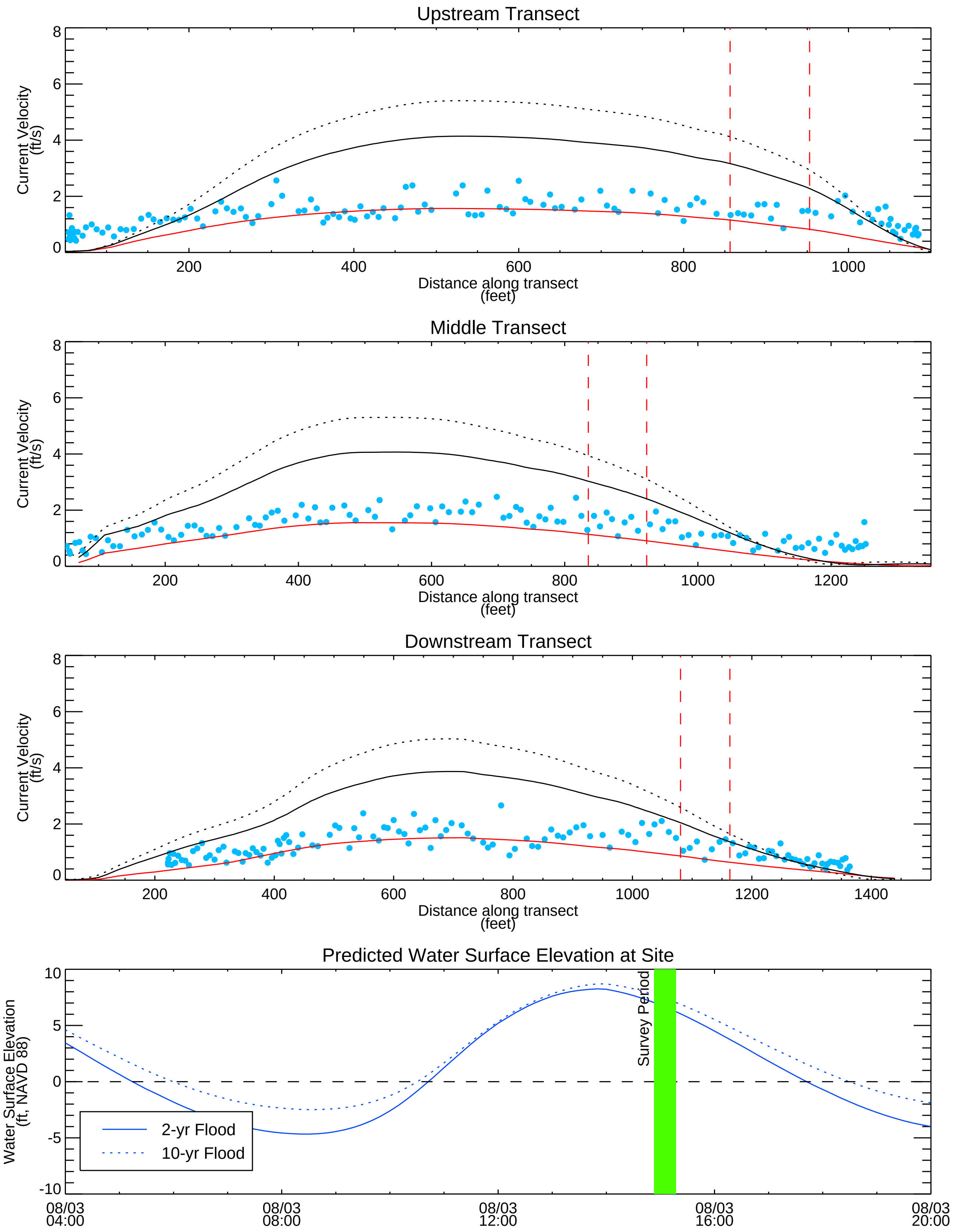
**Figure 6h**

Predicted vs. Measured Cross-Channel Velocity Distribution (August 3, 2015)
Transects 022, 023, 024
Turbidity Control Evaluation Report
Southern Cove, Orrington Remediation Site

*Note: Red dashed line indicates approximate placement range of silt curtain.*



● Measured Depth-Averaged Velocity
Predicted Depth-Averaged Velocity (Tidal)
Predicted Depth-Averaged Velocity (2-yr Flood)
Predicted Depth-Averaged Velocity (10-yr Flood)

**Figure 6i**

Predicted vs. Measured Cross-Channel Velocity Distribution (August 3, 2015)
Transects 025, 026, 027
Turbidity Control Evaluation Report
Southern Cove, Orrington Remediation Site

*Note: Red dashed line indicates approximate placement range of silt curtain.*

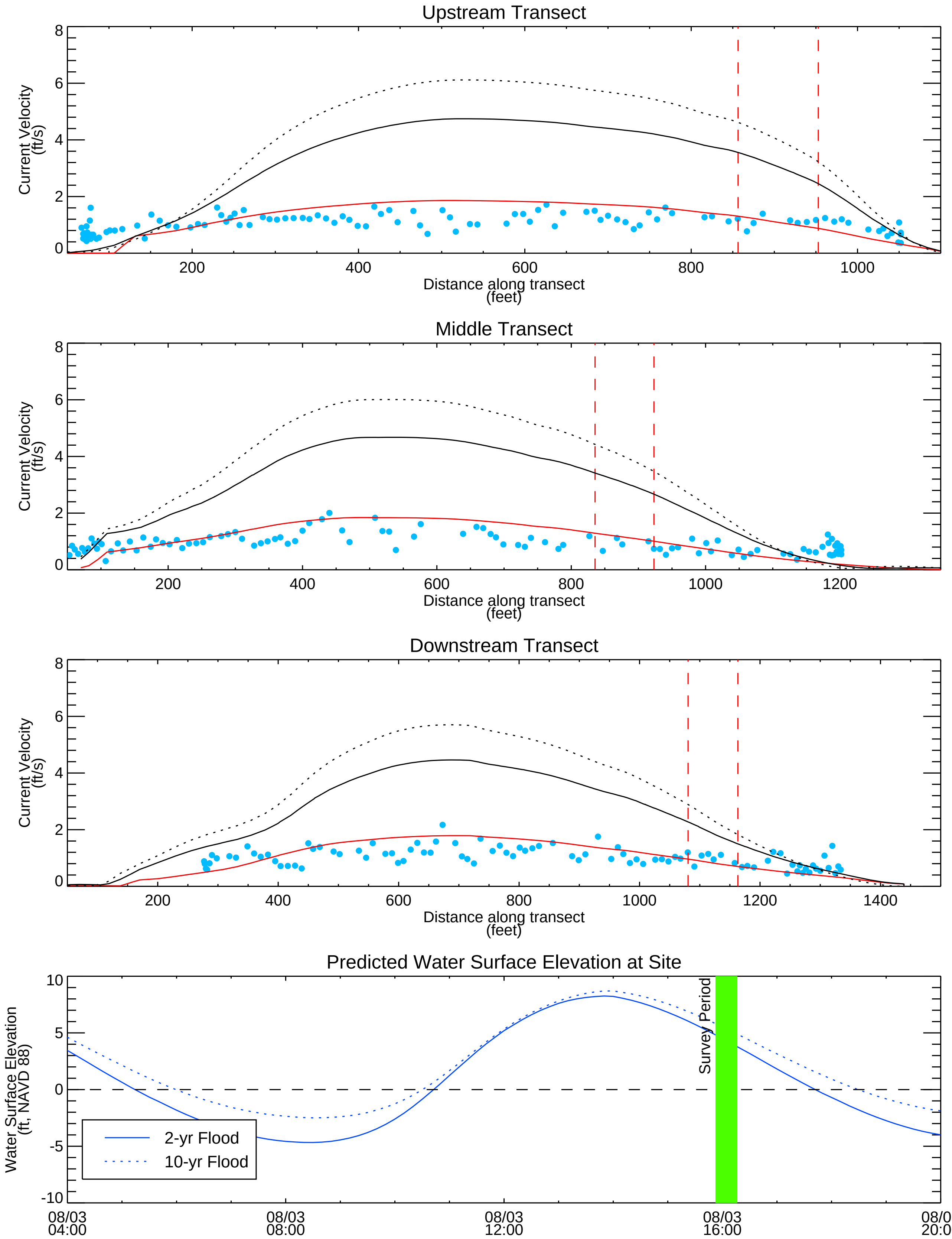
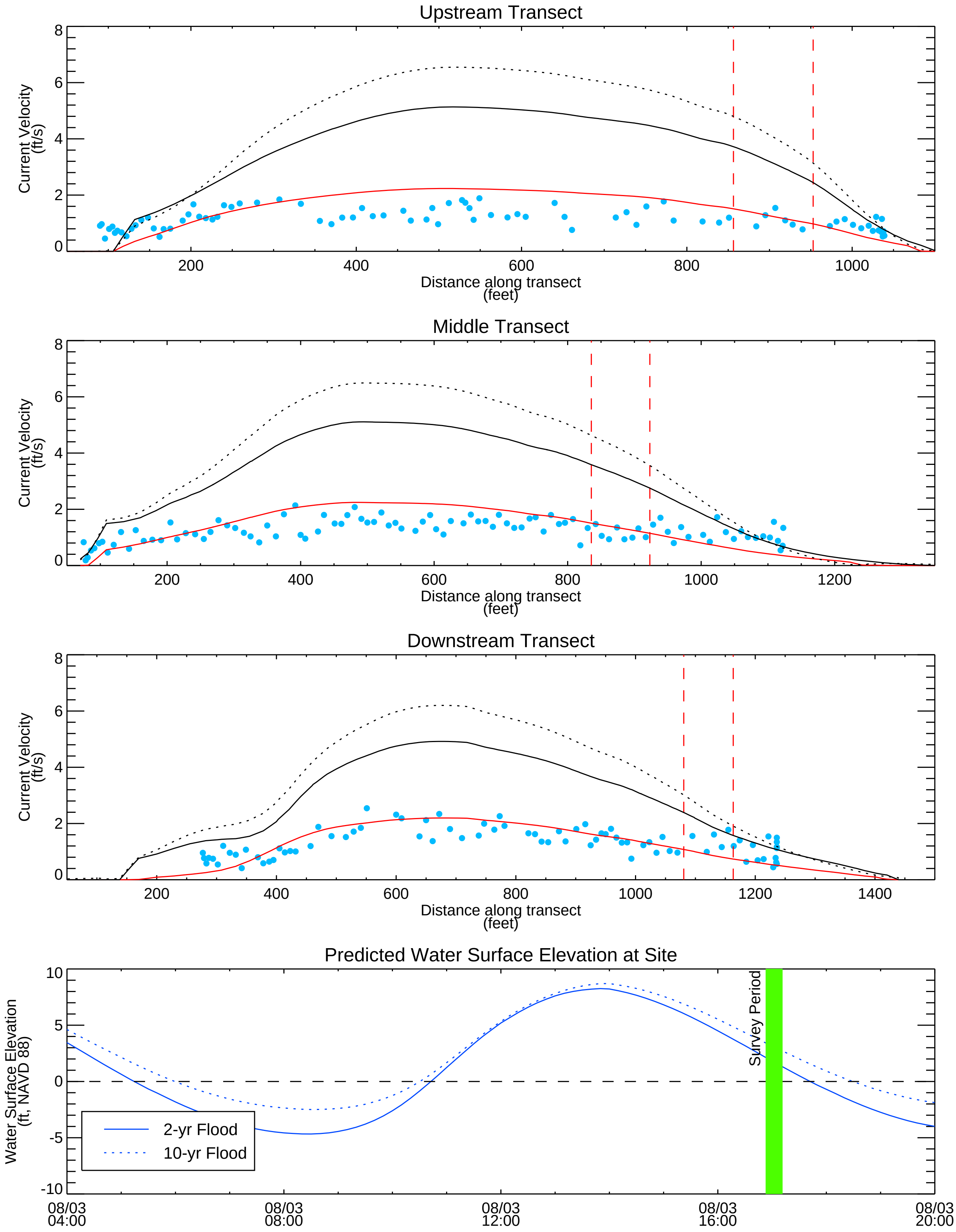


**Figure 6j**

Predicted vs. Measured Cross-Channel Velocity Distribution (August 3, 2015)
Transects 028, 029, 030
Turbidity Control Evaluation Report
Southern Cove, Orrington Remediation Site

*Note: Red dashed line indicates approximate placement range of silt curtain.*



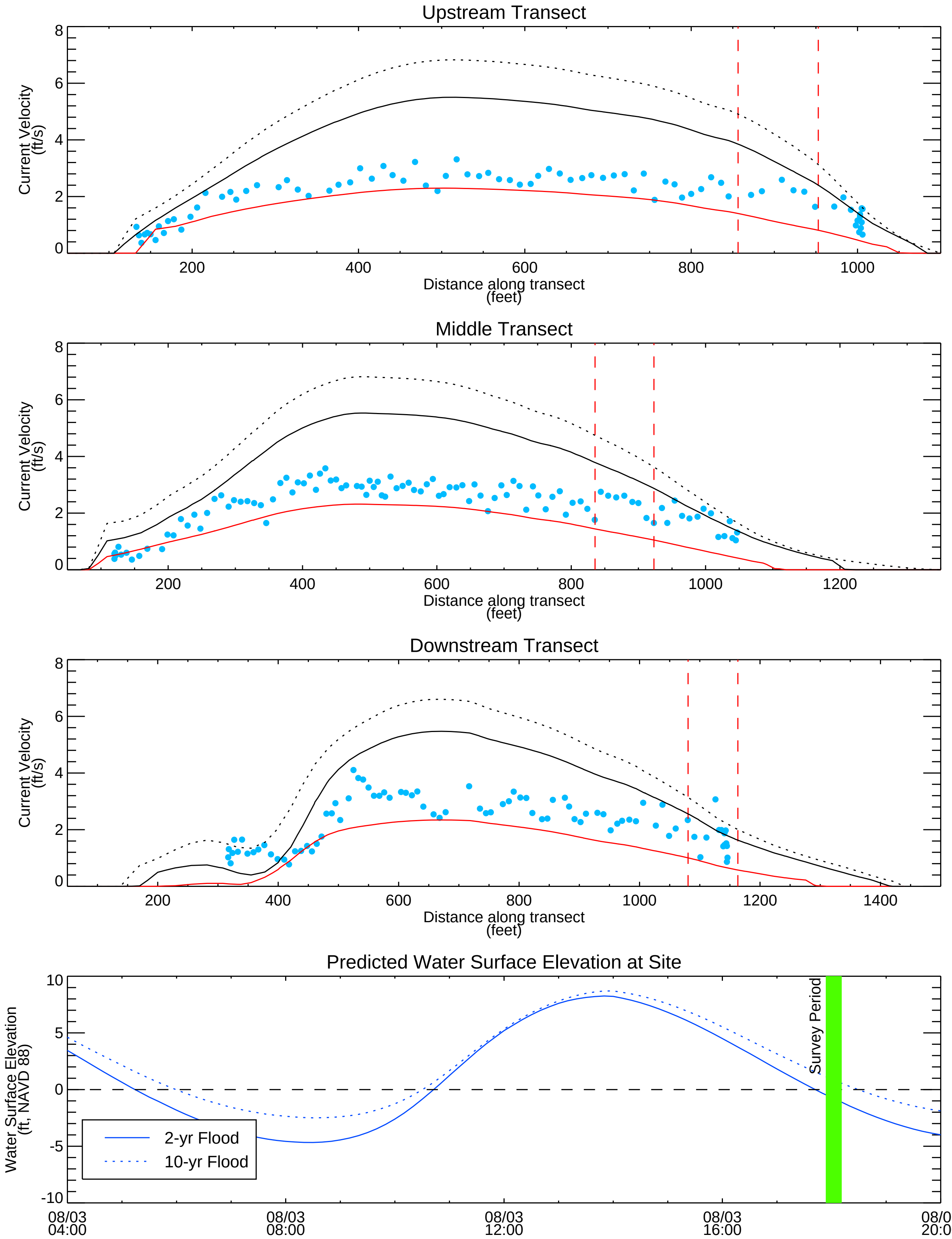
● Measured Depth-Averaged Velocity
— Predicted Depth-Averaged Velocity (Tidal)
— Predicted Depth-Averaged Velocity (2-yr Flood)
⋯ Predicted Depth-Averaged Velocity (10-yr Flood)

ANCHOR QEA

**Figure 6k**

Predicted vs. Measured Cross-Channel Velocity Distribution (August 3, 2015)
Transects 031, 032, 033
Turbidity Control Evaluation Report
Southern Cove, Orrington Remediation Site

*Note: Red dashed line indicates approximate placement range of silt curtain.*



| | |
|---|---|
| ● | Measured Depth-Averaged Velocity |
| — | Predicted Depth-Averaged Velocity (Tidal) |
| — | Predicted Depth-Averaged Velocity (2-yr Flood) |
| ⋯ | Predicted Depth-Averaged Velocity (10-yr Flood) |

ANCHOR QEA

**Figure 6l**

Predicted vs. Measured Cross-Channel Velocity Distribution (August 3, 2015)
Transects 034, 035, 036
Turbidity Control Evaluation Report
Southern Cove, Orrington Remediation Site

*Note: Red dashed line indicates approximate placement range of silt curtain.*

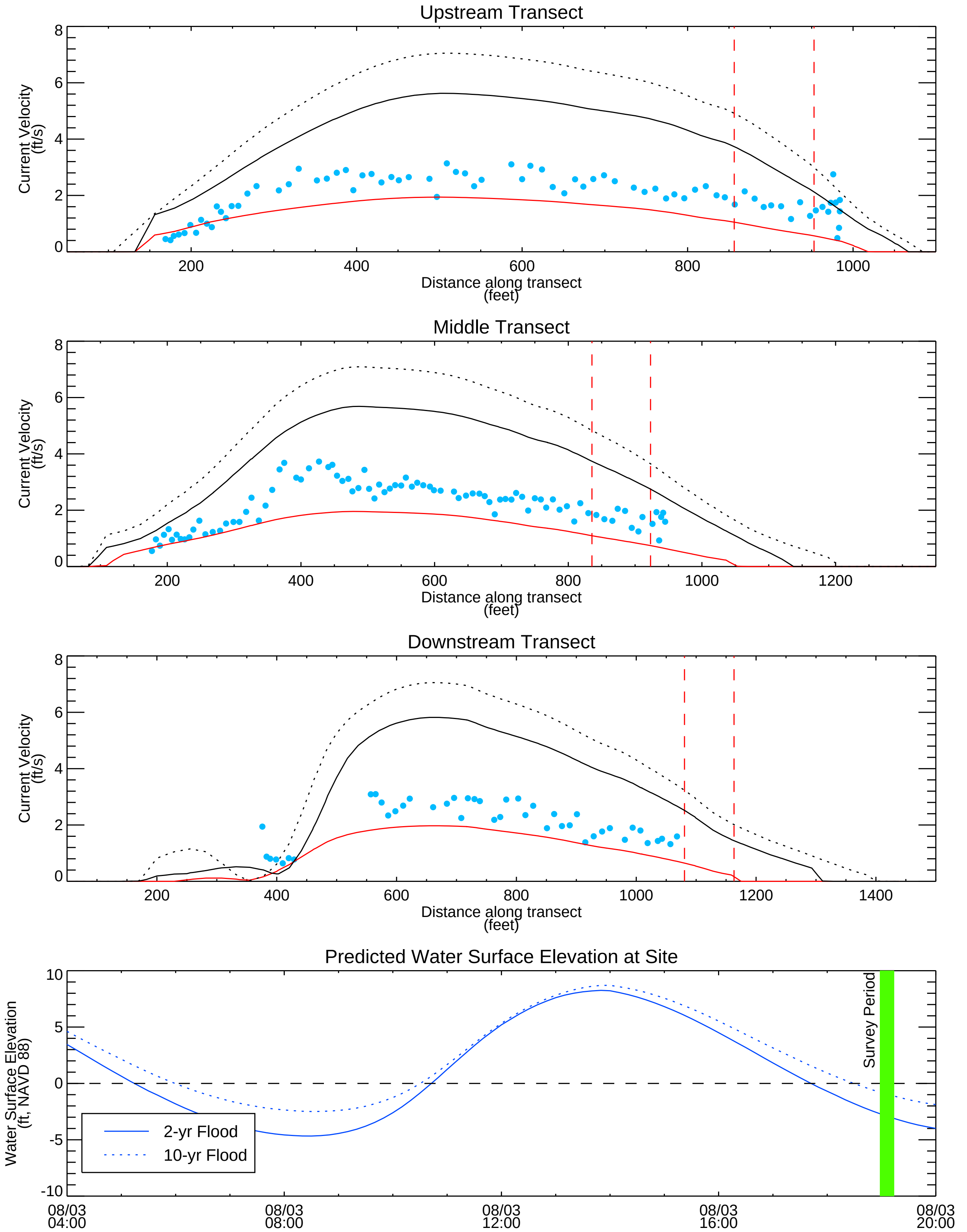
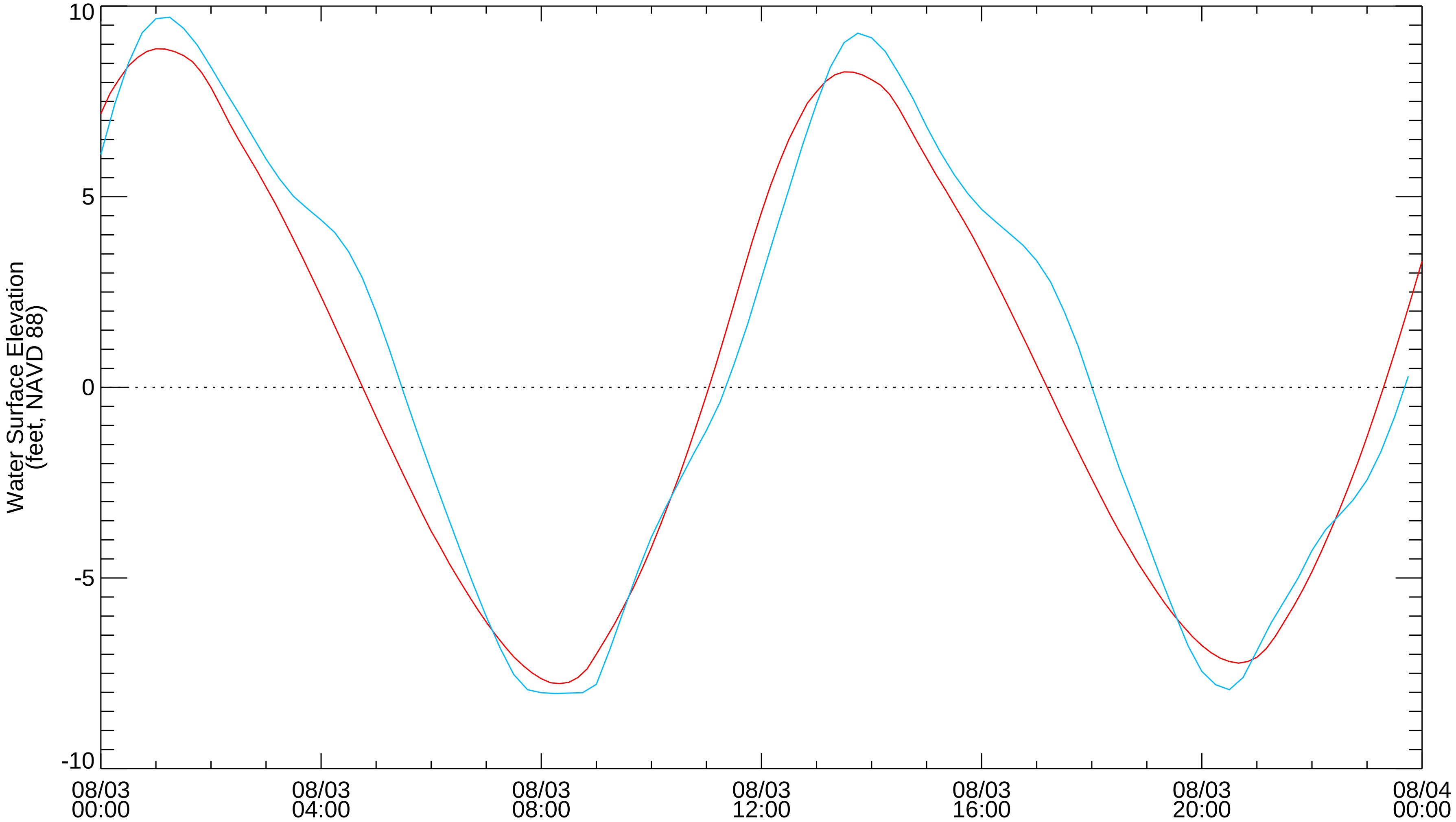


**Figure 6m**

Predicted vs. Measured Cross-Channel Velocity Distribution (August 3, 2015)
Transects 037, 038, 039
Turbidity Control Evaluation Report
Southern Cove, Orrington Remediation Site

*Note: Red dashed line indicates approximate placement range of silt curtain.*

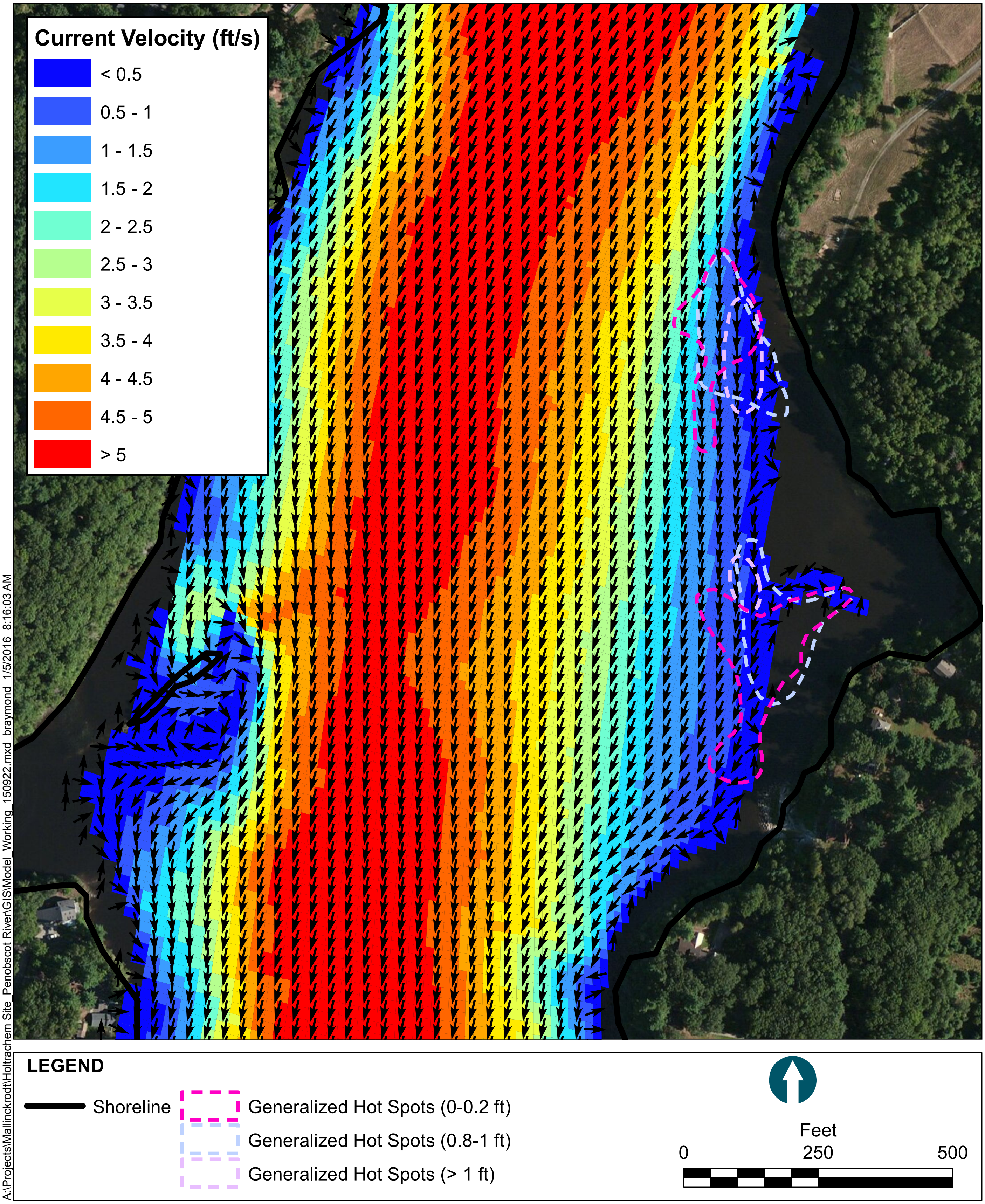


ANCHOR QEA

**Figure 7**

Measured vs. Predicted Water Surface Elevation at Bangor
Turbidity Control Evaluation Report
Southern Cove, Orrington Remediation Site

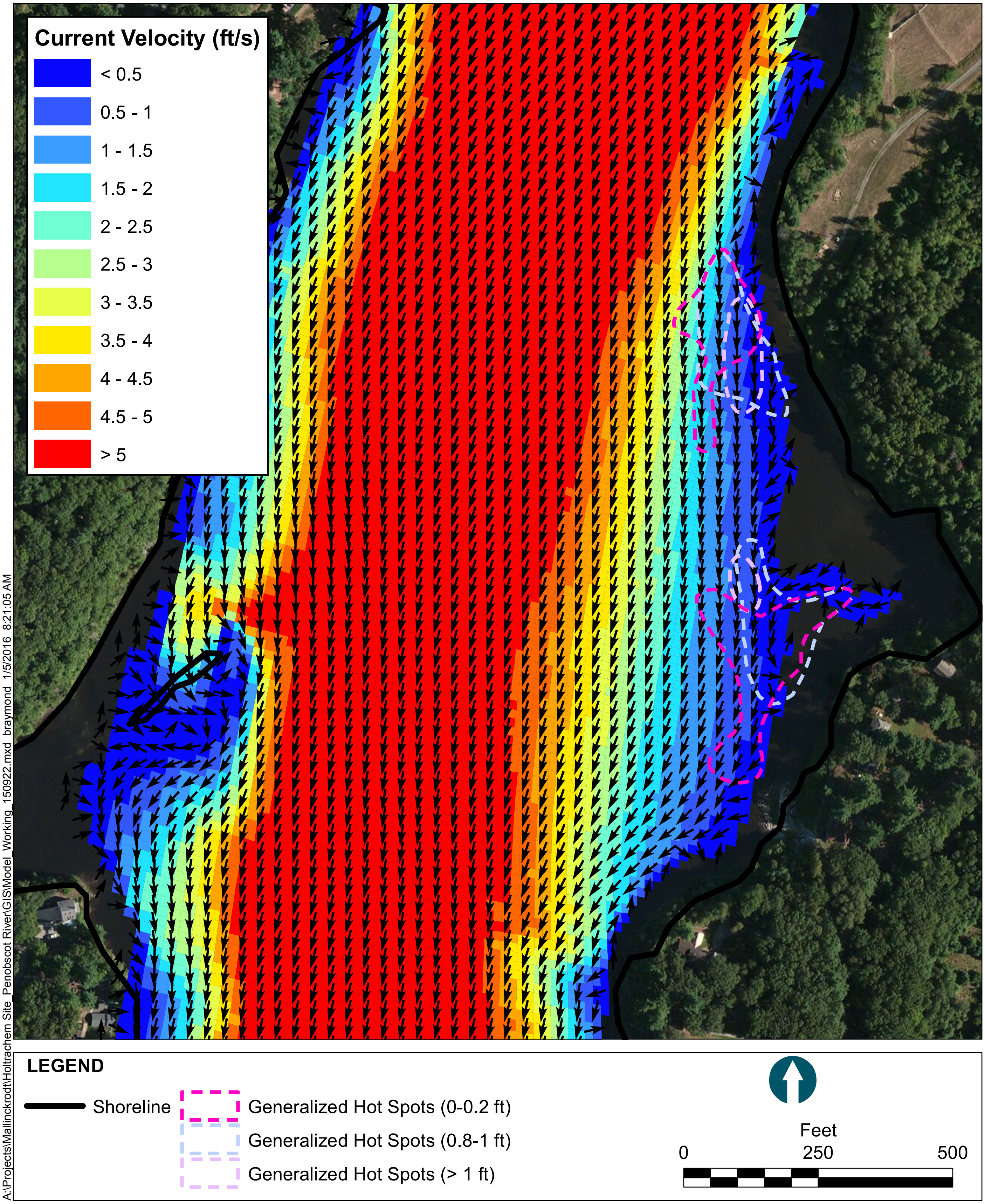
*Note: Measured water surface elevations from USGS Bangor gage (Station 8414612 ).*



A:\Projects\Mallinckrodt\Holtrachem Site Penobscot River\GIS\Model Working 150922.mxd braymond 1/5/2016 8:16:03 AM

**NOTES:**
Predicted maximum ebb tide occurs at model time 08/03/15 06:00.

**Figure 8**
Predicted Depth-Averaged Current Velocity
2-Year Flood (75,730 cfs), Maximum Ebb
Turbidity Control Evaluation Report
Southern Cove, Orrington Remediation Site



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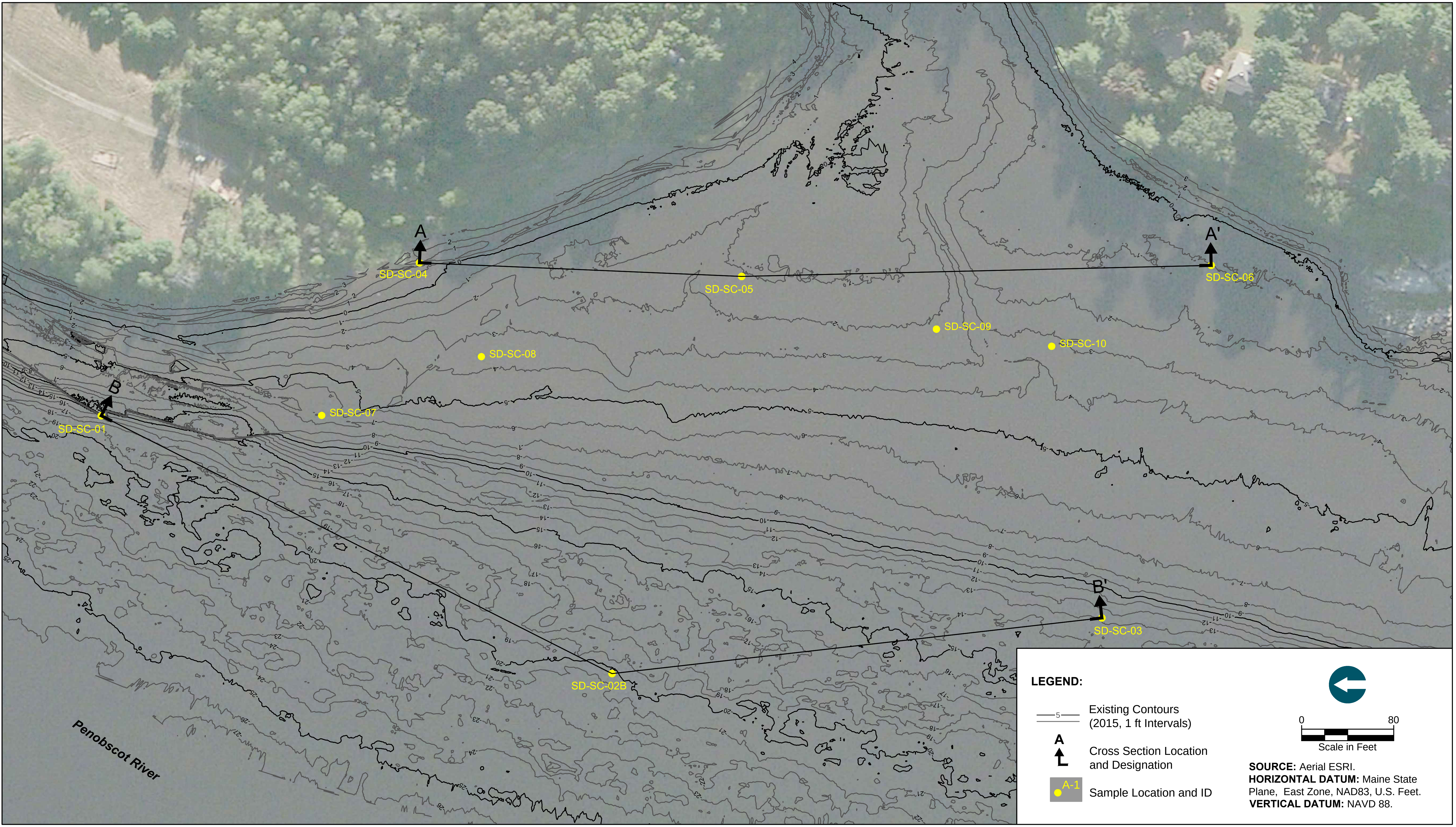
ANCHOR QEA

**NOTES:**
Predicted maximum ebb tide occurs at model time 08/03/15 06:50.

**Figure 9**
Predicted Depth-Averaged Current Velocity
10-Year Flood (111,500 cfs), Maximum Ebb
Turbidity Control Evaluation Report
Southern Cove, Orrington Remediation Site



**LEGEND:**

| | |
|---|---|
| 5 | Existing Contours (2015, 1 ft Intervals) |
| A | Cross Section Location and Designation |
| ● A-1 | Sample Location and ID |

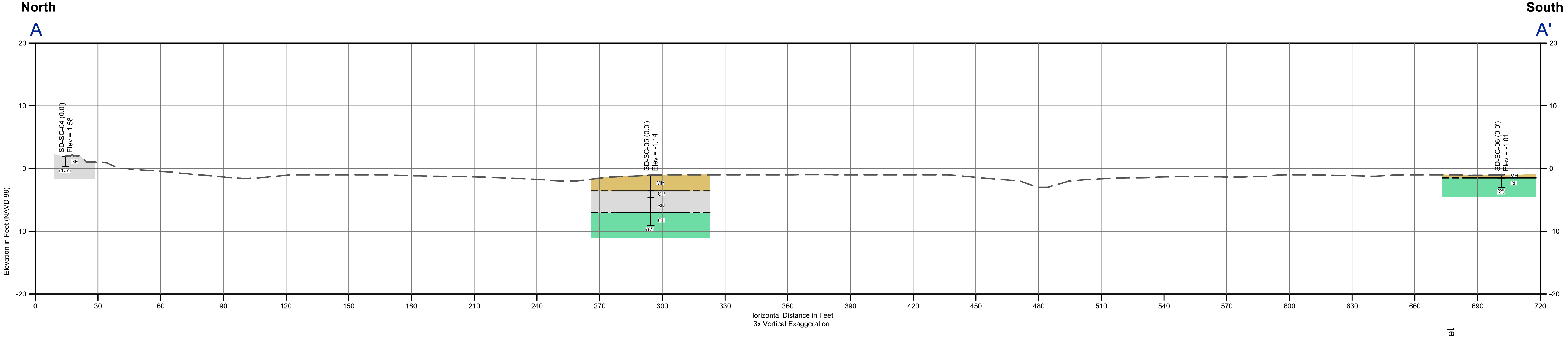
**SOURCE:** Aerial ESRI.
**HORIZONTAL DATUM:** Maine State Plane, East Zone, NAD83, U.S. Feet.
**VERTICAL DATUM:** NAVD 88.

*DRAFT*

ANCHOR QEA

## Figure 10

Plan View of Southern Cove Geotechnical Explorations
Turbidity Control Evaluation Report
Southern Cove, Orrington Remediation Site

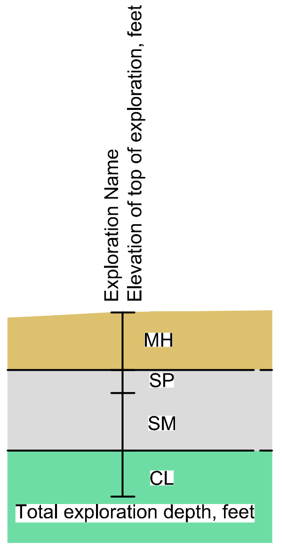


LEGEND:

| | |
|---|---|
| ▨ | Gravel |
| ▨ | Sand |
| ▨ | Silt |
| 🟩 | Clay |

GW - well graded gravels
GP - poorly graded gravels
SW - well graded sands
SP - poorly graded sands
SM - silty sands
MH - inorganic silts
CL - inorganic clays
SW-SM - well graded sand and silty sand

VERTICAL DATUM: NAVD 88



**SOURCE:**
Bathymetry based on multibeam survey conducted by Aqua Survey, Inc. between June 29 and 30, 2016 and provided in file entitled: "BathyContoursNAVD88Revised.dxf".

Mar 14, 2016 8:29am psciaba A:\CAD - Boston\PROJECTS\0617 - Penobscot River - Orrington Maine\0617-RP-006 Plan View and Sections-2.dwg Figure 11

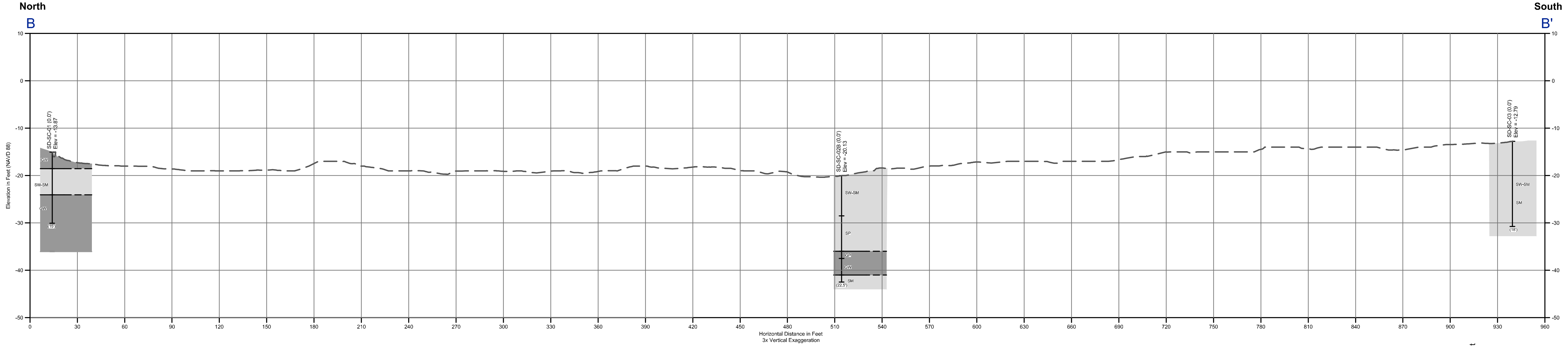
*DRAFT*

ANCHOR QEA

**Figure 11**
Cross Section A-A'
Turbidity Control Evaluation Report
Southern Cove, Orrington Remediation Site

A:\CAD - Boston\PROJECTS\0617 - Penobscot River - Orrington Maine\0617-RP-006 Plan View and Sections-2.dwg Figure 12

Mar 14, 2016 8:30am psciaba

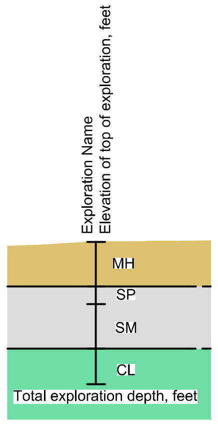


LEGEND:

| | |
|---|---|
| ▨ | Gravel |
| ▨ | Sand |
| ▨ | Silt |
| ▨ | Clay |

GW - well graded gravels
GP - poorly graded gravels
SW - well graded sands
SP - poorly graded sands
SM - silty sands
MH - inorganic silts
CL - inorganic clays
SW-SM - well graded sand and silty sand

VERTICAL DATUM: NAVD 88



**SOURCE:**
Bathymetry based on multibeam survey conducted by Aqua Survey, Inc. between June 29 and 30, 2015 and provided in file entitled: "BathyContoursNAVD88Revised.dxf".

DRAFT

ANCHOR QEA

**Figure 12**
Cross Section B-B'
Turbidity Control Evaluation Report
Southern Cove, Orrington Remediation Site

# Appendix C

# Delineation of Sediment Removal Areas for Basis of Remedial Design Technical Memorandum

**Mallinckrodt US LLC**

# MEMORANDUM

| | | | |
|---|---|---|---|
| **To:** | Stacy Ladner, MEDEP | **Date:** | March 25, 2016 |
| **From:** | Kathryn Zeigler, Covidien | **Project:** | 140617-01.01, Task 9.1 |
| **Cc:** | Pat Duft, Covidien<br>Paul LaRosa, Anchor QEA<br>John Weston, CDM<br>Chris Greene, Geosyntec | | |
| **Re:** | Southern Cove, Orrington Remediation Site<br>Proposed Delineation of Sediment Removal Areas for Basis of Remedial Design - Revised | | |

## 1 OBJECTIVE

Sediment in the Southern Cove adjacent to the Orrington Remediation Site (Site) will be removed in accordance with requirements in the Board of Environmental Protection (BEP) Order (Order) effective April 3, 2014, which incorporates, with modifications, the Compliance Order issued by the MEDEP dated November 24, 2008. The objective of this technical memorandum is to present the delineation of sediment with concentrations of mercury exceeding the media protection standards (MPSs) in the Southern Cove, for the Maine Department of Environmental Protection's (MEDEP's) review and approval. The areas and depths to be removed (sediment removal areas or prisms) described in this memorandum will serve as the basis of design for the Southern Cove Corrective Measures Implementation Plan (CMIP).

Mallinckrodt submitted the draft Technical Memorandum describing the delineation of sediment removal areas for basis of remedial design for the Southern Cove on October 29, 2015. Following that submittal, Mallinckrodt presented an overview of the technical memorandum to the Maine Department of Environmental Protection (MEDEP) on February 18, 2016, and received comments from MEDEP by email on February 26, 2016. Mallinckrodt presented responses to MEDEP comments during a webinar on March 15, 2016. Based on feedback received from MEDEP in their written comments and during the March 15 webinar, this Final Technical Memorandum has been revised. Specific responses to MEDEP's February 29, 2015 comments are submitted under separate cover.

Sediment mercury data for the Southern Cove in the context of the MPSs are presented and discussed. This technical memorandum is intended to describe the removal areas only; additional background information is available in the *Southern Cove Pre-Design Work Plan* (Anchor QEA and CDM 2015), and details of the planned remedial action will be presented in the Southern Cove CMIP.

## 2 DATA PRESENTATION

Figures 1 through 9 are located at the end of this memo and depict sample data and proposed sediment removal areas. Sample locations are depicted on Figure 1. Sample data for specific depth intervals are depicted on Figures 2 through 6. The removal areas for each of these specific depth intervals required by the Order are also shown on Figures 2 through 6.

Mercury concentrations that exceed 2.2 milligrams per kilogram (mg/kg) at any depth interval at each sample location, along with the tidal natural communities vegetation delineation, are shown on Figure 7. The results of a bathymetric survey conducted during the pre-design (PD) investigation are shown on Figure 8. The horizontal and vertical extents of the sediment required to be removed by the Order, and that is proposed as the prism of sediment to be removed, are shown on Figure 9. This figure demonstrates that the proposed sediment removal prisms meet the requirements of the Order.

Figures 10 through 13 are embedded in the text and depict specific areas sampled during the PD investigation, and additional proposed sample locations to be collected in the Spring of 2016 to address MEDEP comments on the Draft Technical Memorandum.

## 3 DATA CONSIDERED

Data collected as part of the *Site Investigation Report* (SIR; CDM 1998) and the *Corrective Measures Study* (CMS; CDM 2003), in addition to the 2015 PD investigation sample data, were used to delineate the sediment removal areas.

Data are also available from the Penobscot River Mercury Study Panel investigation conducted between 2008 and 2013, and from samples collected by Weston in 2002. Although these data were considered, data collected by others are not being relied upon for final contaminant delineation and remedial design for the Southern Cove because sampling objectives and procedures differed from the sampling efforts conducted by Mallinckrodt US LLC (Mallinckrodt) under MEDEP-approved work plans and quality control procedures. These other data were reviewed and found to generally confirm the proposed sediment removal areas presented here. Where these data were inconsistent with results of investigations performed by Mallinckrodt, additional sampling was conducted to corroborate or refute data points, as described in the following sections.

## 4 COMPLIANCE WITH MEDIA PROTECTION STANDARDS

The remedial requirements for the Southern Cove are described in the State of Maine Board of Environmental Protection (Maine BEP) Order effective April 3, 2014, which incorporates, with modifications, the Compliance Order issued by the MEDEP dated November 24, 2008 (Order). The MEDEP and Maine BEP decisions were based on review of extensive data from the Southern Cove sampling and analysis efforts completed during the SIR and CMS phases.

The MPSs identified in the Order require that sediment be removed where mercury levels exceed 2.2 mg/kg, averaged over a 0.25-acre area. Irrespective of concentrations, sediment within the two hot spot areas identified for three separate depth intervals must also be removed. The hot spots are defined in the Order by both the map and a list of sample locations included as a “narrative MPS” that must be encompassed in the sediment removal areas.

Mallinckrodt reviewed the sediment removal areas identified in the Order, and expanded them to include adjacent sample locations where mercury was detected at levels above 2.2 mg/kg. Data were also further evaluated to determine if mercury concentrations exceed the MPS of 2.2 mg/kg over a 0.25-acre area outside of the sediment removal areas identified in the Order. Based on this review, locations were identified where additional sample data were needed to confirm and delineate elevated mercury concentrations in sediment. Samples were collected as part of the PD investigation and results are discussed in the following section. The resultant proposed sediment removal areas are based on the data review and the additional sampling results described in Section 5 below. These proposed sediment removal areas represent the minimum removal areas; the boundaries may be refined and optimized during design to provide practical removal limits and to facilitate efficient construction.

## 5 PRE-DESIGN INVESTIGATION DELINEATION RESULTS

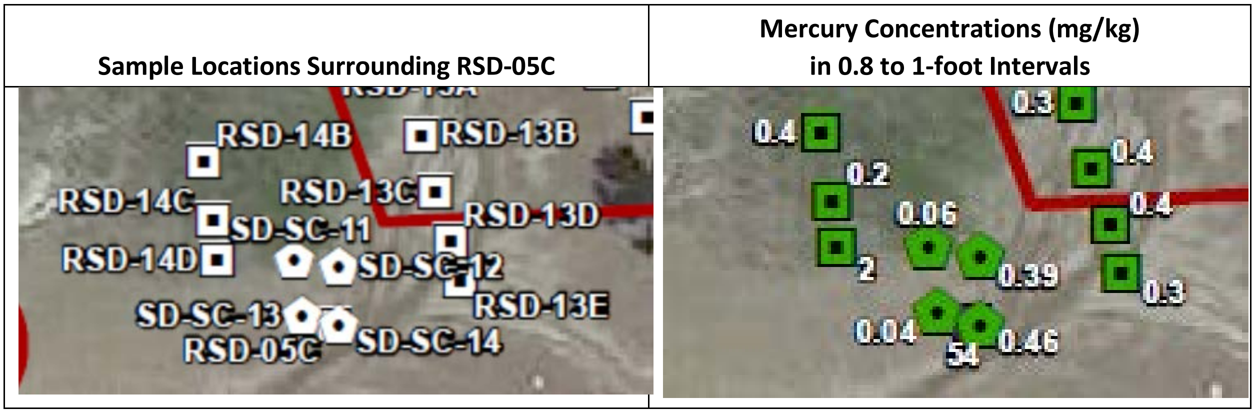
The following describes results of the PD investigation sampling conducted to complete the delineation. All PD investigation work was conducted in accordance with quality assurance/quality control procedures in the MEDEP-approved *Southern Cove Pre-Design Work Plan* (Anchor QEA and CDM 2015), and subsequent work plan modifications requested during the field investigation and approved by MEDEP.

### 5.1 Data Corroboration at RSD-05C

Mercury was previously detected at 54 mg/kg in the sample at location RSD-05C from 0.8 to 1 foot, as reported in the SIR (CDM 1998). During the PD investigation, four additional samples were collected in the area of RSD-05C from 0.8 to 1 foot at locations shown on Figure 10, and analyzed for mercury. Detected mercury concentrations ranged from 0.04 to 0.39 mg/kg, as summarized in Table 1 and depicted on Figure 10 below. These results indicate that current mercury concentrations are less than 2 mg/kg in this area; therefore, RSD-05C it is not included in the proposed sediment removal area.

**Table 1: RSD-05C Delineation PD Results**

| Sample Location | Sample ID | Upper Depth (feet) | Lower Depth (feet) | Mercury Concentration (mg/kg) |
|---|---|---|---|---|
| SD-SC-11 | SD-SC-11-150616-0.2-1 | 0.8 | 1 | 0.06 |
| SD-SC-12 | SD-SC-12-150616-0.8-1 | 0.8 | 1 | 0.39 |
| SD-SC-13 | SD-SC-13-150616-0.8-1 | 0.8 | 1 | 0.04 |
| SD-SC-14 | SD-SC-14-150616-0.8-1 | 0.8 | 1 | 0.46 |



**Sample Locations Surrounding RSD-05C**

**Mercury Concentrations (mg/kg) in 0.8 to 1-foot Intervals**

Figure 10: Corroboration Sampling at RSD-05C

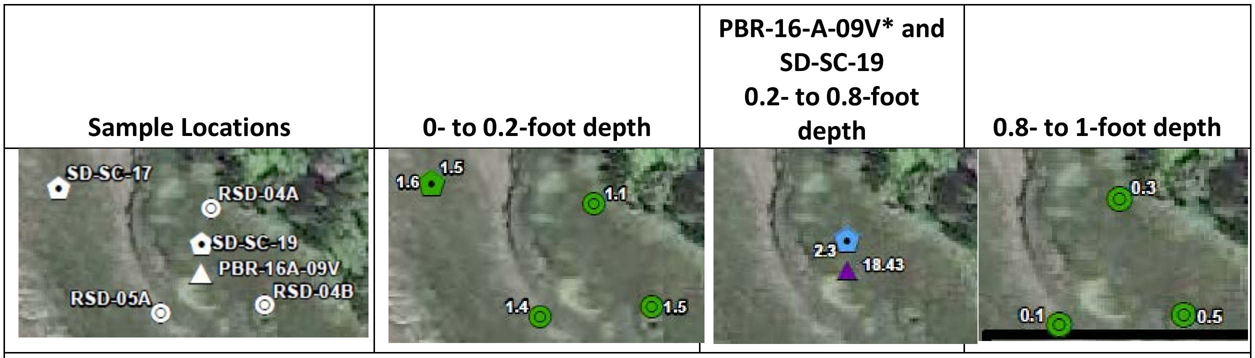
## 5.2 Data Corroboration at PBR-16-A-09V

Although data collected by the Penobscot River Mercury Study Panel (2013) are not being used to delineate sediment removal areas, the data were reviewed. These data indicated a possible elevated mercury concentration of 18.43 mg/kg averaged over 0.2 to 0.8 foot at PBR-16-A-09V. During the PD investigation, one additional sample was collected from this location at the same sample interval to verify the Penobscot River Mercury Study Panel (2013) data; results are presented in Table 2.

Figure 11 below depicts sample location and mercury data from different depth intervals in the vicinity of PBR-16-A-09V. Mercury concentrations were less than 2.2 mg/kg in the 0- to 0.2-foot and 0.8- to 1-foot intervals. The PD sample collected from the 0.2- to 0.8-foot interval contained 2.3 mg/kg of mercury. Because this result is an isolated, low-level detection very close to the MPS, and other data indicate concentrations below the MPS, an average concentration of sediment in the 0- to 1-foot depth interval was calculated based on samples collected by Mallinckrodt to evaluate MPS compliance. The average concentration of 1.1 mg/kg mercury indicates that sediment in this area meets the MPS.

**Table 2: Additional Data to Corroborate Penobscot River Mercury Study Panel Results at PBR-16-A-09V**

| Sample Location | Sample ID | Upper Depth (feet) | Lower Depth (feet) | Mercury Concentration (mg/kg) |
|---|---|---|---|---|
| SD-SC-19 | SD-SC-19-150617-0.2-0.8 | 0.2 | 0.8 | 2.3 |



*Average of subsample data over the depth interval

**Figure 11: Mercury Concentrations in the Vicinity of PBR-16-A-09V**

## 5.3 Delineation/Data Corroboration at RSD-07D

Mercury was previously detected at 2.9 mg/kg in the sample at location RSD-07D from 0 to 0.2 foot, as reported in the SIR (CDM 1998). During the PD investigation, four surface sediment samples were collected in the area of RSD-07D from 0 to 0.2 foot and analyzed for mercury. Detected mercury concentrations ranged from 1.1 to 1.6 mg/kg and are shown in Table 3 and Figure 2. As shown on Figure 2, these results indicate that current mercury concentrations average 1.8 mg/kg over a 0.25-acre area; therefore, RSD-07D is not included in the proposed sediment removal area.

**Table 3: RSD-07D Delineation PD Sample Results**

| Sample Location | Sample ID | Upper Depth (feet) | Lower Depth (feet) | Mercury Concentration (mg/kg) |
|---|---|---|---|---|
| SD-SC-15 | SD-SC-15-150619-0-0.2 | 0 | 0.2 | 1.1 |
| SD-SC-16 | SD-SC-16-150619-0-0.2 | 0 | 0.2 | 1.5 |
| SD-SC-17 | SD-SC-17-150619-0-0.2 | 0 | 0.2 | 1.6 |
| SD-SC-17 | BD-1506191340 Field Duplicate | 0 | 0.2 | 1.5 |
| SD-SC-18 | SD-SC-18-150619-0-0.2 | 0 | 0.2 | 1.1 |
| SD-SC-18 | BD-1506191341 Field Duplicate | 0 | 0.2 | 0.81 |

### *5.3.1 Southerly Stream*

The area in the Southern Cove near the southerly stream discharge was not included in the sediment removal area delineation in the Order. However, Mallinckrodt determined that average mercury concentrations in sediment in this area exceeded 2.2 mg/kg over a 0.25-acre area; therefore, additional PD sampling was conducted to delineate the extent of sediments exceeding the MPS. The delineation is depicted on Figures 2 and 3, including MPS compliance area mercury averages, and the PD investigation sampling rationale and results are summarized in Table 4.

**Table 4: Southern Cove Southerly Stream PD Delineation**

| Location ID | Sample ID | Objective | Upper Depth (feet) | Lower Depth (feet) | Mercury Concentration (mg/kg) |
|---|---|---|---|---|---|
| SD-SC-20 | SD-SC-20-150922-0-0.2 | Delineate between RSD-12E (3.5 mg/kg) and RSD-6E (0.1 mg/kg) south of the Southerly Stream discharge | 0 | 0.2 | 0.75 |
| SD-SC-23 | SD-SC-23-150922-0.8-1 | Delineate/confirm vertical delineation at RSD-05B (1.4 mg/kg at 0 to 0.2 foot; 5 mg/kg at 0.8 to 1 foot) | 0.8 | 1 | 0.02 |
| SD-SC-24 | SD-SC-24-150922-0.8-1 | | 0.8 | 1 | 0.21 |
| SD-SC-25 | SD-SC-25-150922-0.8-1 | | 0.8 | 1 | 0.02 |

Note: SD-SC-21 was collected from within the proposed Southerly Stream sediment removal area and analyzed for grain size and Atterberg limits to compare to other treatability samples

### *5.3.2 East Side of Southern Sediment Removal Area*

Sample SD-SC-22 was collected from a higher elevation vegetated hummock shoreward of the Southern Sediment Removal Area identified in the Order. Because this area had not been sampled or characterized during previous sampling events, a sample and duplicate were collected to characterize mercury concentrations from 0 to 0.2 foot depth, and another sample was collected from 0.8 to 1 foot depth. Results indicate compliance with the MPS, as summarized in Table 5.

**Table 5: SD-SC-22 Sample Results**

| Location ID | Sample ID | Upper Depth (feet) | Lower Depth (feet) | Mercury Concentration (mg/kg) |
|---|---|---|---|---|
| SD-SC-22 | BD-1509220000<br>Field Duplicate | 0 | 0.2 | 0.91 |
| SD-SC-22 | SD-SC-22-150922-0-0.2 | 0 | 0.2 | 1 |
| SD-SC-22 | SD-SC-22-150922-0.8-1 | 0.8 | 1 | 1.7 |

## 5.4 Vertical Delineation

The CMS indicated that mercury in the Southern Cove was generally limited to the top 1 to 2 feet of sediments, which were underlain by increasingly coarser sediments that did not contain mercury. To further define the bottom of the sediment removal areas, four deeper sediment samples were collected within the two sediment removal areas to confirm the vertical extent of mercury exceeding the MPS; sample data are presented in Table 6.

**Table 6: Southern Cove Vertical Delineation Sample Results**

| Sample Location | Sample ID | Location | Upper Depth (feet) | Lower Depth (feet) | Mercury Result (mg/kg) |
|---|---|---|---|---|---|
| SD-SC-07 | SD-SC-07-150618-30-36 | Northern Sediment Removal Area Northern End | 2.5 | 3.0 | 13 |
| SD-SC-08 | SD-SC-08-150618-30-36 | Northern Sediment Removal Area Southern End | 2.5 | 3.0 | 0.06 |
| SD-SC-09 | SD-SC-09-150616-30-33 | Southern Sediment Removal Area Northern End | 2.5 | 2.8 | 0.04 |
| SD-SC-10 | SD-SC-10-150619-18-20 | Southern Sediment Removal Area Southern End | 1.5 | 1.7 | 0.05 |

The deeper sample from the southern side of the Northern Sediment Removal Area (SD-SC-08), and the two samples from the Southern Sediment Removal Area (SD-SC-09 and SD-SC-10) contained less than 1 mg/kg mercury. However, the sample collected from the 30- to 36-inch interval at the northern end of the Northern Sediment Removal Area (SD-SC-07) contained 13 mg/kg mercury.

Overall, these results support previous conclusions that mercury levels above the MPSs are limited to shallow sediments in the top few feet of the Southern Cove. The result from SD-SC-07 is also consistent with previous data that indicate the northernmost section of the Northern Sediment Removal Area contains the highest and deepest concentrations of mercury in the Southern Cove. The final depth of sediment removal in this area will be determined during construction, as described in Section 7, and will be further detailed in the Southern Cove CMIP.

## 6 TIDAL WETLAND COMMUNITY SURVEY

A tidal wetland community survey was performed to support sediment removal delineation and permitting. The Southern Cove was inspected by a wetlands ecologist on Thursday, May 28, 2015, to identify the extent of wetland communities within the project area, identify the species present, and determine whether any of these species are on the Official List of Endangered and Threatened Plants in Maine (Maine Natural Resources Program). At the time of the visit, the plants within the wetland had not reached full growth for the season, but had grown enough to allow identification of the types and extent of species. The Southern Cove was accessed by foot during low tide, and boundaries of the component communities were mapped using a handheld Trimble GPS unit. The survey included landward and offshore edges of the wetland, truncating the landward edge at the transition to the shoreline vegetative community. None of the species identified is on the Maine Natural Resources Program list of endangered and threatened plants. The extents of each species are depicted on Figure 8.

## 7 CONCLUSIONS – PROPOSED SEDIMENT REMOVAL AREAS

Based on recent sampling and review of historic data described above, three proposed sediment removal areas/prisms have been identified to meet the requirements in the Order. The horizontal and vertical extents of the proposed removal prisms are shown on Figure 9, along with the removal areas and depth intervals required by the MPS in the Order. One section of the removal area identified in the Order was excluded from the proposed sediment removal areas based on data collected since the Order was issued, as described in Section

5.3.2. The Order included a vegetated wetland hummock east of the southern removal area where no sample data was available. Samples collected as part of the PD investigation from SD-SC-22 showed mercury levels below 2.2 mg/kg at this location, therefore it was excluded from the proposed sediment removal areas.

Rationale for delineation of the horizontal and vertical extents of the three proposed sediment removal areas is explained in the following sections.

## 7.1 Southern Sediment Removal Area

The horizontal extent of the proposed Southern Sediment Removal Area includes all sample locations in the area exceeding 2.2 mg/kg in any sampled depth intervals, as depicted on Figure 7. One exception outside the removal area is a concentration of 2.6 mg/kg mercury detected at SD-10-C1 from 0 to 0.2 foot. However, with consideration of samples from the same depth interval within a 0.25-acre area that includes SD-10-C1, the average mercury concentration of the 0.25-acre area is 2.1 mg/kg, which is less than the MPS (see Figure 2). Therefore, this sample location is not included in the proposed sediment removal area.

For vertical delineation in the Southern Sediment Removal Area, data depicted on Figures 2 and 3 show mercury concentrations exceeding the MPS in the top 1 foot of sediment. All data from sediment samples collected below 1 foot depth show mercury concentrations below 2.2 mg/kg (Figures 4, 5, and 6) with the exception of sample SD-10-B4, which had 5.7 mg/kg mercury at 1.5 to 2 feet depth (Figure 5). However, adjacent samples had less than 1 mg/kg mercury at the same depth interval for an average concentration of 1.6 mg/kg over a 0.25-acre area within the 1.5- to 2-foot depth interval. Based on these results, the proposed depth for the southern sediment removal area dredge prism is 1 foot.

Based on comments received from MEDEP on the Draft Delineation Technical Memorandum, Mallinckrodt will collect the following samples in the Spring of 2016 and adjust the extent of the sediment removal area if needed to meet MPS:

- <u>North and East of RSD-15A and RSD-15B</u>: Three additional samples will be collected to complete delineation—one north of the sediment removal area and two to the east, as shown on Figure 12. Samples will be collected from 0- to 0.2-foot and 0.8 to 1-foot depth intervals.

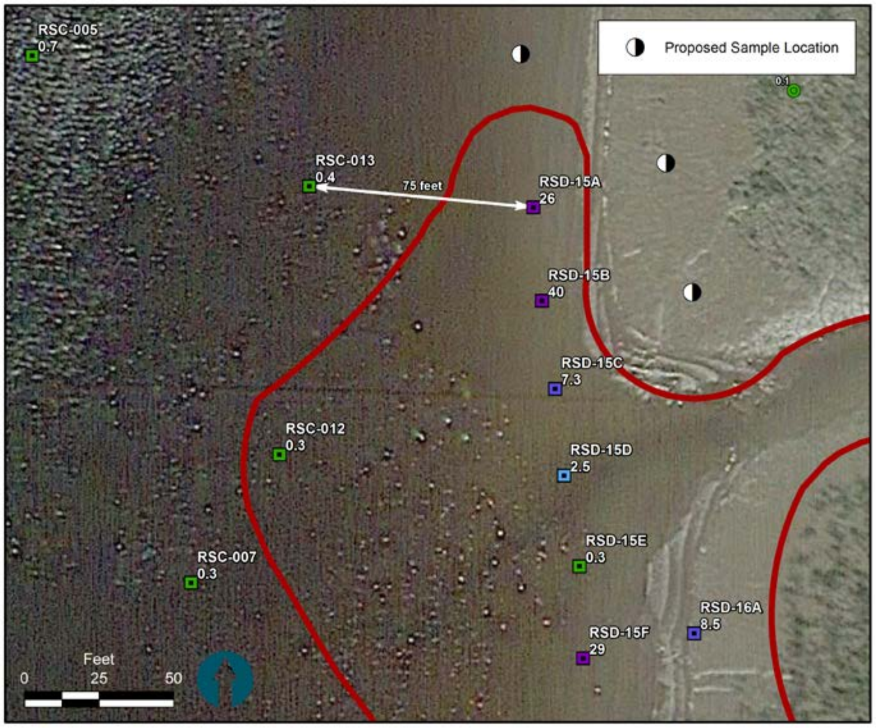


Figure 12: Delineation at RSD-15A and RSD-15B – Southern Sediment Removal Area

## 7.2 Southerly Stream Sediment Removal Area

The horizontal extent of the proposed Southerly Stream Sediment Removal Area was established based on mercury concentrations greater than 2.2 mg/kg and applying the narrative MPS of an average mercury concentration of less than 2.2 mg/kg over a 0.25-acre area to sample locations outside the proposed removal area, as shown on Figures 2 and 3. The average concentration was calculated based on samples from similar depth intervals. The proposed depth of this removal area is 0.8 foot (Figure 9) based on concentrations meeting the MPS in samples from the 0.8- to 1-foot depth interval.

## 7.3 Northern Sediment Removal Area

The horizontal extent of the Northern Sediment Removal Area is well defined by sample data and encompasses all data points that exceed 2.2 mg/kg in this vicinity. This removal area has been divided into three subsections based on differences in the depth of mercury contamination, as discussed below and shown on Figure 9.

### 7.3.1 Northern Sediment Removal Area – Northern Portion

The highest and deepest mercury concentrations are found in the northern portion of the Northern Sediment Removal Area, which is close to a historical National Pollutant Discharge Elimination System (NPDES) discharge that is shown on the figures. The elevated concentrations of mercury are localized and decrease rapidly in the horizontal direction out from RSC-024, the location with the highest concentration, especially to the west with increasing water depth towards the main river channel. The proposed removal depth is 3 feet in the area of highest mercury concentrations, corresponding to the deepest measured interval, with mercury above 2.2 mg/kg (sample SD-SC-07 from 30 to 36 inches). However, because the PD investigation sampling equipment could not penetrate to deeper depths, it is unclear if the contamination extends deeper than 3 feet in this area. Therefore, the final dredge depth at this location will be determined during construction based on observations in the field during excavation. Details on vertical delineation and construction verification will be provided in the Southern Cove CMIP.

Based on comments received from MEDEP on the Draft Delineation Technical Memorandum, Mallinckrodt will collect the following samples in the Spring of 2016 and adjust the extent of the sediment removal area, if needed, to meet MPS:

- North and East of RSC-11G. Sediment samples will be collected from two additional locations east of the Northern Sediment Removal Area (Figure 13). From each location, samples will be collected from two depth intervals between surface and 2 feet.

**Figure 13: RSD-11G – Northern Sediment Removal Area**

### *7.3.2 Northern Sediment Removal Area – Southern Portion*

Mercury concentrations in the southern portion of the proposed Northern Sediment Removal Area are lower than to the north but still exceed the MPS in the top 2 feet. The deeper sample (SD-SC-08) indicates a much lower mercury concentration of 0.06 mg/kg at 3 feet depth. Therefore, the proposed removal depth in this area is 3 feet based on sample results.

### *7.3.3 Northern Sediment Removal Area – Western Edge*

Mercury concentrations show a rapid decrease in concentration and contaminant depth along the western edge of the Northern Sediment Removal Area and towards the main river channel where water depths increase.  Thus, the removal depth of the western edge of the Northern Sediment Removal Area is proposed at 1 foot to meet the MPS.

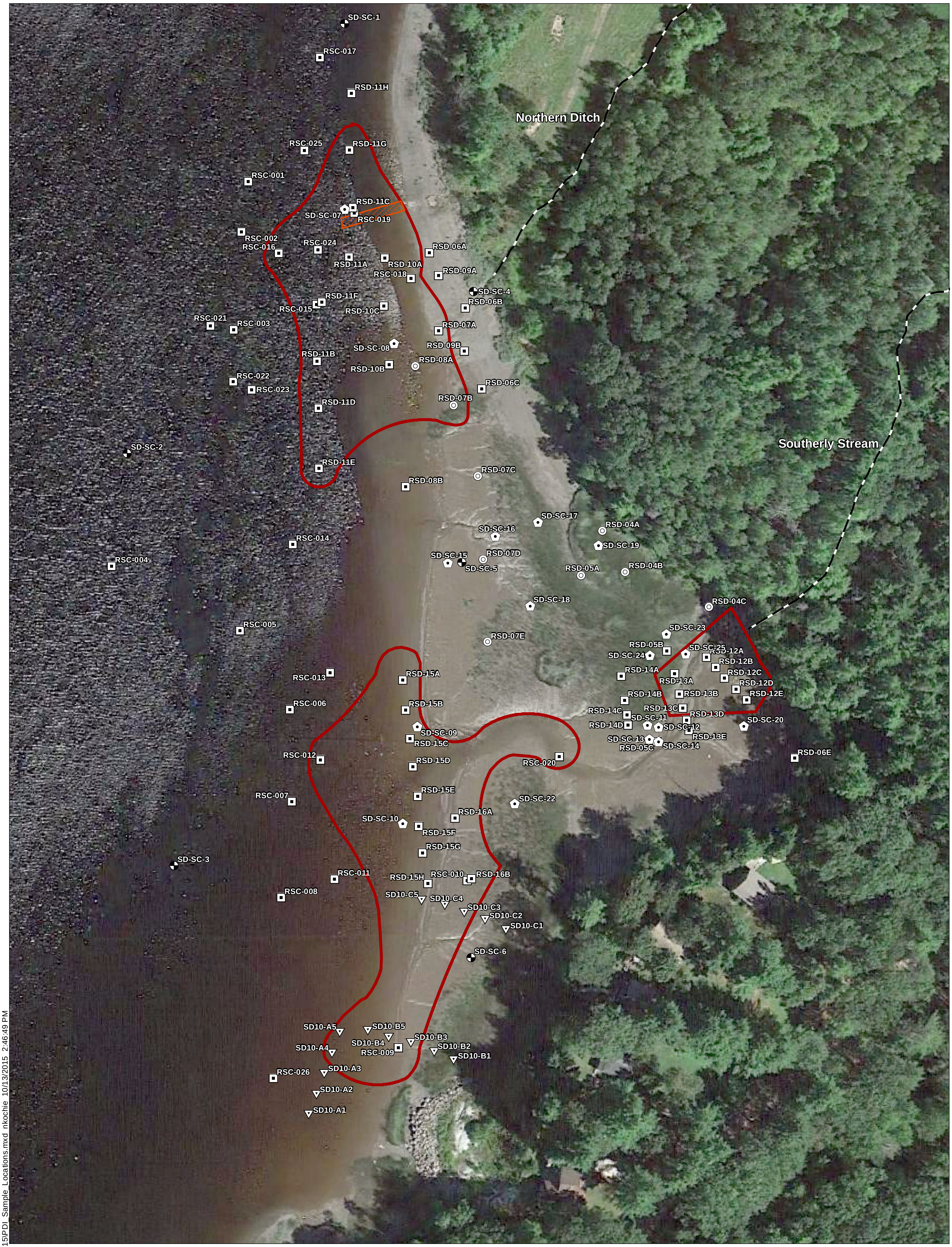
## 8 REFERENCES

Anchor QEA (Anchor QEA, LLC) and CDM (CDM Smith, Inc.), 2015.  *Southern Cove Pre-Design Work Plan*.  Orrington Remediation Site, Orrington Maine.  Prepared for Mallinckrodt US LLC.  June 2015.

CDM (Camp Dresser & McKee Inc.), 1998.  *Site Investigation Report Volume I*.  HoltraChem Manufacturing Site, Orrington, Maine.  December 22, 1998; Revised August 15, 2001.

CDM, 2003.  *Corrective Measures Studies*.  Mallinckrodt Inc., HoltraChem Manufacturing Site, Orrington, Maine.  May 27, 2003; Revised September 19, 2003.

Penobscot River Mercury Study Panel, 2013.  *Penobscot River Mercury Study Final Report*.  Mercury Contamination of the Penobscot River Estuary: Current Situation, Remediation Targets and Possible Remediation Procedures.  Submitted to Judge John Woodcock Unites States District Court (District of Maine).  April 2013.



**Sample Locations**

- ◎ 1995 Sample Location
- ⊡ 1997 Sample Location
- ▽ 2001 Sample Location
- ⬠ 2015 Sample Location
- ◐ 2015 Geotechnical Sample Location
- ▭ Proposed Sediment Removal Area

- ▨ Historical NPDES Discharge
- – – Stream

Feet
0 50 100 150 200

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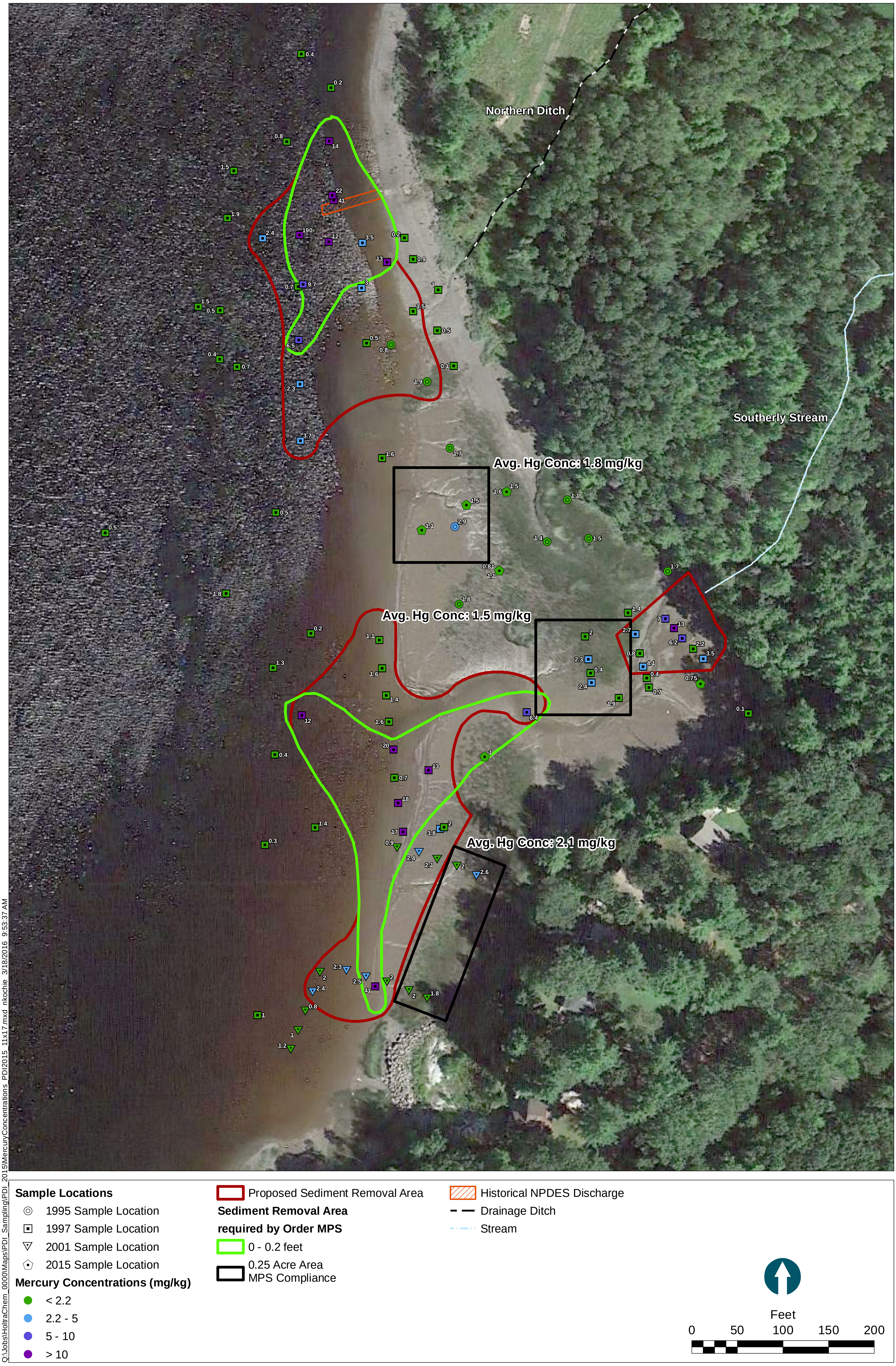
ANCHOR
QEA

**Figure 1**
Sediment Sample Locations
Southern Cove, Orrington Remediation Site
October, 2015



**Sample Locations**

◎ 1995 Sample Location

⊡ 1997 Sample Location

▽ 2001 Sample Location

⬠ 2015 Sample Location

**Mercury Concentrations (mg/kg)**

● < 2.2

● 2.2 - 5

● 5 - 10

● > 10

☐ Proposed Sediment Removal Area

**Sediment Removal Area required by Order MPS**

☐ 0 - 0.2 feet

☐ 0.25 Acre Area MPS Compliance

▨ Historical NPDES Discharge

— — Drainage Ditch

- - - Stream

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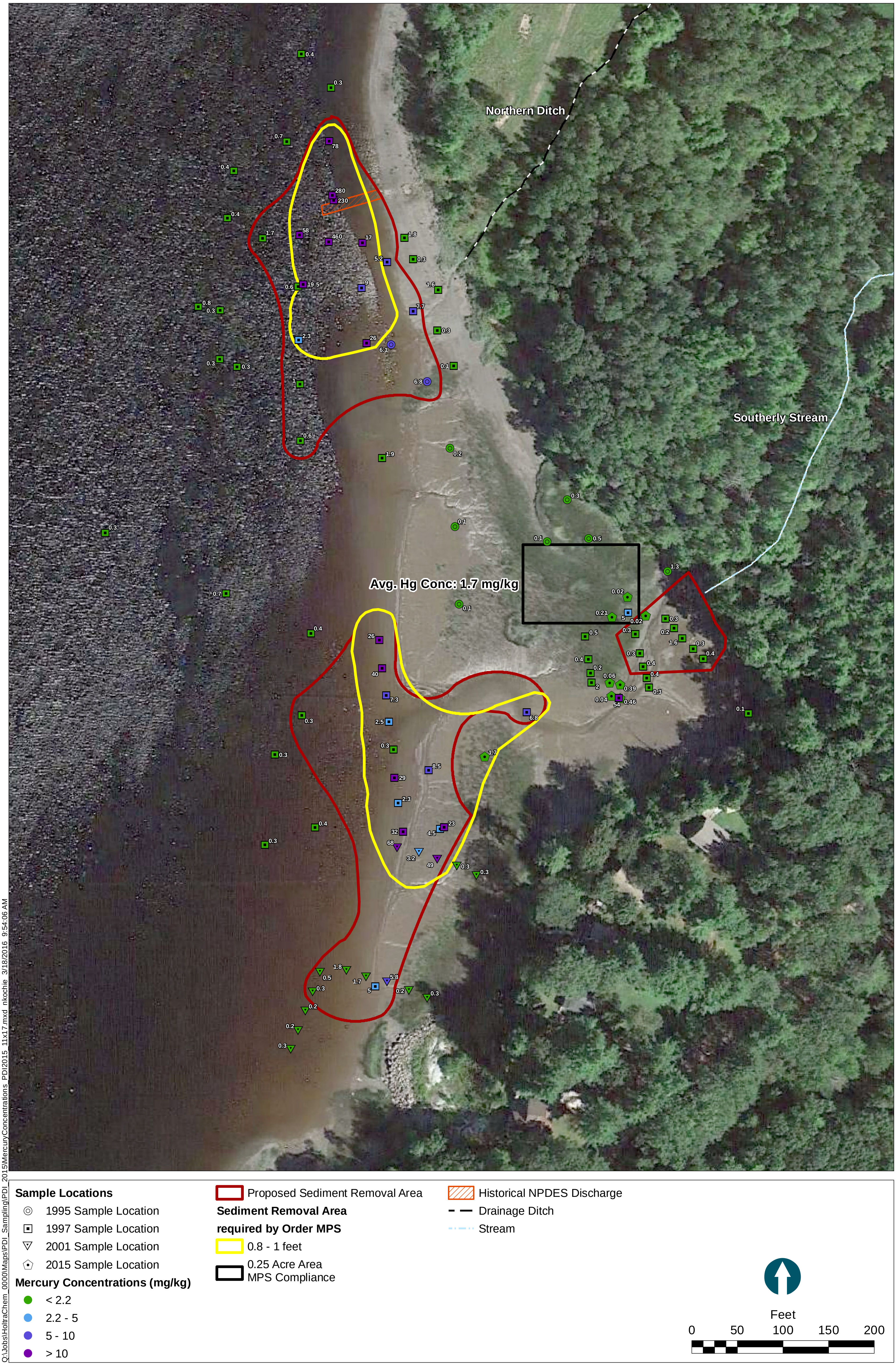
ANCHOR QEA

## Figure 2

Surface Sediment Mercury Concentrations (0 - 0.2 ft)
Southern Cove, Orrington Remediation Site
March, 2016



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ANCHOR QEA

**Figure 3**
Subsurface Sediment Mercury Concentrations (0.8 - 1.0 ft)
Southern Cove, Orrington Remediation Site
March, 2016

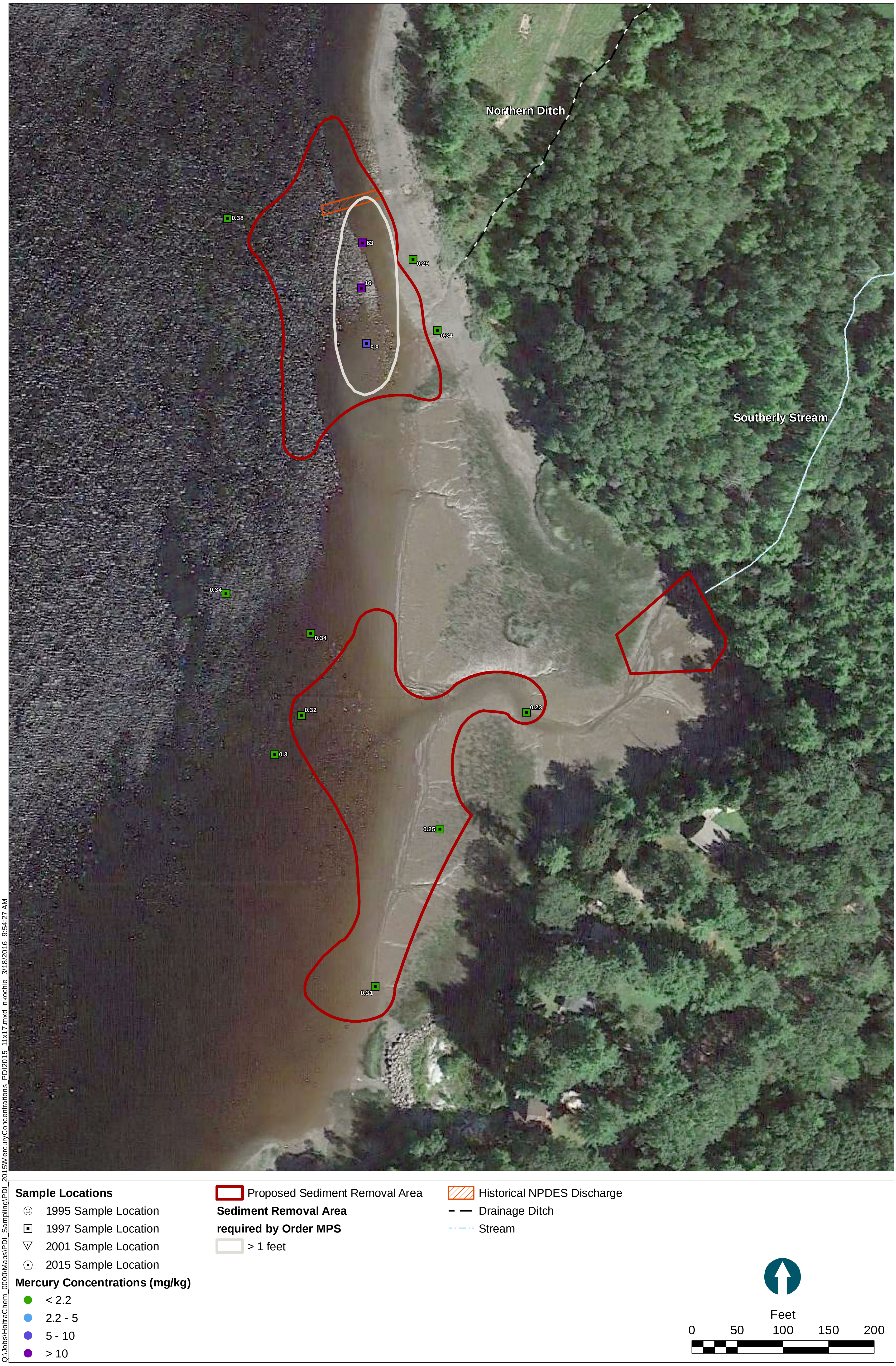

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**Figure 4**
Subsurface Sediment Mercury Concentrations (1.0 - 1.5 ft)
Southern Cove, Orrington Remediation Site
March, 2016

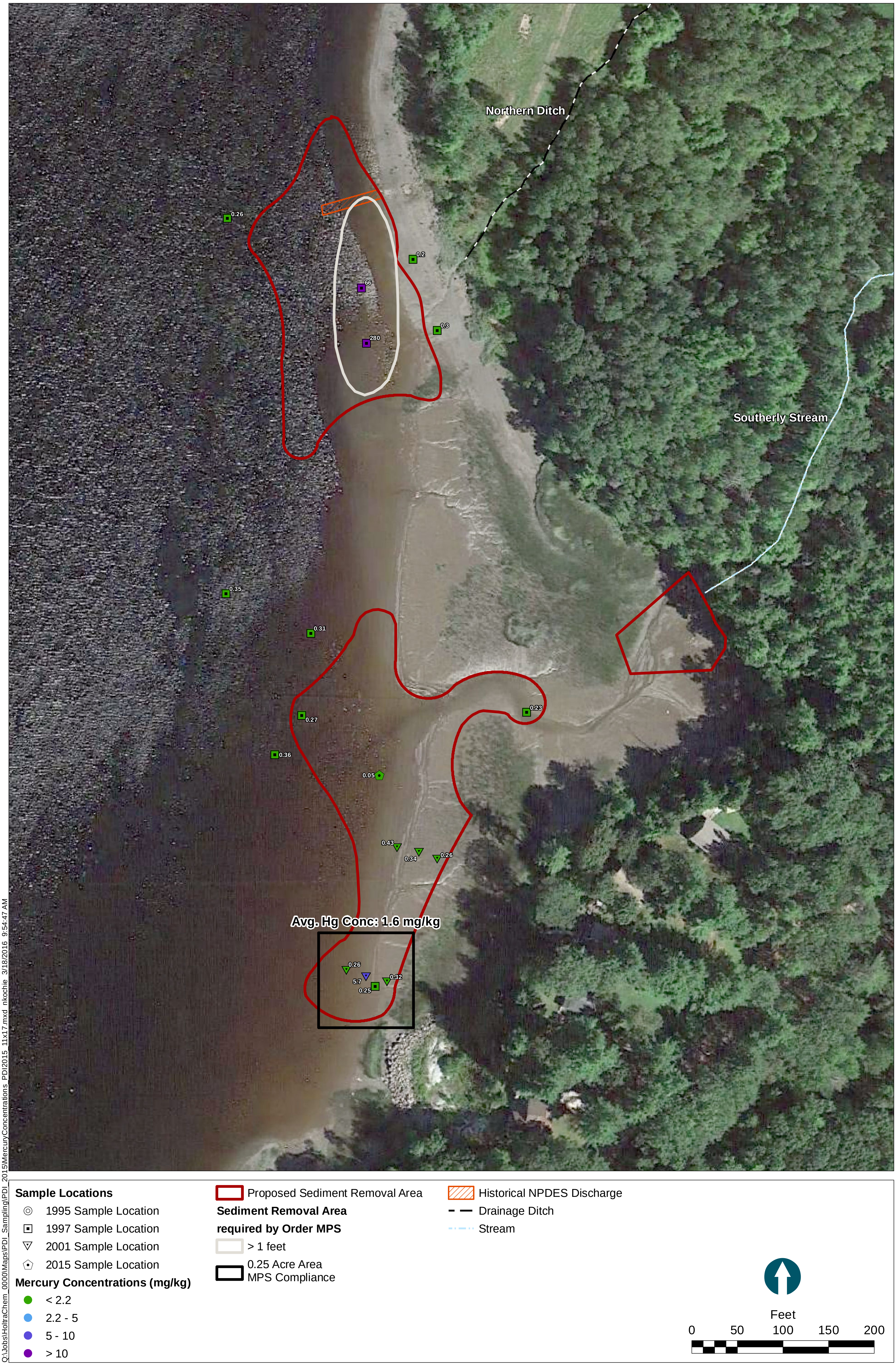

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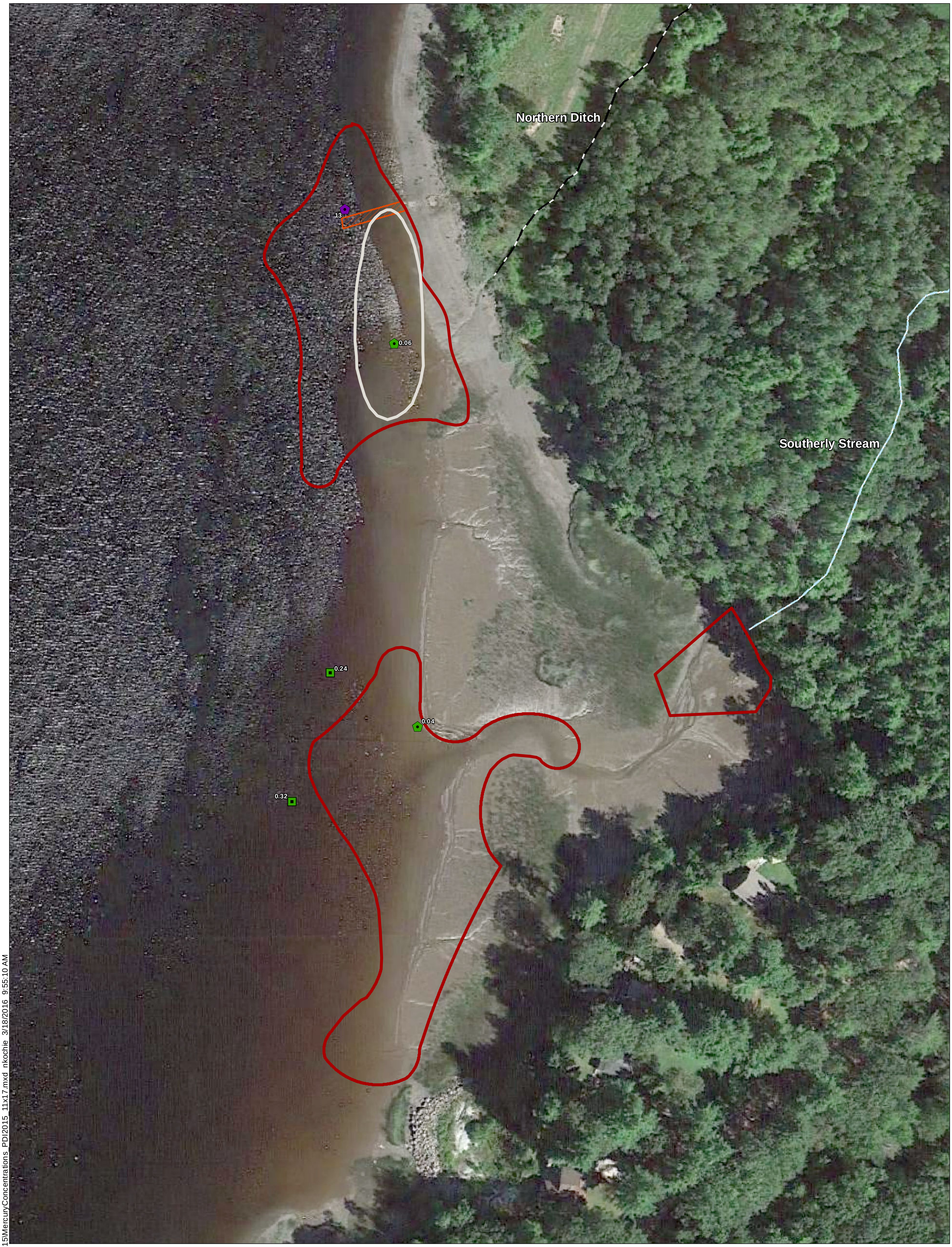
**Figure 5**
Subsurface Sediment Mercury Concentrations (1.5 - 2.0 ft)
Southern Cove, Orrington Remediation Site
March, 2016



**Sample Locations**
- ◎ 1995 Sample Location
- ⊡ 1997 Sample Location
- ▽ 2001 Sample Location
- ⬠ 2015 Sample Location

**Mercury Concentrations (mg/kg)**
- ● < 2.2
- ● 2.2 - 5
- ● 5 - 10
- ● > 10

▭ Proposed Sediment Removal Area

**Sediment Removal Area required by Order MPS**
- ▭ > 1 feet

▨ Historical NPDES Discharge

– – Drainage Ditch

····· Stream

Feet
0 50 100 150 200

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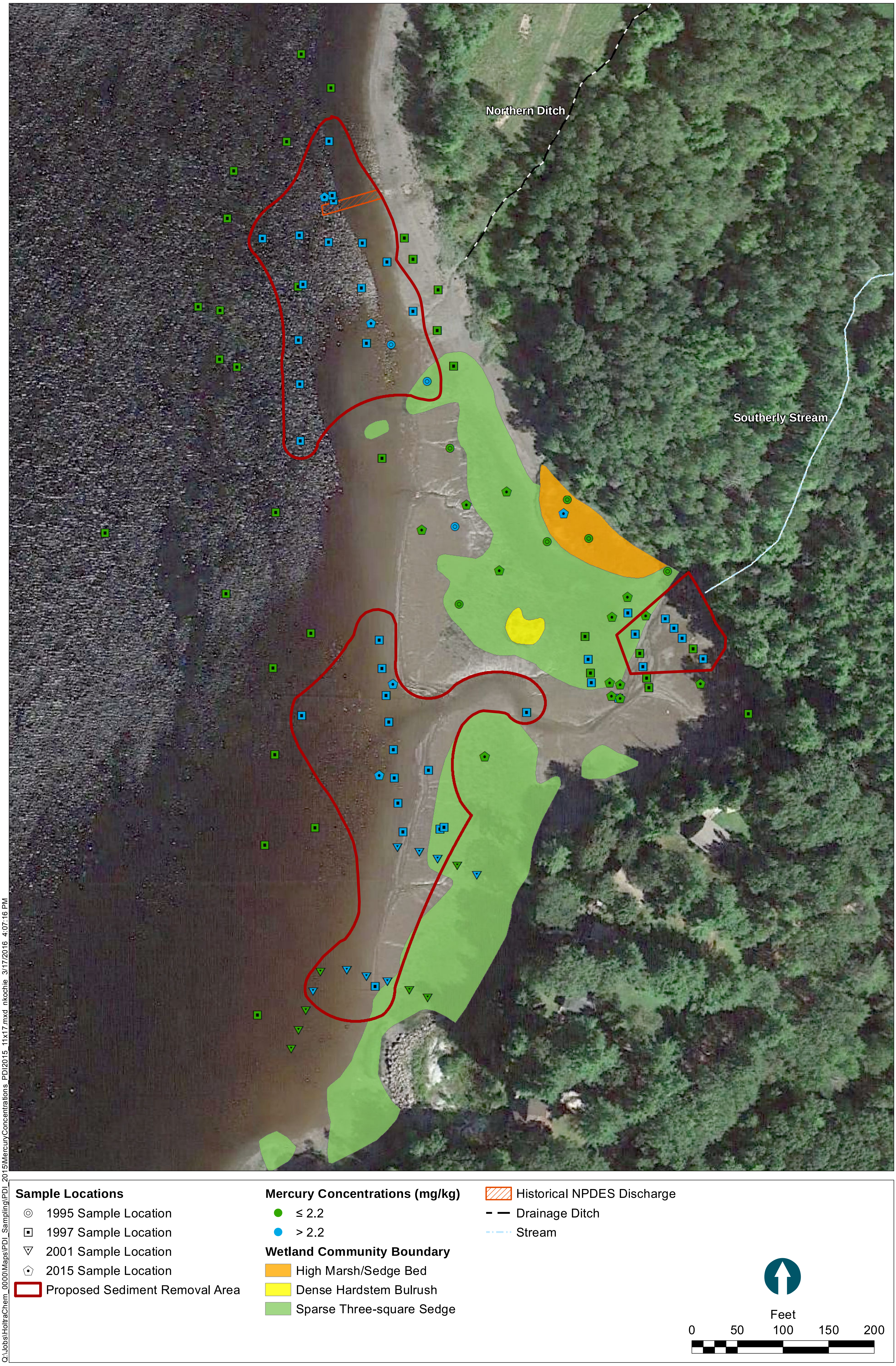
ANCHOR QEA

**Figure 6**
Subsurface Sediment Mercury Concentrations (Greater 2.0 ft)
Southern Cove, Orrington Remediation Site
March, 2016



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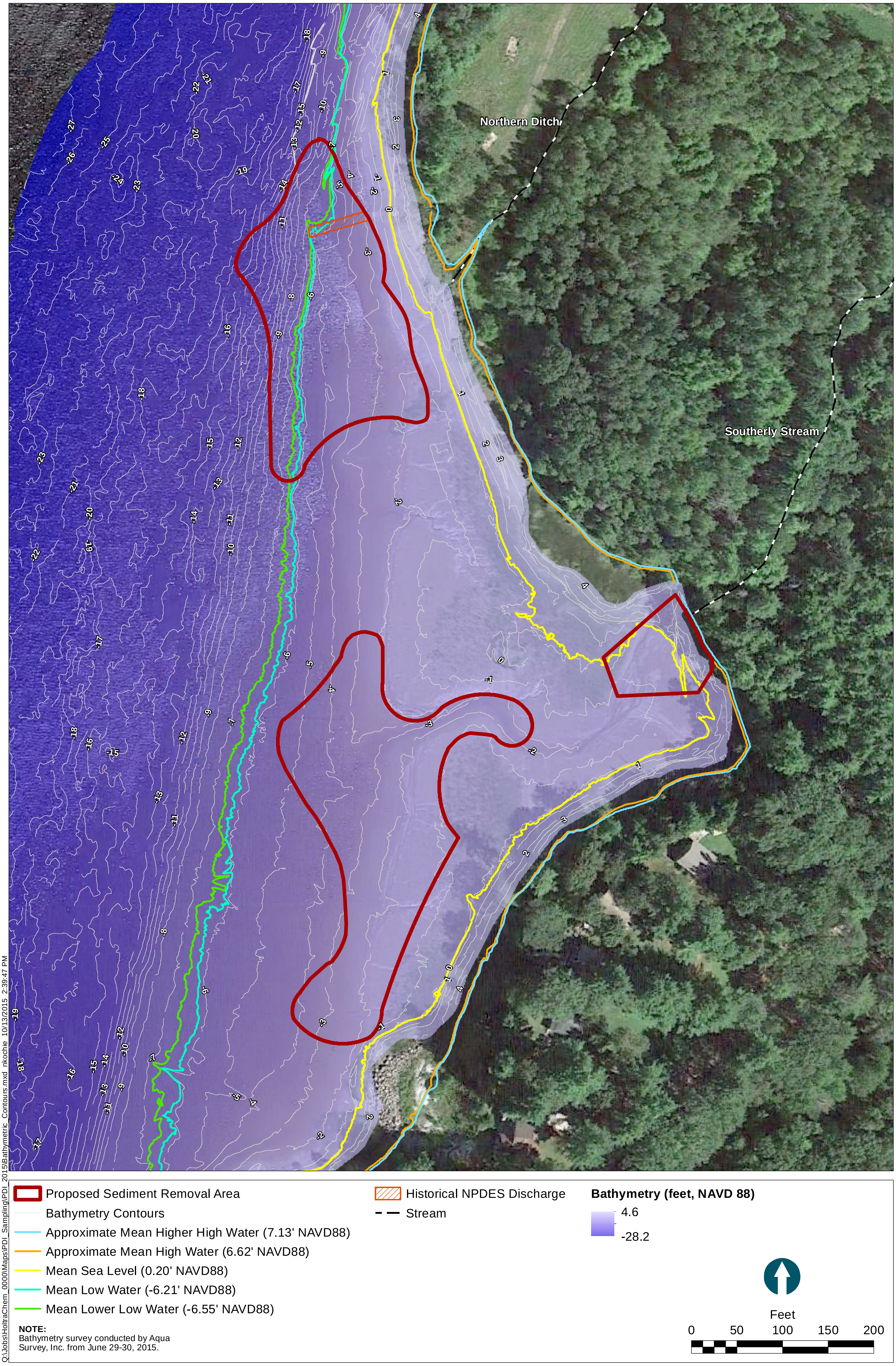
ANCHOR QEA

**Figure 7**
Mercury Concentrations - All Depths and Vegetation Survey
Southern Cove, Orrington Remediation Site
March, 2016



**NOTE:**
Bathymetry survey conducted by Aqua Survey, Inc. from June 29-30, 2015.

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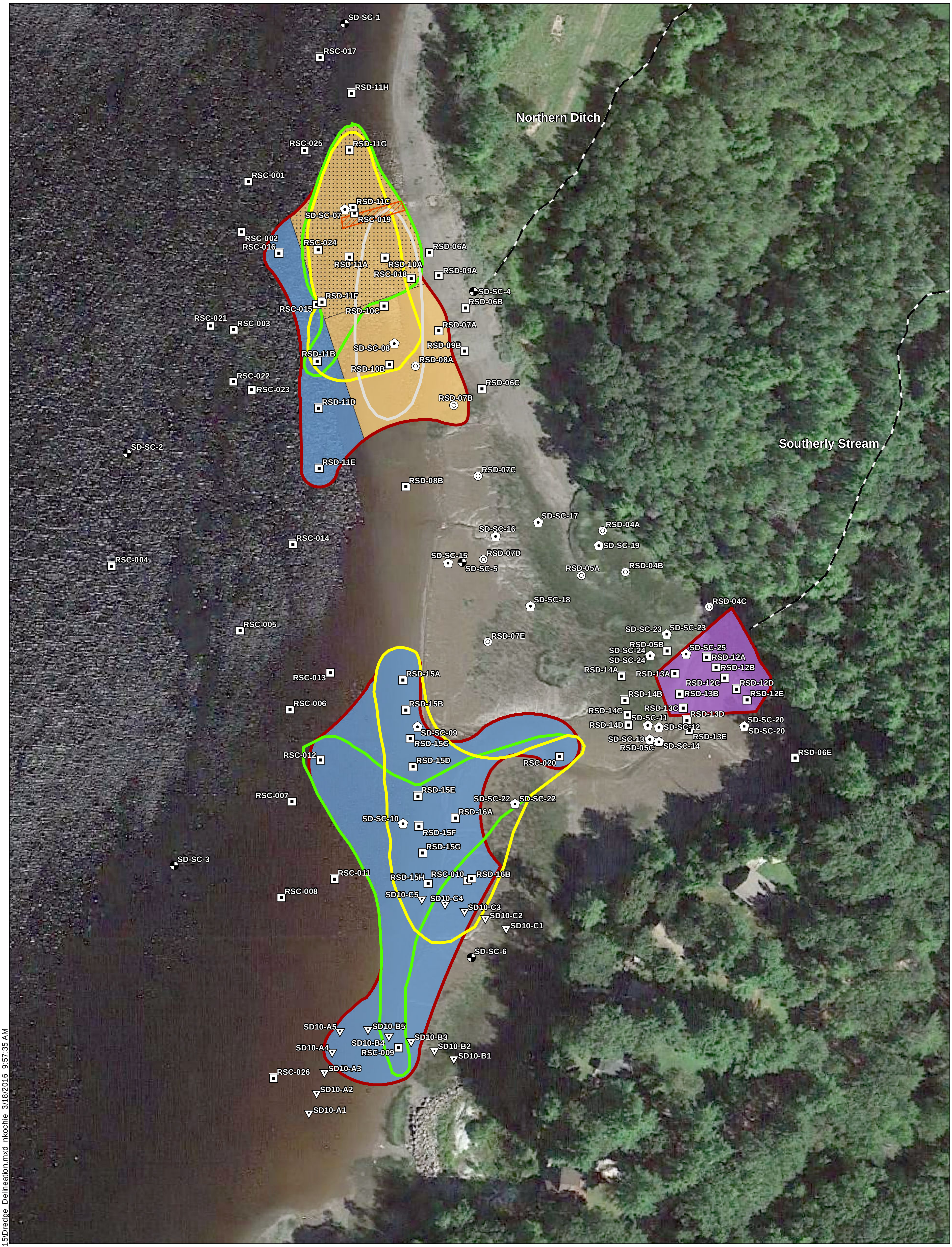
ANCHOR QEA

**Figure 8**
Bathymetric Survey Results
Southern Cove, Orrington Remediation Site
October, 2015



**Sample Locations**

- ◎ 1995 Sample Location
- ⊡ 1997 Sample Location
- ▽ 2001 Sample Location
- ⬠ 2015 Sample Location
- ◐ 2015 Geotechnical Sample Location

**Dredge Depth Delineation**

- 🟪 0.8 feet
- 🟦 1 foot
- 🟧 3 feet
- ▦ 3 feet (Final Dredge Depth To Be Adjusted During Construction)

🟥 Proposed Sediment Removal Area

**Sediment Removal Area required by Order MPS**

- 🟩 0 - 0.2 feet
- 🟨 0.8 - 1 feet
- ⬜ > 1 feet

▨ Historical NPDES Discharge

— — Stream

Feet

0 50 100 150 200

**Note:**
Proposed sediment removal areas represent the minimum removal limits; the boundaries may be optimized for efficient construction.

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ANCHOR QEA

**Figure 9**
Proposed Sediment Removal Areas and Depths
Southern Cove, Orrington Remediation Site
March, 2016

**Mallinckrodt US LLC**

March 25, 2016

Ms. Stacy Ladner
Unit Manager
Division of Oil & Hazardous Waste Facility Regulation
Bureau of Remediation and Waste Management
Maine Department of Environmental Protection
17 State House Station
Augusta, ME 04333

**Subject:** **Southern Cove, Orrington Remediation Site**
**Response to MEDEP Comments dated February 26, 2016, on the**
**Proposed Delineation of Sediment Removal Areas for Basis of Remedial Design**
**(October 29, 2015)**

Dear Stacy:

Mallinckrodt submitted the Draft Technical Memorandum *Proposed Delineation of Sediment Removal Areas for Basis of Remedial Design* (October 29, 2015) describing the delineation of sediment removal areas for basis of remedial design for the Southern Cove. Following that submittal, Mallinckrodt presented an overview of the technical memorandum to the Maine Department of Environmental Protection (MEDEP) on February 18, 2016, and received comments from MEDEP by email on February 26, 2016. Mallinckrodt presented responses to MEDEP comments during a webinar on March 15, 2016. Based on feedback received from MEDEP in their written comments and during the March 15 webinar, a response to each of MEDEP's comments is provided below. The Technical Memorandum has been revised accordingly and will be submitted under separate cover.

**MEDEP Comment #1 - Section 7.1 Southern Sediment Removal Area:**
Additional sediment samples should be taken in order to properly delineate the northernmost portion of the southern sediment removal area. Supporting data does not exist to properly delineate this removal area. The area includes samples RSD-15A, RSD-15B, and SD-SC-09 that have exceedances of the media protection standards (MPS) for mercury but are not appropriately bounded by a corresponding non-exceedance. The closest non-exceedances are approximately 100 feet away. The area to the west of sample RSC-012 in the Southern Sediment Removal Area is also not adequately delineated.

***Response:***
<u>SD-SC-09</u>: This sample is a composite collected over the depth interval 0 to 25 inches at several subsampling locations. The objective for collection of this sample was to characterize a bulk sample of the sediment for disposal requirements. The sample was not collected for delineation, and as a

composite, is not appropriate for that purpose. RSD-15C is located adjacent to SD-SC-09, was collected from a discrete depth interval and is appropriate for delineation.

North and East of RSD-15A, RSD-15B, and RSD-15C: Three additional samples will be collected to complete delineation—one north of the sediment removal area and two to the east, as shown on Figure 1. Samples will be collected from 0- to 0.2-foot and 0.8- to 1-foot depth intervals based on the depth of contamination observed in previously collected nearby samples.

West of RSD-15A, RSD-15B and RSD-15C: Mercury was not detected at concentrations greater than 2.2 mg/kg in any samples west of the sediment removal areas, and this is not a depositional area. Specifically, sample RSC-013 where mercury was detected at 0.4 mg/kg is located 75 feet west of RSD-15A. Therefore, delineation is complete in this area and no additional samples are planned.

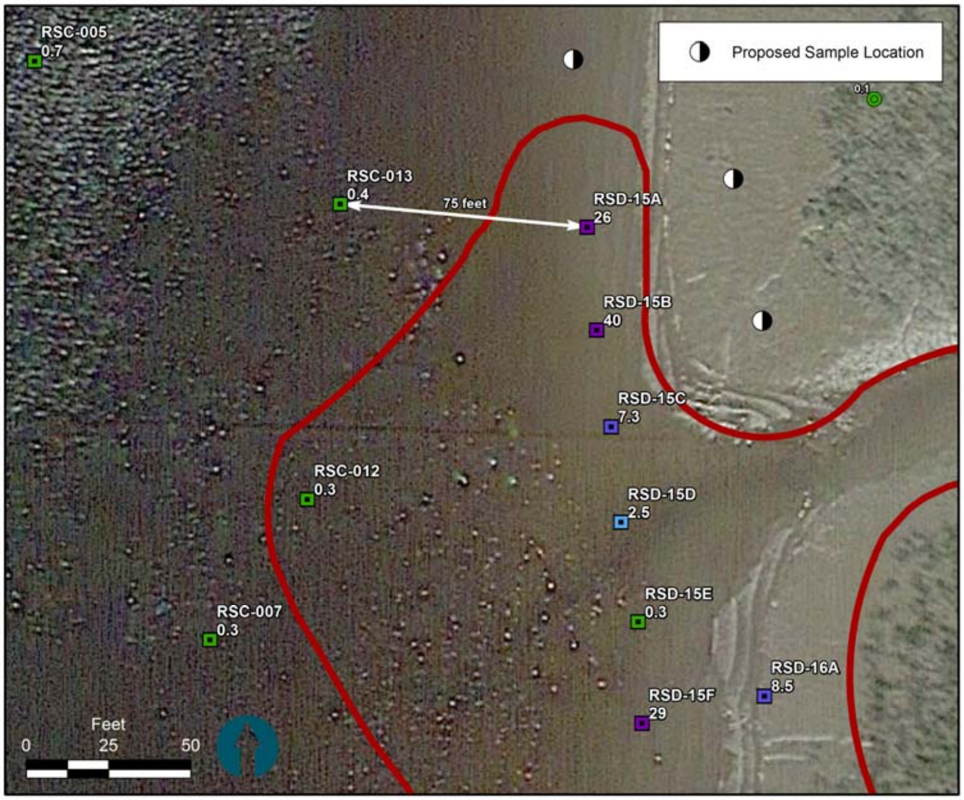


**Figure 1: Delineation at RSD-15A and RSD-15B – Southern Sediment Removal Area**

West of sample RSC-012: This area is delineated by two samples located 52 (RSC-007) and 61 feet to the west (RSC-006) where mercury was detected at 1.3 and 0.4 mg/kg, respectively (Figure 2). Also, samples collected at RSC-012 from deeper depths between 0.8 and 2 feet have less than 2.2 mg/kg mercury. In addition, all samples west of the sediment removal areas contain less than 2.2 mg/kg mercury and this is not a depositional area. Therefore, no additional samples to the west of RSC-012 are required to complete delineation.

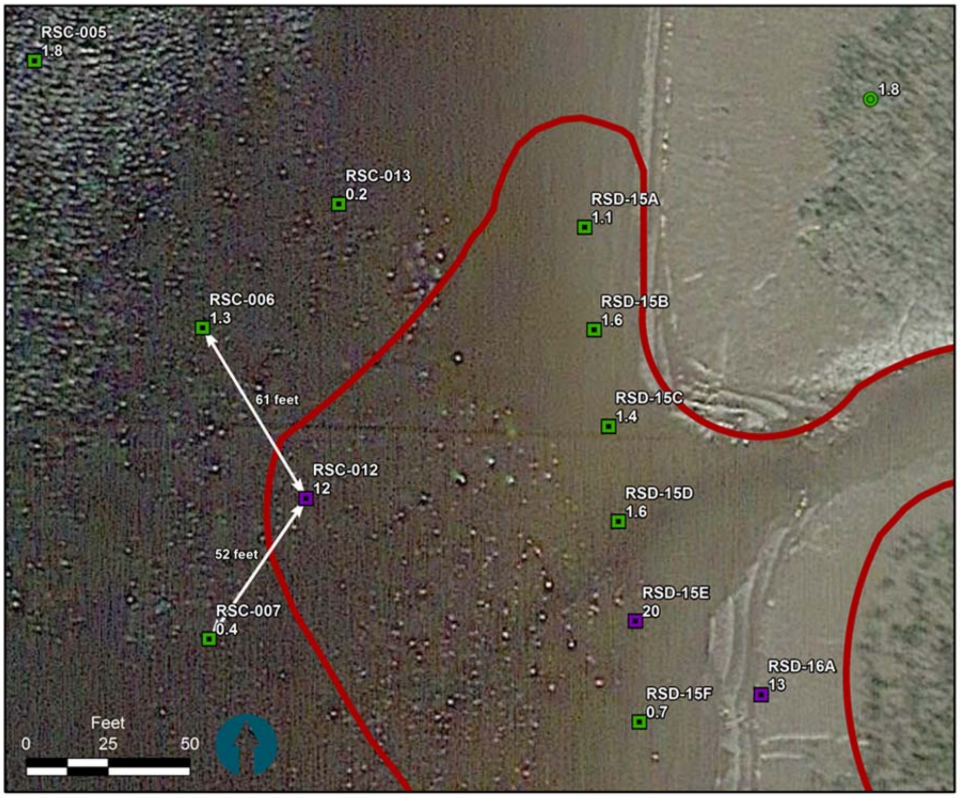


**Figure 2: Delineation at RSC-012 - Southern Sediment Removal Area**

**Comment #2 - Section 7.3 Northern Sediment Removal Area:**
The area to the north and east of sample RSC-11G is not adequately delineated. The areas to the west, south, and east of sample RSD-11E are not adequately delineated.

***Response:***
North and East of RSC-11G: Sediment samples will be collected from two additional locations east of the Northern Sediment Removal Area (Figure 3). From each location, samples will be collected from the 0 – 0.2 feet and 1 – 1.5 feet depth intervals.

Delineation north of RSD-11G is supported by sample RSD-11H, located 59 feet to the north, where 0.2 mg/kg mercury was detected. Therefore, no additional sampling north of the Northern Sediment Removal Area is required to complete the delineation.

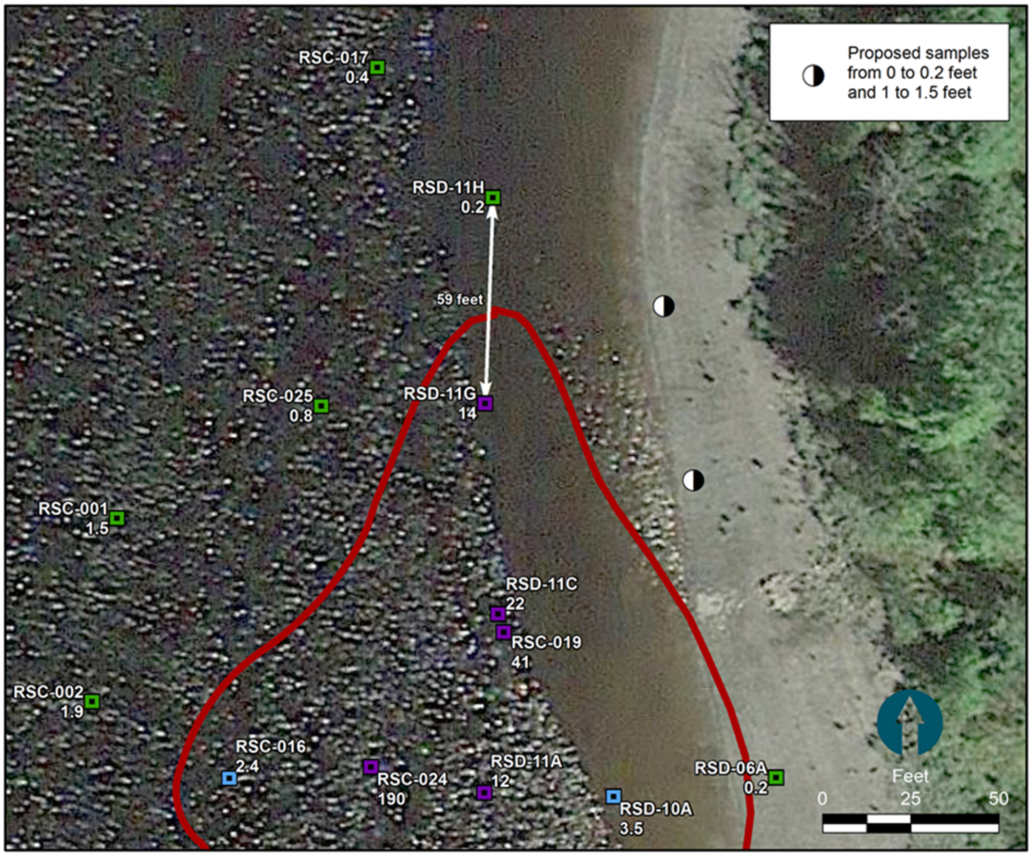


**Figure 3: RSD-11G – Northern Sediment Removal Area**

East and South of Sample RSD-11E: Delineation east and south of RSD-11E is supported by samples located 91 feet to the east (RSD-08B) and 83 feet to the south (RSC-014), where mercury concentrations were 1.6 and 0.5 mg/kg respectively (Figure 4). Therefore, no additional sampling north of the Northern Sediment Removal Area is required to complete delineation.

West of Sample RSD-11E: Delineation is complete to the west of the Northern Sediment Removal Area. All samples west of the sediment removal areas have less than 2.2 mg/kg mercury and this is not a depositional area. Therefore, no additional sampling is necessary to complete delineation.

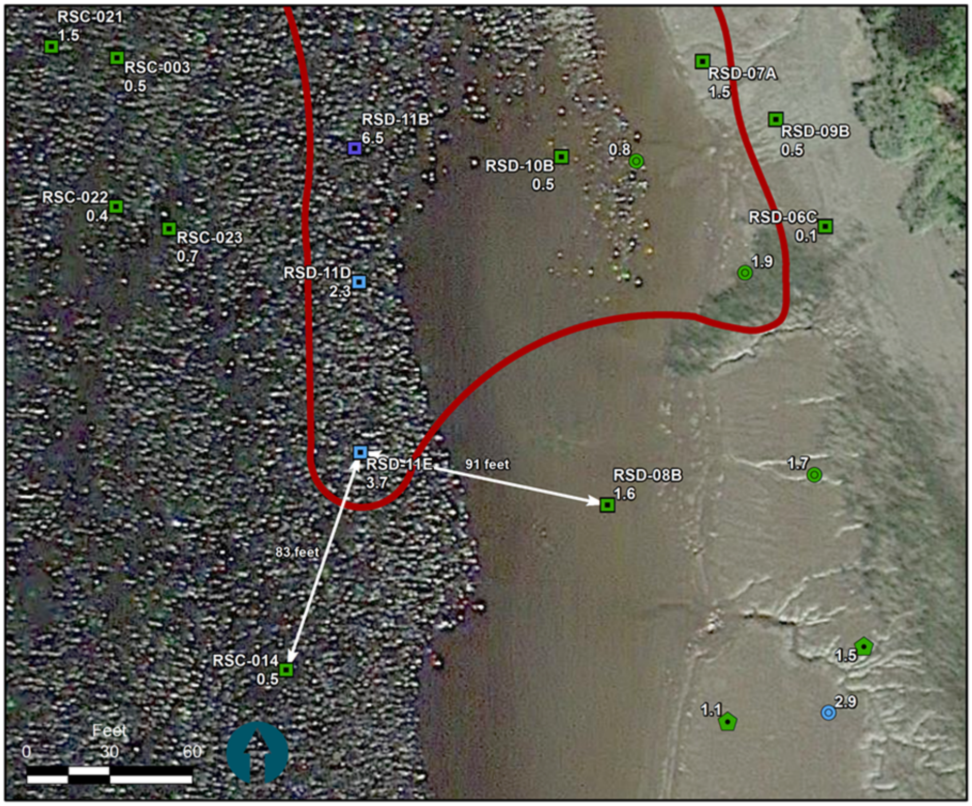


**Figure 4: RSD-11E – Northern Sediment Removal Area**

**MEDEP Comment #3:**
The Order says that irrespective of concentrations, sediment within the two hot spot areas at three specific depths must be removed. For the Southern Sediment Removal area, the plan averages the concentrations at depth over a 0.25-acre area to get the concentrations below 2.2 mg/kg and then limits the removal depth interval. It appears that this lower depth is not identified in the order as a specific removal area and would therefore be acceptable to average over a 0.25-acre area.

On the other hand, the Northern Sediment Removal Area is not limited by depth in the Order. To be consistent with the Order, the plan should remove all the sediment without averaging at the specified depths in the hot spot areas defined by the narrative in the Order. It is hard to determine if this is the intent of the proposal. We understand that the Northern Portion of the Northern Sediment Removal Area will be determined in the field due to the inability to obtain samples in the field. Therefore, the acceptable removal depth for this area will need to be determined in the future.

***Response:***
The Order defined three areas/depths for the Northern Sediment Removal Area, and two areas/depths for the Southern Sediment Removal Area. As depicted on Figure 5, the dredge depth of the entire Southern Removal Area is 1 foot deep which is consistent with the depth required in the Order as shown by the green and yellow outlines in Figure 5, with the exception of a vegetated hummock on the eastern side of the area. Samples collected at two depth intervals from this hummock since the Order was finalized show mercury to be less than 2.2 mg/kg (SD-SC-22) therefore the removal area was adjusted to avoid the vegetated hummock (Figure 5). This is further described in the Revised Technical Memorandum being submitted under separate cover.

The dredge depth of the Southern portion of the Northern Removal Area is 3 feet deep which is consistent with the depth required in the Order as shown by the green, yellow, and white outlines in Figure 5. The dredge depth of the Northern portion of the Northern Removal Area is at least 3 feet deep with the final depth of sediment removal to be determined during construction. This is consistent with the Order as the horizontal delineation encompasses the entire hot spot while the depth is noted as greater than 1 foot but the final depth is not defined. This is described in the Revised Technical Memorandum (Section 7) and details on vertical delineation and construction verification will be further detailed in the Southern Cove CMI Plan.

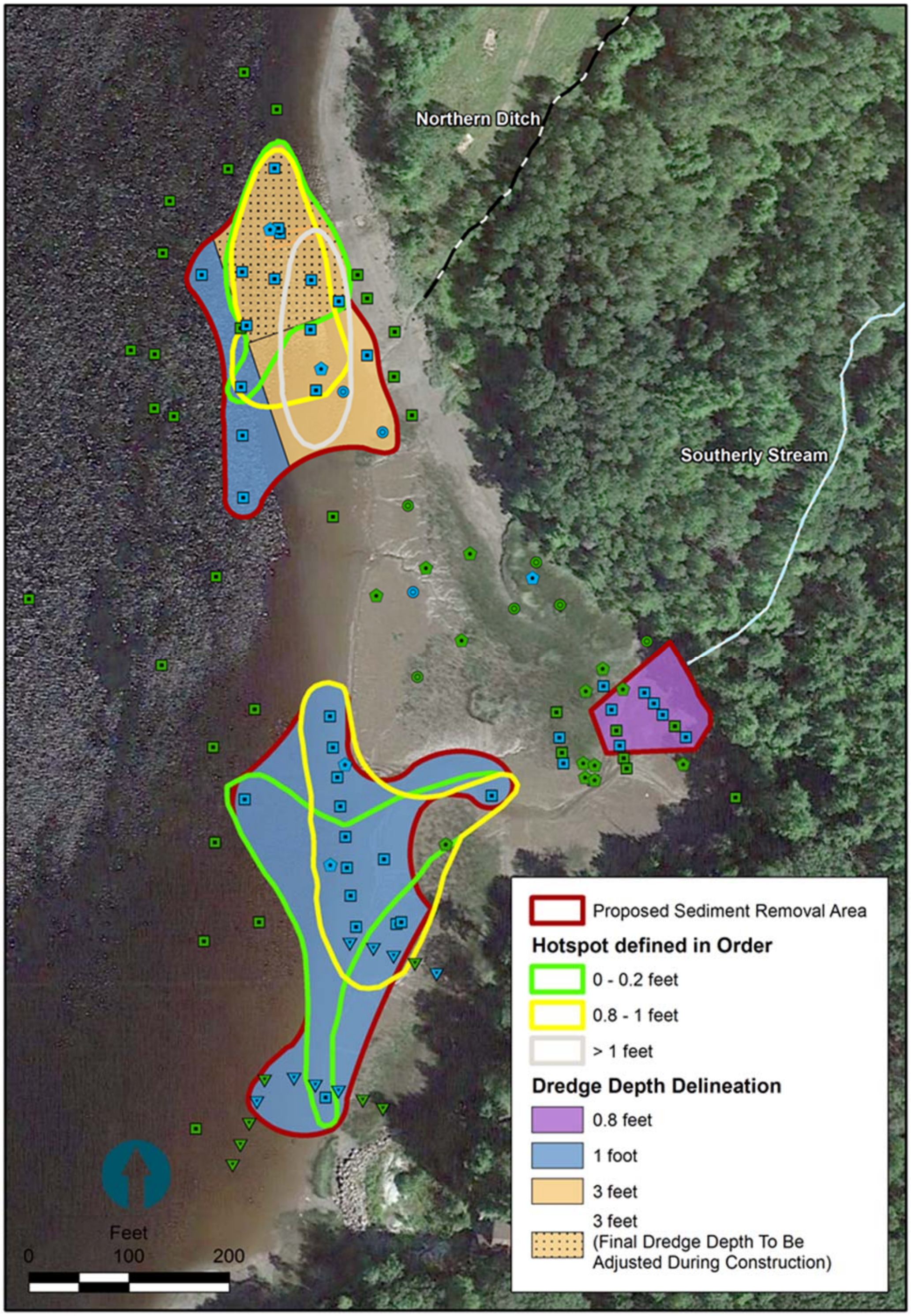


**Figure 5: Proposed and Order-required Sediment Removal Areas/Depths**

**MEDEP Comment #4:**
For clarity, Anchor QEA should provide additional information regarding the samples that were composited. This was discussed, and agreed to, during our February 18, 2016, conference call.

***Response:***
A summary of the four composite samples collected from within the sediment removal area prisms for disposal characterization purposes was emailed to MEDEP on February 21, 2016, and again on February 26, 2016. A copy of the summary is also included here as Attachment A.

Please contact me with any questions or comments. We look forward to receiving your concurrence on delineation of the sediment removal areas to allow completion of the Corrective Measures Implementation Plan.

Regards,

Kathy Zeigler

Kathy Zeigler
Mallinckrodt US LLC

Attachment A

## Preliminary Summary of Sediment Characterization within Sediment Removal Areas – Southern Cove

Four composite samples (SD-SC-07 through SD-SC-10) were collected from the sediment removal areas to characterize material for handling and disposal requirements. Each composite sample, with the exception of samples for volatile organic compound analyses, was composited from material collected from four subsampling locations surrounding the sample location. The locations of the composite sub-sampling locations are depicted on **Figure 5-1.** The samples tested for Toxicity Characteristic Leaching Procedure (TCLP) volatile organic compounds were not composited and were collected as discrete grab samples from the first composite subsampling location.

The TCLP testing results are summarized in **Table 5-1**, including comparison to the estimated requirements of the waste disposal facility; no exceedances were noted. Non-TCLP characterization analytical results are summarized in **Table 5-2**.

**Table 5-1: Waste Characterization – TCLP Test Data (mg/L)**

| | Estimated Disposal Requirements | SD-SC-07 0 to 24 inches | SD-SC-08 0 to 24 inches | SD-SC-09 0 to 25 inches | SD-SC-10 0 to 1.5 feet (including duplicate sample results) | |
|---|---|---|---|---|---|---|
| **TCLP Metals** | | | | | | |
| Arsenic | <5.0 | 0.02 J | 1 U | 0.03 J | 0.05 J | 0.04 J |
| Barium | <100.00 | 0.1 J | 0.12 J | 0.06 J | 0.09 J | 0.08 J |
| Cadmium | <1.0 | 0.1 U | 0.1 U | 0.1 U | 0.1 U | 0.1 U |
| Chromium | <5.0 | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U |
| Lead | <5.0 | 0.5 U | 0.5 U | 0.5 U | 0.5 U | 0.03 J |
| Mercury | <0.2 | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Selenium | <1.0 | 0.5 U | 0.5 U | 0.5 U | 0.5 U | 0.5 U |
| Silver | <5.0 | 0.1 U | 0.1 U | 0.1 U | 0.1 U | 0.1 U |
| **TCLP Volatiles** | | | | | | |
| Benzene | <0.5 | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U |
| Carbon tetrachloride | <0.5 | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U |
| Chlorobenzene | <100.0 | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U |
| Chloroform | <6.0 | 0.0075 U | 0.0075 U | 0.0075 U | 0.0075 U | 0.0075 U |
| 1,2-Dichloroethane | <0.5 | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U |
| Vinyl Chloride | <0.2 | 0.01 U | 0.01 U | 0.01 U | 0.01 U | 0.01 U |
| **TCLP Semi-volatiles (Base Neutrals)** | | | | | | |
| 1,4-Dichlorobenzene | <7.5 | 0.025 U | 0.025 U | 0.025 U | 0.025 U | .0025 U |
| Hexachlorobenzene | <0.13 | 0.01 U | 0.01 U | 0.01 U | 0.01 U | 0.01 U |
| Hexachlorobutadiene (Hexachloro-1,3-butadiene) | <0.5 | 0.01 U | 0.01 U | 0.01 U | 0.01 U | 0.01 U |
| Hexachloroethane | <3.0 | 0.01 U | 0.01 U | 0.01 U | 0.01 U | 0.01 U |
| Nitrobenzene | <2.0 | 0.01 U | 0.01 U | 0.01 U | 0.01 U | 0.01 U |
| Pyridine | <5.0 | 0.025 U | 0.025 U | 0.025 U | 0.025 U | 0.025 U |

|  | Estimated Disposal Requirements | SD-SC-07 0 to 24 inches | SD-SC-08 0 to 24 inches | SD-SC-09 0 to 25 inches | SD-SC-10 0 to 1.5 feet (including duplicate sample results) |  |
|---|---|---|---|---|---|---|
| 2,4-Dinitrotoluene | <0.13 | 0.025 U | 0.025 U | 0.025 U | 0.025 U | 0.025 U |
| **TCLP Semi-volatiles (Acid Compounds)** |  |  |  |  |  |  |
| 2-Methylphenol (o-Cresol) | <200.0 | 0.025 U | 0.025 U | 0.025 U | 0.025 U | 0.025 U |
| 3-Methylphenol & 4-Methylphenol (m&p-Cresol) | <200.0 | 0.025 U | 0.025 U | 0.025 U | 0.025 U | 0.025 U |
| Cresol, Total | <200.0 |  |  |  |  |  |
| Pentachlorophenol | <100.0 | 0.05 U | 0.05 U | 0.05 U | 0.05 U | 0.05 U |
| 2,4,5-Trichlorophenol | <400.0 | 0.025 U | 0.025 U | 0.025 U | 0.025 U | 0.025 U |
| 2,4,6-Trichlorophenol | <2.0 | 0.025 U | 0.025 U | 0.025 U | 0.025 U | 0.025 U |
| **TCLP HERBICIDES** |  |  |  |  |  |  |
| 2,4-D (2,4-Dichlorophenoxyacetic acid) | <10.0 | 0.025 U | 0.025 U | 0.025 U | 0.025 U | 0.025 U |
| 2,4,5-TP (Silvex) | <1.0 | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U |
| **TCLP Pesticides** |  |  |  |  |  |  |
| Chlordane | <0.03 | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Endrin | <0.02 | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Heptachlor | <0.008 | 0.0001 U | 0.0001 U | 0.0001 U | 0.0001 U | 0.0001 U |
| Hexachlorocyclohexane (BHC), gamma- (Lindane) | <0.4 | 0.0001 U | 0.0001 U | 0.0001 U | 0.0001 U | 0.0001 U |
| Methoxychlor | <10.0 | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Toxaphene | <0.5 | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |

Notes:

1) Sample depth is reported as below mudline.

J = Compound analyzed, but the result value was estimated.

mg/L = milligrams per liter

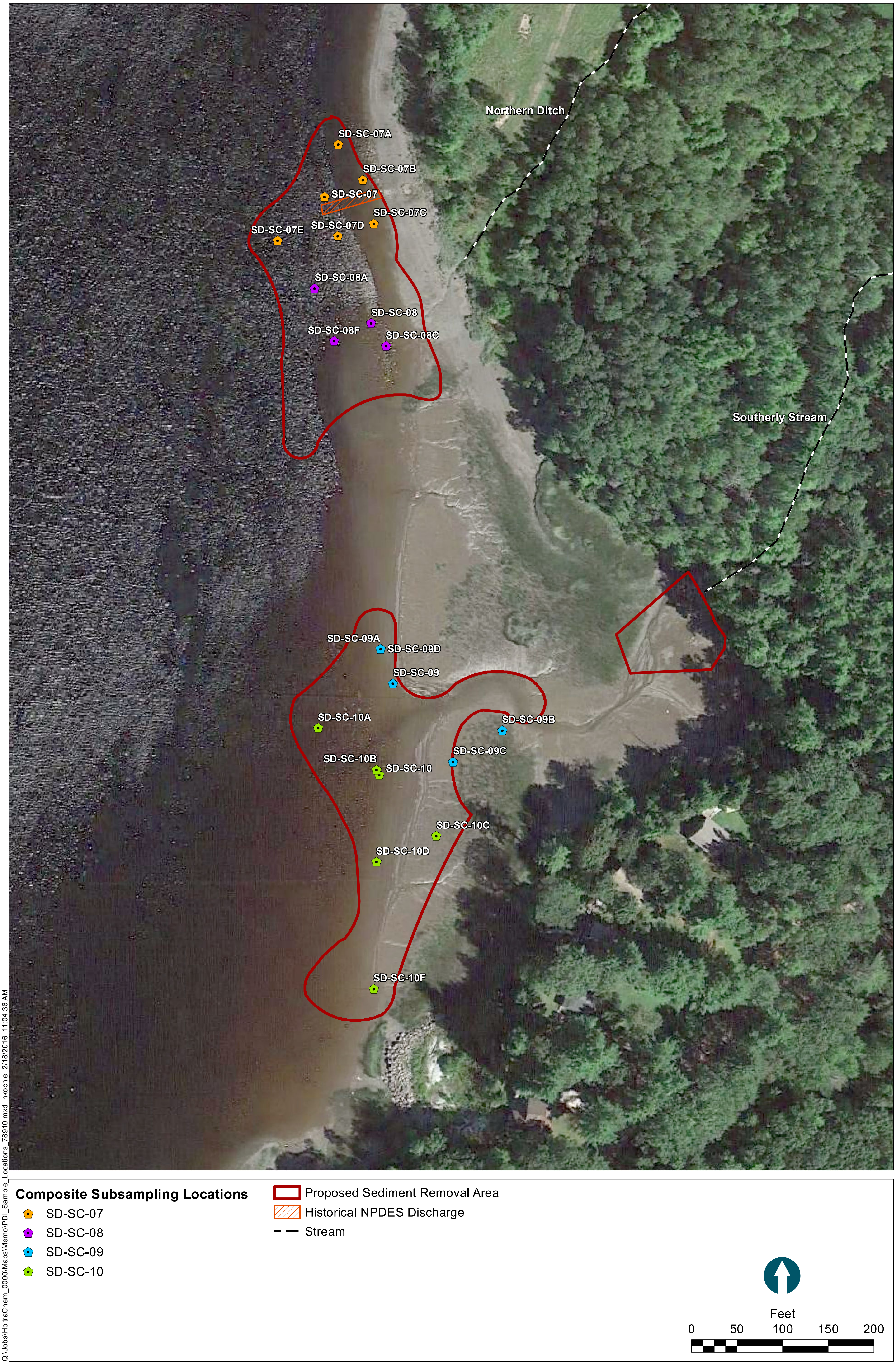
TCLP = Toxicity Characteristic Leaching Procedure

U = Compound analyzed but not detected above detection limit.

## Table 5-2: Waste Characterization – Non-TCLP Analytical Results

| | | Depth Below Mudline | | | | |
|---|---|---|---|---|---|---|
| | | SD-SC-07 | SD-SC-08 | SD-SC-09 | SD-SC-10 | |
| | Units | 0 to 24 inches | 0 to 24 inches | 0 to 25 inches | 0 to 18 inches | 0 to 18 inches* |
| Chloride | mg/kg | 13J | 38J | 430J | 170J | 320J |
| Cyanide | mg/kg | 10U | 10U | 10U | 10U | 10U |
| Flash Point | deg F | 70U | 70U | 70U | 70U | 70U |
| Gravel | pct | 26.1 | 24.7 | **U** | **U** | NA |
| Liquid Limit | unitless | NV | NV | NV | NV | NA |
| Mercury | mg/kg | 2.1J | 24J | 15J | 4J | 12J |
| Moisture (Water) Content | pct | 25.1 | 44.2 | 220.4 | 226.7 | NA |
| pH | SU | 5.9 | 5.3 | 5.6 | 5.8 | 5.6 |
| Plastic Limit | unitless | NP | NP | NP | NP | NA |
| Plasticity Index | unitless | NP | NP | NP | NP | NA |
| Sand | pct | 64.1 | 52.5 | 16.2 | 16.1 | NA |
| Sulfate | mg/kg | 130 | 200 | 1100 | 670 | 960 |
| Sulfide, Reactive | mg/kg | 10U | 10U | 10U | 10U | 10U |
| Total fines (Reported, Not Calculated) | pct | 9.8 | 22.8 | 83.8 | 83.9 | NA |
| Total Organic Carbon (Laboratory Average) | pct | 0.182 | 1.18 | 8.55 | 7.16 | 4.69 |
| Total Solids | pct | 87.7 | 77.7 | 42.2 | 44.4 | 35.2 |

Notes:
* Field Duplicate
deg F = degree Fahrenheit
J = estimated based on data validation
mg/kg = milligrams per kilogram
NP = non-plastic
pct = percent
SU = standard units
U = not detected
NA = Not analyze



Q:\Jobs\HoltraChem_0000\Maps\Memo\PDI_Sample_Locations_78910.mxd nkochie 2/18/2016 11:04:36 AM

ANCHOR QEA

**Figure 5-1**
Sediment to be Removed – Characterization Samples
Southern Cove, Orrington Remediation Site
February, 2016

# Appendix D

# Water Quality and Fish Monitoring Plan

# WATER QUALITY AND FISH MONITORING PLAN

## Southern Cove

Orrington Remediation Site
Orrington, Maine

*Prepared by:*

Anchor QEA, LLC
9 Water Street, First Floor
Amesbury, MA 01913

Mallinckrodt US LLC

June 2016

# Table of Contents

# List of Figures

# Acronyms

| | |
|---|---|
| BMP | best management practice |
| CMI Plan | *Southern Cove, Orrington Remediation Site, Corrective Measures Implementation Plan* |
| CQA | Construction Quality Assurance |
| DGPS | differential global positioning system |
| ESA | Endangered Species Act |
| Maine DEP | Maine Department of Environmental Protection |
| NMFS | National Marine Fisheries Service |
| WQFMP | Water Quality and Fish Monitoring Plan |

# Section 1. Introduction

This document presents the Water Quality and Fish Monitoring Plan (WQFMP) that will be implemented during the in-water field activities performed as part of the Southern Cove Corrective Measures. The purpose of the WQFMP is to monitor environmental conditions before and during the in-water field activities. The WQFMP was developed to meet requirements associated with permits under the Clean Water Act Section 401 water quality certification and the Endangered Species Act. This document details the water quality monitoring activities and protections that will be implemented during construction. It is part of the *Southern Cove, Orrington Remediation Site, Corrective Measures Implementation Plan* (CMI Plan).

The objective of the corrective measures, as detailed in the CMI Plan, is to remove sediments containing mercury from the Southern Cove to meet media protection standards. In-water dredging and initial backfilling will be completed within a contained area, surrounded by mobile turbidity curtains referred to as “moon pools.” A portion of the sediment removal within the intertidal zone may be accomplished during low tide by excavation rather than dredging in water. Final backfilling with clean materials to restore the grade to pre-construction conditions will be accomplished without use of turbidity curtains, regardless of tidal stage.

The WQFMP is organized as follows:

- *Section 2 – Water Quality Monitoring Program* describes the compliance boundary; monitoring locations, criteria, methods, and frequency; and reporting
- *Section 3 – Fish Monitoring Program* describes methods and reporting requirements
- *Section 4 – Contingency Plan* describes response actions for water quality monitoring and fish monitoring triggers and construction best management practices (BMPs)
- *Section 5 – Monitoring Personnel and Key Contacts* lists roles and responsibilities of key personnel

# Section 2. Water Quality Monitoring Program

Potential water quality impacts related to in-water work in the Southern Cove involve suspension of bottom sediments that could increase turbidity within the water column. Water quality monitoring will be conducted during in-water construction activities, including:

- Equipment setup
- Dredging
- Initial backfill placement

Water quality monitoring will not be conducted during activities that are not considered in-water, such as excavation of sediment from the intertidal areas during low tide.

## 2.1 Compliance Boundary and Monitoring Locations

Two water quality monitoring stations will be located at fixed positions within the Penobscot River approximately 600 feet north and south of the Southern Cove. The specific location of the monitoring stations will be established and presented to the Maine Department of Environmental Protection (Maine DEP) after coordination with the United States Coast Guard.

The Penobscot River in the vicinity of the Southern Cove experiences a change in water levels of up to 16 feet due to tidal fluctuations, and over a tidal cycle, the direction of the flow varies. At any given time, the up-current monitoring location will represent reference conditions, and the down-current monitoring location will serve as the compliance boundary. Due to the tidal influence, the location of the up-current and down-current location will switch. The depth of the monitoring locations will be located where water depths will be sufficient for the monitoring equipment and for a small boat to provide maintenance without disturbing or suspending bottom sediments (e.g., a minimum of 6 feet of water at low tide).

Additional non-compliance monitoring may be performed during construction, at the discretion of the person directing the field effort, to investigate anomalous conditions that may occur during a given day. Such conditions may include concentrations of debris in an area or a turbidity plume not associated with in-water construction activities. The intent is to provide on-site field staff latitude in addressing any concerns about activities or conditions that might be influencing water quality in the vicinity of the dredging activities. Details about the type and frequency of additional manual monitoring and the location and rationale for performing it will be thoroughly documented in the field logbook and any appropriate log sheets.

## 2.2 Reference Values

Initial characterization of ambient turbidity conditions in the vicinity of the Southern Cove will be established based on a reference survey completed prior to the start of in-water work. The primary objective of the reference survey is to provide data to understand baseline turbidity conditions in the project area.

The pre-construction reference survey will consist of at least two sampling events completed in the vicinity of the Southern Cove prior to the start of in-water construction work. Sampling events will be targeted for a maximum flood and maximum ebb tidal flows. Turbidity will be measured at each sampling station at one to three different depths within the water column (surface, middle, and bottom), as allowed by the bathymetry. Each event will target six monitoring stations, including three stations near the Southern Cove and three locations within the Penobscot River channel located upstream, lateral, and downstream of the Southern Cove. Additionally, effort will be made to schedule these events to include storm conditions, which have been known to increase turbidity in tributaries up-gradient from the Southern Cove.

The initial reference value will be established at the 90th percentile concentration of the dataset. Data collected from the up-current construction monitoring station (which will switch depending on the tide) during construction will be added to the dataset as it is collected and the 90th percentile of the dataset re-calculated.

## 2.3 Water Quality Monitoring Criteria

Water quality criteria is established at not-to-exceed 35 nephelometric turbidity units above the reference value at the compliance point. Reference values will be set at the higher of the daily up-current measurement or the updated 90th percentile value, which includes data from pre-construction water quality monitoring and construction monitoring data, as described above. Turbidity exceedances at the compliance boundary will trigger contingency response actions as specified in Section 4.

## 2.4 Monitoring Methods

Monitoring for increased turbidity will be accomplished through both visual monitoring during construction, and collection of turbidity measurements. The preferred method for collecting turbidity measurement data will be from moored buoys equipped with automatic monitoring equipment placed in the river. However, depending on permitting requirements and site conditions, manual collection of turbidity measurements may be required. Both methods are described in the following subsections.

### 2.4.1 Visual Monitoring

Field personnel will perform visual monitoring under the guidance and supervision of the Construction Quality Assurance (CQA) Engineer. Areas of focus will include the visual monitoring of filtered water draining from the sediment transport barge and the area surrounding the moon pool during dredging operations.

Field personnel will be instructed to monitor for visual evidence of increased suspended sediments and turbidity plumes during in-water activities, and to report observations immediately to the CQA Engineer. These responsibilities will be reinforced by the CQA Engineer during the daily field coordination briefings held each morning for field personnel working that day.

### 2.4.2 Manual Turbidity Monitoring Methods

Prior to manually collecting monitoring data, tide charts will be reviewed to determine flow direction in the river, and the down-current location will be identified as the compliance monitoring point. During periods of ebb and slack, the down-current location will be the compliance point. The compliance point will shift to the up-current position during flood periods.

Monitoring equipment will be calibrated prior to its use following manufacturers' instructions. The turbidity meter will be calibrated using calibration standards (preferably the standard whose value is closest to the river turbidity during that day) at the beginning and end of each day of monitoring. In addition, standards may be measured to check the calibration throughout the day, especially if higher or lower than expected turbidity values occur. Calibration information will be recorded in the field notebook. Equipment that does not properly calibrate will not be used.

Instruments and equipment will be tested and inspected before each monitoring event. Any field equipment that is faulty or not functioning properly will not be used for monitoring.

Water quality monitoring measurements will be collected from a self-propelled vessel, and monitoring stations will be located using a differential global positioning system (DGPS).

Turbidity will be measured using a calibrated field probe deployed at the midpoint of the water column, with the depth to be determined depending on tidal elevations. After collecting the turbidity measurements, the depth to bottom will be measured using a weighted line. The water quality monitoring data (e.g., station coordinates, date, time, visual flow observations, tidal stage, turbidity reading, water depth, and other observations) will be recorded on water quality monitoring forms.

### 2.4.3 Automatic Water Quality Monitoring Buoys

Moored water quality monitoring buoys may be used for compliance point monitoring instead of manual monitoring, **Figure 1** shows an example of a moored monitoring station. Data collection equipment would be operated in accordance with the manufacturers' specification and quality control procedures. The feasibility of using this monitoring method will be dependent on further evaluation of field conditions and vessel traffic at the monitoring locations, permit requirements, and the ability to anchor the equipment given the high water flow and tidal fluctuations.

**Figure 1: Example of a Deployed Water Quality Monitoring Buoy**

## 2.5 Monitoring Frequency and Schedule

In-water dredging will occur primarily during high tide events, which results in an approximate 5-hour work window in shallow areas of the Southern Cove during each tidal cycle. For manual, boat-based compliance monitoring, the data collection frequency and schedule during active dredging will occur at three different levels, as described below:

- *Intensive* –Turbidity measurements will be collected every 1 hours during dredging, with at least two measurements per day, for the first 3 days.
- *Routine* – If no confirmed exceedances occur during the Intensive monitoring period, collection of turbidity measurements will occur once daily during dredging for 3 additional days. Routine monitoring will also be implemented if dredging turbidity plumes become visually evident within the Southern Cove outside of the moon pool.
- *Limited* – If no confirmed exceedances occur during the Routine monitoring period, collection of turbidity measurements will occur once per week during dredging.

The occurrence of confirmed exceedances, visual turbidity observations at the point of compliance, or a significant change in construction equipment or operations will trigger a transition back to Intensive monitoring.

Monitoring during backfill placement will occur at the same frequency as monitoring performed during dredging; however, visual plumes of turbidity within and immediately adjacent to the Southern Cove will not trigger more intensive monitoring. Exceedances at the point of compliance would trigger BMPs and more intensive monitoring during backfill placement.

## 2.6 Reporting and Data Submittals

For the hand collection of data, measurements will be recorded in the field on the water quality monitoring forms. If used, automatic data monitoring buoys will report data directly into a database.

Regardless of the data collection technique, data will be reported to Maine DEP in the following communications and submittals:

- *Daily Reporting* – Any exceedances of the turbidity criteria at the compliance point will be reported by email to Maine DEP.
- *Weekly Reporting* – Monitoring data will be compiled into a summary table with a comparison to criteria values and provided to Maine DEP on a weekly basis.
- *Final Reporting* – Once all construction is complete, results for the entire construction period will be compiled and reported to Maine DEP.

# Section 3. Fish Monitoring Program

The objective of the fish monitoring program is to minimize the potential for adverse impacts to fish during in-water construction activities in the Southern Cove, consistent with the requirements outlined in the Biological Opinion issued by National Marine Fisheries Service (NMFS) and other permits. The Endangered Species Act (ESA)-listed fish species that could be present in the Southern Cove during the construction period are the shortnose sturgeon, Atlantic sturgeon, and Atlantic salmon. Both sturgeon species are bottom feeders that may enter the Southern Cove to feed. The Atlantic salmon typically occupy the mid to upper water column, and may enter the Southern Cove during river migration.

The following elements have been integrated into the CMI Plan to minimize the potential for affecting fish:

- Use of mobile moon pools that include turbidity curtains surrounding the active dredge areas
- Use of an underwater sonar camera, comparable to the Sound Metrics *Didson* or *Aris* models, to check for the presence of ESA-listed species, and removal of any identified fish prior to dredging

In-water dredging and initial placement of backfill will be completed within contained, mobile curtains referred to as moon pools. Final backfilling with clean material and restoration of sediment bottom elevations will be completed without the use of turbidity curtains. A portion of the sediment removal within the intertidal zone will be accomplished in the dry during low tide conditions, and fish exclusion will not be required during these activities.

## 3.1 Reporting Requirements

If a sick, injured, or dead specimen of a threatened or endangered species is found, the CQA Engineer, or designee, must notify NMFS Law Enforcement. The finder must take care when handling sick or injured specimens to ensure effective treatment, and when handling dead specimens to preserve biological material in the best possible condition for later analysis of cause of death. The finder also has the responsibility to carry out instructions provided by NMFS Law Enforcement to ensure that evidence intrinsic to the specimen is not disturbed unnecessarily.

# Section 4. Contingency Plan

The primary purpose of water quality and fish monitoring during construction is to determine when adverse impacts may be occurring so that additional contingency actions can be implemented, if necessary, as described in this section. As described in Sections 2.6 and 3.1, for the water quality and fish monitoring programs respectively, immediate notification of the CQA Engineer by field personnel of field observations and measurements that exceed triggers is critical so that contingencies can be implemented in a timely manner.

## 4.1 Contingency Response Actions

The following sections describe the responses to triggers for turbidity and fish monitoring.

### 4.1.1 Visual Monitoring Observations Response Actions

If visual monitoring indicates a turbidity plume outside the moon pool work area, field personnel will notify the CQA Engineer, who will oversee implementation of the following contingency actions:

- Determine if the turbidity plume is attributed to the construction activity or other activities occurring within the river (e.g., wind waves, boat wakes).
- Determine if the turbidity plume is of sufficient extent and sufficient duration (i.e., 1 hour or more of visual observations) to trigger a response action.
- If the turbidity plume is attributed to the construction activity, and is of sufficient extent and duration:
  - Collect turbidity monitoring measurements to determine if there is an exceedance of criteria at the compliance point. Re-check turbidity measurements at the compliance point within 30 minutes of the initial reading to confirm.
  - Implement BMPs described in Section 4.2.

### 4.1.2 Exceedance of Turbidity Criteria Response Actions

If turbidity criteria are exceeded at the compliance point during construction activities, the CQA Engineer will oversee the following actions:

- Determine if exceedance is attributed to the construction activity or other activities occurring within the river (e.g., wind waves, boat wakes, barge/ship traffic).
- Immediately re-take measurements at the compliance point.
- Verify that the turbidity meter is functioning correctly and that exceedances are not the result of other instrument interferences. As necessary, collect a water sample to verify that the relationship between TSS and turbidity NTU is approximately 1:1.
- Confirm that BMPs are being implemented for work activities.
- Retake measurements within 30 minutes of initial reading to re-confirm the exceedance.
- If the exceedance is confirmed, inform Maine DEP of the exceedance, confirm that standard BMPs are being implemented, and identify the plan for implementing additional BMPs as appropriate. BMPs for specific construction activities are described in Section 4.2.
- Monitoring will revert to an Intensive schedule (Section 2.5).

### 4.1.3 Fish Monitoring Response Actions

If shortnose sturgeon, Atlantic sturgeon, or Atlantic salmon are identified within the moon pool:

- Stop work
- If the fish appears sick, injured or dead, see Section 3.1 for reporting and fish handling requirements.
- Remove the moon pool curtain to allow the fish to exit the area
- Confirm the fish is no longer in the area using the underwater camera
- Redeploy the moon pool curtain
- Check the enclosed moon pool area using the underwater camera

In-water work may resume once visual observations indicate that the shortnose sturgeon, Atlantic sturgeon, or Atlantic salmon have left the work area. The CQA Engineer, or designee, will be responsible for recording the observations and response actions related to these occurrences.

## 4.2 Construction Best Management Practices

The Contractor shall implement the BMPs discussed in Sections 4.2.1 and 4.2.2 during in-water construction operations to minimize impacts to water quality and fish from work activities.

In general, field personnel will be reminded daily during the morning site meeting of responsibilities of personnel to perform visual monitoring for turbidity impacts and fish presence, and of the importance of immediately reporting any observations to the CQA Engineer. Pictures of shortnose sturgeon, Atlantic sturgeon, and Atlantic salmon will be readily accessible in the work area at the Southern Cove, and field personnel will be briefed on the behavior of each species.

Field personnel will also be briefed by the CQA Engineer, on a weekly basis at the morning site meetings, of the importance of implementing the BMPs listed here.

### 4.2.1 Dredging

The following BMPs and conservation measures will be implemented, to the maximum extent practicable, to avoid and/or minimize environmental impacts during dredging:

- Work will occur within a turbidity control system.
- The Contractor shall begin dredging at the highest elevation of material to be removed and work toward the lowest elevation. “Glory holing” will not be allowed.
- No bottom stockpiling or multiple bites of the clamshell bucket is allowed.
- Dredge buckets and barges shall not be overfilled.
- Overdredging at the base of a slope shall not occur.
- No riverbed leveling is allowed.
- Depending on the results of the water quality monitoring program, enhanced BMPs may also be implemented to further minimize turbidity. Enhanced BMPs may include the following:
  - Slowing the velocity (i.e., cycle time) of the ascending loaded clamshell bucket through the water column
  - Preventing water from draining from the bucket at the water surface
  - Pausing the dredge bucket near the bottom while descending and near the water line while ascending to minimize disturbance of bottom sediments from pressure waves

### 4.2.2 Sand Backfill Placement

The following BMPs and conservation measures will be implemented, to the maximum extent practicable, to avoid and/or minimize environmental impacts during sand backfill placement:

- The backfill will be specified to have limited fines content to minimize the turbidity generated during backfill placement.
- The Contractor will not be permitted to place backfill in an uncontrolled manner (e.g., dumping sand from above the water surface). Uncontrolled backfilling could disturb the native sediment surface and cause resuspension of surficial sediments.
- The Contractor will be required to place backfill from downslope to upslope to minimize the potential for upslope materials to slough and resuspend native sediments.

# Section 5. Monitoring Roles and Responsibilities

The CQA Engineer will oversee the monitoring programs, implementation of contingency measures, and reporting. Specifically, the CQA Engineer will be responsible for:

- Oversight of water quality and fish monitoring field activities
- Verification that results are properly recorded and forms are completed
- Verification that appropriate calibration and quality control and assurance procedures are conducted
- Notification to Maine DEP or NMFS in the event that criteria are exceeded
- Reporting requirements

The Remediation Contractor and all field personnel are responsible for implementation of best management practices and visual monitoring for the presence of ESA fish species and indications of elevated turbidity in the work area.

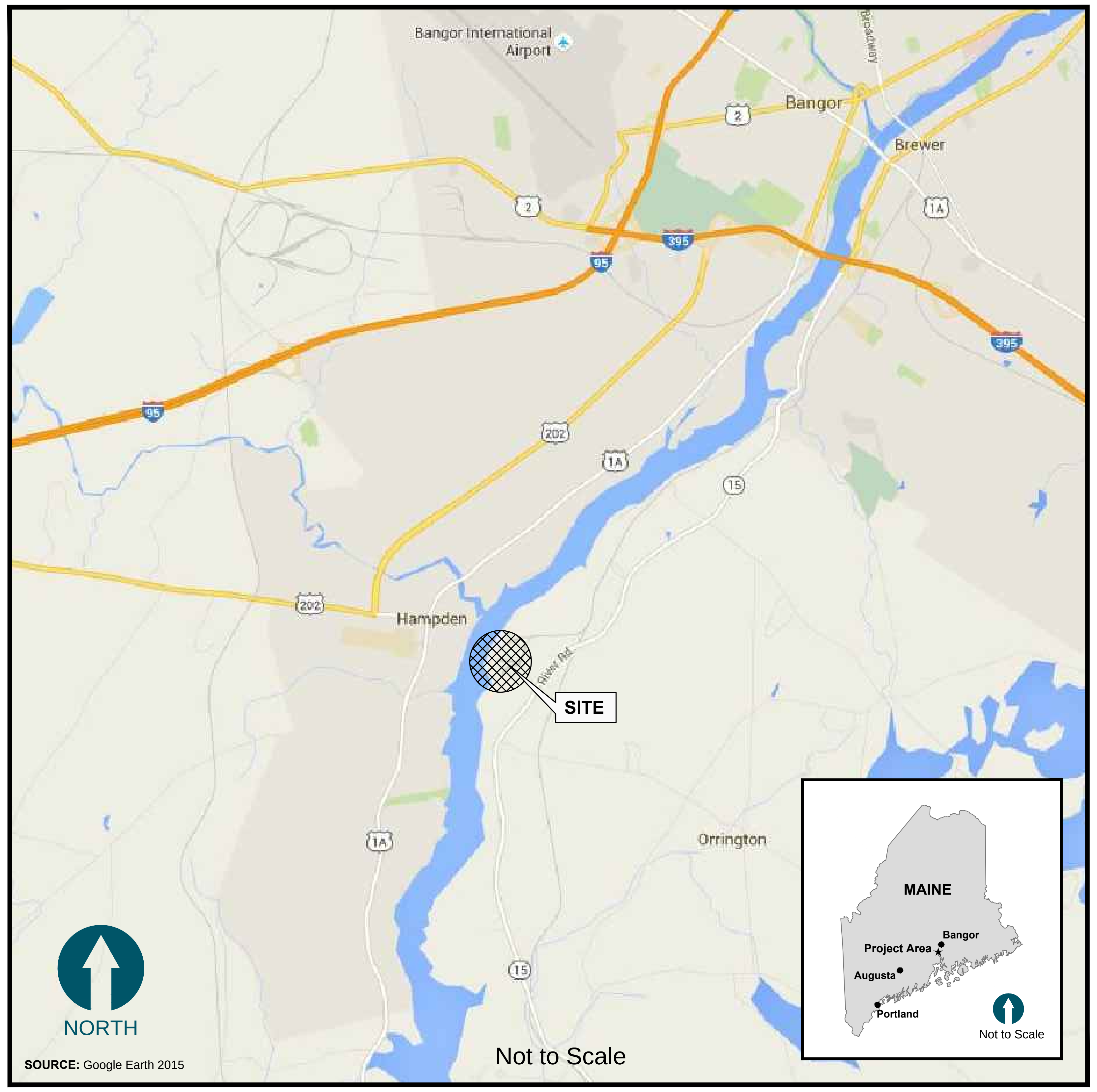
# Appendix E

# Drawings

# SOUTHERN COVE CORRECTIVE MEASURES IMPLEMENTATION PLAN, ORRINGTON REMEDIATION SITE

# ORRINGTON, MAINE

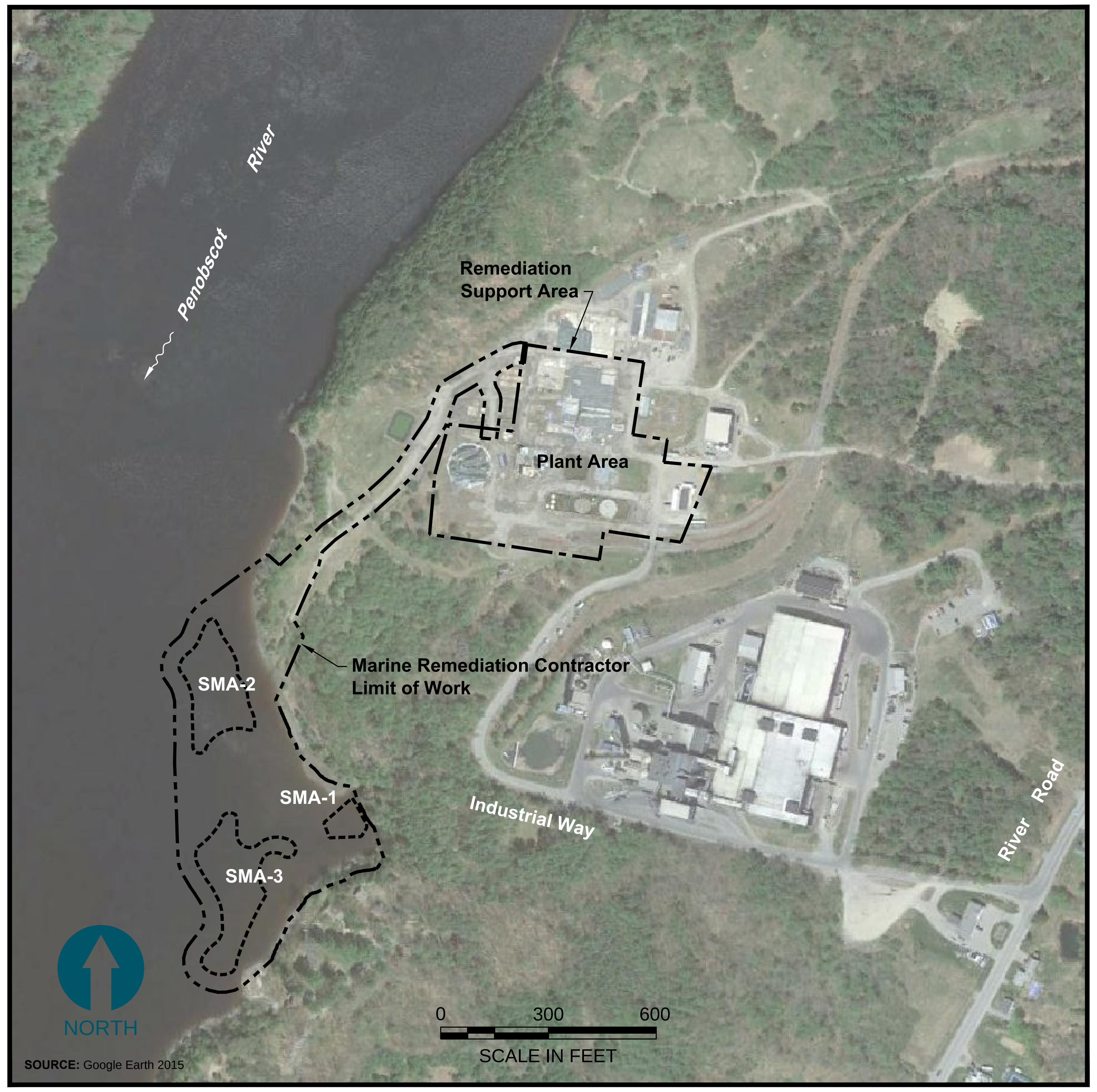
## VICINITY MAP



**SOURCE:** Google Earth 2015

Not to Scale

## LOCATION MAP



**SOURCE:** Google Earth 2015

## DRAWING INDEX

| SHEET NO. | SHEET ID | SHEET TITLE |
|---|---|---|
| 1. | G-1 | COVER SHEET |
| 2. | G-2 | GENERAL NOTES, LEGEND, AND ABBREVIATIONS |
| 3. | G-3 | SITE LAYOUT |
| 4. | G-4 | OVERVIEW OF WORK |
| 5. | G-5 | EXISTING CONDITIONS PLAN - SOUTHERN COVE REMEDIATION AREA |
| 6. | G-6 | SOUTHERN COVE STAGING AND ACCESS |
| 7. | G-7 | UPLAND SITE STAGING AND ACCESS |
| 8. | C-1 | EROSION AND ENVIRONMENTAL CONTROLS PLAN |
| 9. | C-2 | EROSION AND ENVIRONMENTAL CONTROL DETAILS (1 OF 2) |
| 10. | C-3 | EROSION AND ENVIRONMENTAL CONTROL DETAILS (2 OF 2) |
| 11. | C-4 | DREDGE / EXCAVATION PLAN |
| 12. | C-5 | DREDGE / EXCAVATION CROSS SECTIONS A-A' AND B-B' |
| 13. | C-6 | DREDGE / EXCAVATION CROSS SECTIONS C-C' AND D-D' |
| 14. | C-7 | DREDGE / EXCAVATION CROSS SECTIONS E-E' AND F-F' |
| 15. | C-8 | DREDGE / EXCAVATION CROSS SECTIONS G-G' AND H-H' |
| 16. | C-9 | BARGE OFFLOADING TEMPORARY CONSTRUCTION AND DETAILS |
| 17. | C-10 | BACKFILL PLAN AND RESTORATION PLAN |
| 18. | C-11 | BACKFILL PLAN AND RESTORATION CROSS SECTIONS A-A' AND B-B' |
| 19. | C-12 | BACKFILL PLAN AND RESTORATION CROSS SECTIONS C-C' AND D-D' |

ANCHOR QEA

**DRAFT DESIGN SUBMITTAL**
**NOT FOR CONSTRUCTION**
**08 APRIL 2016**

**PRELIMINARY**

REVISIONS

| REV | DATE | BY | APP'D | DESCRIPTION |
|---|---|---|---|---|
| 0 | 8 APRIL 2016 | RG | PL | ISSUED FOR RPM REVIEW |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

DESIGNED BY: R. PICKERING
DRAWN BY: P. SCIABA
CHECKED BY: R. GARDNER
APPROVED BY: P. LaROSA
SCALE: AS SHOWN
DATE: 8 APRIL 2016

**SOUTHERN COVE CORRECTIVE MEASURES**
**IMPLEMENTATION PLAN, ORRINGTON REMEDIATION SITE**
**ORRINGTON, MAINE**

COVER SHEET

G-1

SHEET NO. 1 OF 19

Apr 21, 2016 4:04pm psciaba A:\CAD - Boston\PROJECTS\0617 - Penobscot River - Orrington Maine\CONSTRUCTION PLANS\0617 - PL-G-1 - COVER-SHEET.dwg G-1

## GENERAL NOTES

1. The site is located at 99 Industrial Way, Orrington Maine 04474.
2. Any on-site personnel has the authority to stop work activities if questionable or unsafe practices or conditions are observed. Remediation Contractor shall take precautions to address the practices or conditions to the satisfaction of Owner's Representative prior to restarting work. Failure to stop work will not be tolerated and may result in personnel being banned from the Site and replaced by Remediation Contractor or termination of Remediation Contractor entirely at no additional cost to Owner.
3. The following datums have been utilized in the development of the information presented in the Drawings: (a). Horizontal Datum: Maine State Plane East Zone, North American Datum of 1983 (NAD83), U.S. Survey Feet. (b). Vertical Datum: North American Vertical Datum of 1988 (NAVD88), U.S. Survey Feet.
4. Existing topography and site features are based on a survey conducted by the James W. Sewall Company in 2003 and provided in CDM Smith drawing "38410c_master-survey.dwg". Bathymetry based on multibeam survey conducted by Aqua Survey, Inc. between June 29 and 30, 2015 and provided in file entitled: "BathyContoursNAVD88Revised.dxf".
5. Historical investigation locations are approximate and have been obtained from various historical documents.
6. 2014 pre-design investigation locations obtained by CES, Inc. of Bangor Maine between the dates of November 12, 2014 and January 21, 2015.
7. Wetland delineation and classification obtained from CDM Smith drawing "38410_wetland_classifications.dwg" provided on 2015.03.17. Wetland flagged locations obtained by CES, Inc of Bangor Maine between the dates of November 12, 2014 and January 21, 2015.
8. Normal site hours are from 07:00 am to 05:00 pm Monday through Friday. Approval from the remediation project manager is required for construction beyond the normal operating hours.
9. Remediation Contractor shall perform all work within the designated Limits of Work shown on the Drawings, unless otherwise approved.
10. Refer to individual sheets for Drawing-specific notes.
11. Aerial photograph shown on the Drawings was provided by Google Earth 2015, Esri, DigitalGlobe, Geoeye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP swisstopo, and the GIS User Community.
12. All basemap information can only be considered as indicating the conditions existing at the time of the surveys. Use of this information by Contractors or others shall be at the sole risk of Remediation Contractor.
13. Remediation Contractor shall field verify the existing conditions within the Limits of Work and determine the appropriate quantities and required materials to complete the Work in accordance with the Drawings and Specifications.
14. Cross sections and details are shown for illustrative purposes only and are provided only to illustrate the intent of the design. Actual site conditions may vary from the information shown on the cross sections and shall be verified by Remediation Contractor.
15. Locations of utilities shown are considered approximate and shall be verified by Remediation Contractor. Not all utilities may be shown. Remediation Contractor shall verify the presence of utilities both underground and overhead, including Penobscot River crossings.

## SITE PREPARATION

16. The Remediation Contractor shall verify the type and location of all utilities within the Limits of Work prior to the start of work, establish survey control, and verify existing conditions shown on the plans are accurate. Contact Digsafe (811 or 1-888-340-7233) to locate existing utilities prior to any intrusive work. Utility locations shown on the plans are approximate and the Remediation Contractor is responsible for locating utilities.
17. Erect erosion and sediment controls around upland portion of the Limit of Work.
18. Construct access roads as needed to access Sediment Management Area (SMA) removal areas. The Remediation Contractor will be responsible for maintaining access roads throughout construction.
19. Perform clearing and grubbing activities where necessary within the Limit of Work. Remediation Contractor shall only grub areas necessary for the work, and immediately prior to the work commencing in the area to be grubbed.
20. Establish and maintain appropriate support, contamination reduction and exclusion zones in accordance with the Remediation Contractor's health and safety plan.
21. Establish temporary stormwater runoff and runon control measures for the excavation area, including the temporary stormwater basin.
22. All contact stormwater and/or groundwater from within the Nearshore Support Area collected and stored temporarily. The RPM will transport, treat, and dispose of collected water.

## DREDGING AND EXCAVATION

23. Dredging shall be conducted in accordance with all applicable permits, Specification Section 35 02 23 - Dredging and Excavation and all other Contract Documents.
24. Dredging shall be conducted to within a safe distance (distance to be jointly field verified by the RPM and the Remediation Contractor) from each known or reported utility and existing structure. Dredging footprints depicted on these drawings may be revised during construction based on field verification of utility location and depth, constructability, and discussions with the RPM.
25. Dredging shall be conducted in accordance with all required permits and in a manner that does not result in exceedances of project water quality standards as provided in the Specifications and permits provided as an appendix to the Specifications. If water quality standards are exceeded, the Remediation Contractor will be notified and shall immediately implement measures to mitigate the water quality impacts, potentially including stopping work if directed by the RPM.
26. Depicted dredge depths represent the design dredge cut lines and include side slopes between dredge units and side slopes up to the daylight limits. All engineered dredge slopes should be considered as 3 horizontal to 1 vertical unless noted otherwise. Contours depicting overdredge tolerances are not depicted in plan view. Overdredge tolerances are presented in the Specification Section 35 02 23 - Dredging and Excavation and are shown for illustrative purposes on the Drawings.

## BACKFILLING NOTES

27. Placement of backfill material shall be conducted in accordance with all required permits, Specification Section 35 20 26 - Backfill and Material Placement, and all other Contract Documents.
28. Marine backfilling shall be conducted to within a safe distance (distance to be jointly field verified by the Remediation Project Manager, RPM, and the Remediation Contractor) from each known or reported utility and existing structure. Backfill limits depicted on these Drawings may be revised during construction based on field verification of utility location and depth, constructability, and discussions with the RPM.
29. Backfilling shall be conducted in accordance with all required permits and in a manner that does not result in exceedances of project water quality standards as provided in the Specifications and permits provided as an appendix to the Specifications. If water quality standards are exceeded, the Remediation Contractor will be notified and shall immediately implement measures to mitigate the water quality impacts, potentially including stopping work if directed by the RPM.
30. Backfill, where noted, shall return the dredge footprint to existing grade.
31. Overplacement tolerances for backfill placement are presented in Specification Section 35 20 26 - Backfill and Material placement.
32. The first layer of backfill shall be placed with care so as to minimize disturbance of the underlying material.
33. The Remediation Contractor is responsible for selecting the appropriate anchoring means and methods of water-based equipment to limit resuspension of existing sediment and to minimize or prevent, to the extent possible, damage to placed backfill.
34. Backfilled areas shall not be disturbed by barge transport or anchoring after areas have been approved by the RPM.

## SITE RESTORATION

35. The staging areas shall be restored by grading to promote positive stormwater flow towards the North and West, placement of a minimum of 6-inches of topsoil, seeding and erosion control fabric.
36. Staging and truck turning area, access roadways and temporary stormwater basin and controls installed by the Remediation Contractor all shall be removed at the completion of work.
37. Install plantings shown on the drawings. If plantings cannot be installed prior to November 01, then delay installation until the spring at a time directed by the RPM..

## SOIL EROSION AND SEDIMENT CONTROL NOTES

38. All work shall be done in accordance with the Maine erosion and sediment control best management practices.
39. All soil erosion and sediment control practices shall be installed prior to any major soil disturbances, or in their proper sequence and maintained until permanent protection is established.
40. A sub-base course shall be applied immediately following rough grading of travel areas and installation of improvements in order to stabilize access roadways.
41. Any changes to the erosion and sediment control plan will require the submission of revised erosion and sediment control plans to the RPM.
42. Remediation Contractor is responsible for keeping all adjacent roads clean from sediment track-out during life of the Project.
43. The Remediation Contractor shall be responsible for remediating any erosion or sediment problems that arise as a result of ongoing construction at the request of the RPM.

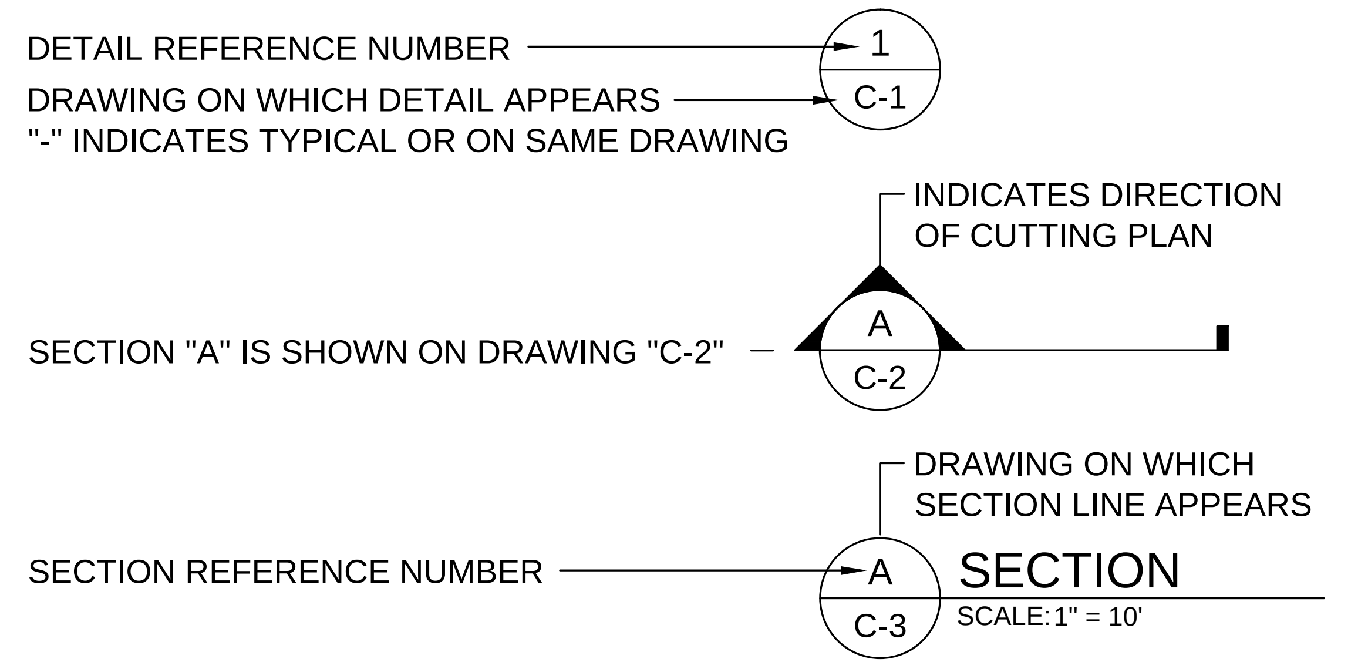
## CONSTRUCTION SEQUENCING

44. The sequence of the Work will be in accordance with the construction schedule submitted by the Remediation Contractor and approved by the RPM. The construction schedule shall be based on the requirements of the Contract Documents, including sequencing requirements in the Specifications and Drawings, and on the MEDEP-approved Workplans. The Remediation Contractor shall notify the RPM and submit an updated project schedule with any modifications to the sequence of Work for approval prior to performing the Work.
45. The Remediation Contractor shall perform Work in a manner that will allow the Site and adjacent property owners to maintain normal activities on their sites. The Remediation Contractor must ensure that neighboring operations or activities are not disturbed, interrupted, or prohibited as a result of Work.
46. Work sequencing shall be conducted in a manner that prevents contamination or recontamination of areas not contaminated or already decontaminated, and in accordance with the Contract Documents. Any contamination or recontamination of materials that occurs as a result of the Remediation Contractor's activities shall be restored by the Remediation Contractor at no additional cost to the Owner.
47. Work sequencing shall be conducted in a manner to coordinate staging, dewatering, and loading of materials to be delivered to RPM for transport and disposal/recycling off the Site.
48. The sequence of Work shall include the completion of the dredging and dewatering, backfill placement, followed by site restoration work.

## ORDER OF PRESEDENCE

49. In the event of a discrepancy among the Contract Documents, the matter shall be promptly submitted to the RPM, who shall promptly make a determination in writing. Any Work performed by the Remediation Contractor impacted by the discrepancy is at the Remediation Contractor's own risk and expense.
50. In the event of a conflict between the Contract Documents and applicable laws, codes, ordinances, regulations, permits, or orders of governmental authorities having jurisdiction over the Work or any portion thereof; or in the event of any conflict between such applicable laws, codes, ordinances, regulations, or orders; the most stringent requirements of any of the above shall govern and be considered as a part of this Contract in order to afford the Owner the maximum benefits thereof.

## DETAIL AND SECTION REFERENCING



## GENERAL LEGEND

| | |
|---|---|
| —∘—∘— | FENCE LINE |
| ╪╪╪╪╪ | RAILROAD |
| SD-SC-15 ● | SEDIMENT SAMPLE LOCATION |
| ▬ ▬ ▬ ▬ | APPROXIMATE EXTENT OF LANDFILL |
| ⌀ | UTILITY POLE LOCATION |
| ◎ | INDUSTRIAL SEWER MANHOLE |
| — — — — | INDUSTRIAL SEWER PIPE |
| - - - - - - | UNDERGROUND DRAIN PIPE |
| -----100-----<br>-----111----- | EXISTING CONTOURS (FEET NAVD88)<br>(1-FOOT INTERVAL) |
| —MHHW— | MEAN HIGHER HIGH WATER (7.13' NAVD88) |
| —MHW— | MEAN HIGH WATER (6.62' NAVD88) |
| —MSL— | MEAN SEA LEVEL (0.20' NAVD88) |
| —MLW— | MEAN LOW WATER (-6.21' NAVD88) |
| —MLLW— | MEAN LOWER LOW WATER (-6.55' NAVD88) |
| —WL— | WETLAND BOUNDARY |
| —TS— | SPARSE THREE-SQUARE SEDGE |
| —MS— | HIGH MARSH/SEDGE BED |
| —HS— | DENSE HARDSTEM BULRUSH |
| — - - — | PROPERTY LINE |
| —ISP— | INDUSTRIAL SEWER PIPE (APPROXIMATE) |
| ▨ | RIP RAP CHANNEL AND APRON |
| ▒ | EXISTING ACCESS ROAD |
| —SF— | SILT FENCE |
| —SSF— | SUPER SILT FENCE |
| ▬▬▬ | EXTENT OF EXCAVATION BOUNDARY |
| — · · — · · — | LANDFILL RIDGE AREA LIMIT OF WORK (BY OTHERS - LANDFILL REMEDIATION CONTRACTOR) |
| — - - — | MARINE REMEDIATION CONTRACTOR LIMIT OF WORK |
| — - — - — | REMEDIATION SUPPORT AREA |
| ▒ | POTENTIAL BARGE OFFLOADING AREA |
| ▩ | 0.8 FOOT DREDGE CUT BELOW EXISTING BATHYMETRY |
| ▨ | 1 FOOT DREDGE CUT BELOW EXISTING BATHYMETRY |
| ▦ | 3 FOOT DREDGE CUT BELOW EXISTING BATHYMETRY |
| ▤ | 3.5 FOOT DREDGE CUT BELOW EXISTING BATHYMETRY |
| ▨ | NEARSHORE INTERTIDAL ACCESS |
| ▩ | EXCAVATION AND IMMEDIATE BACKFILL WITHIN OUTFALL OFFSET |
| ⁘ | APPROXIMATE NEARSHORE SUPPORT AREA |
| ▨ | TEMPORARY SOIL STOCKPILE AREA NO. 1 |
| ▧ | TEMPORARY SOIL STOCKPILE AREA NO. 2 |

ANCHOR QEA

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**NOT FOR CONSTRUCTION**
**08 APRIL 2016**

**PRELIMINARY**

REVISIONS

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| 0 | 8 APRIL 2016 | RG | PL | ISSUED FOR RPM REVIEW |
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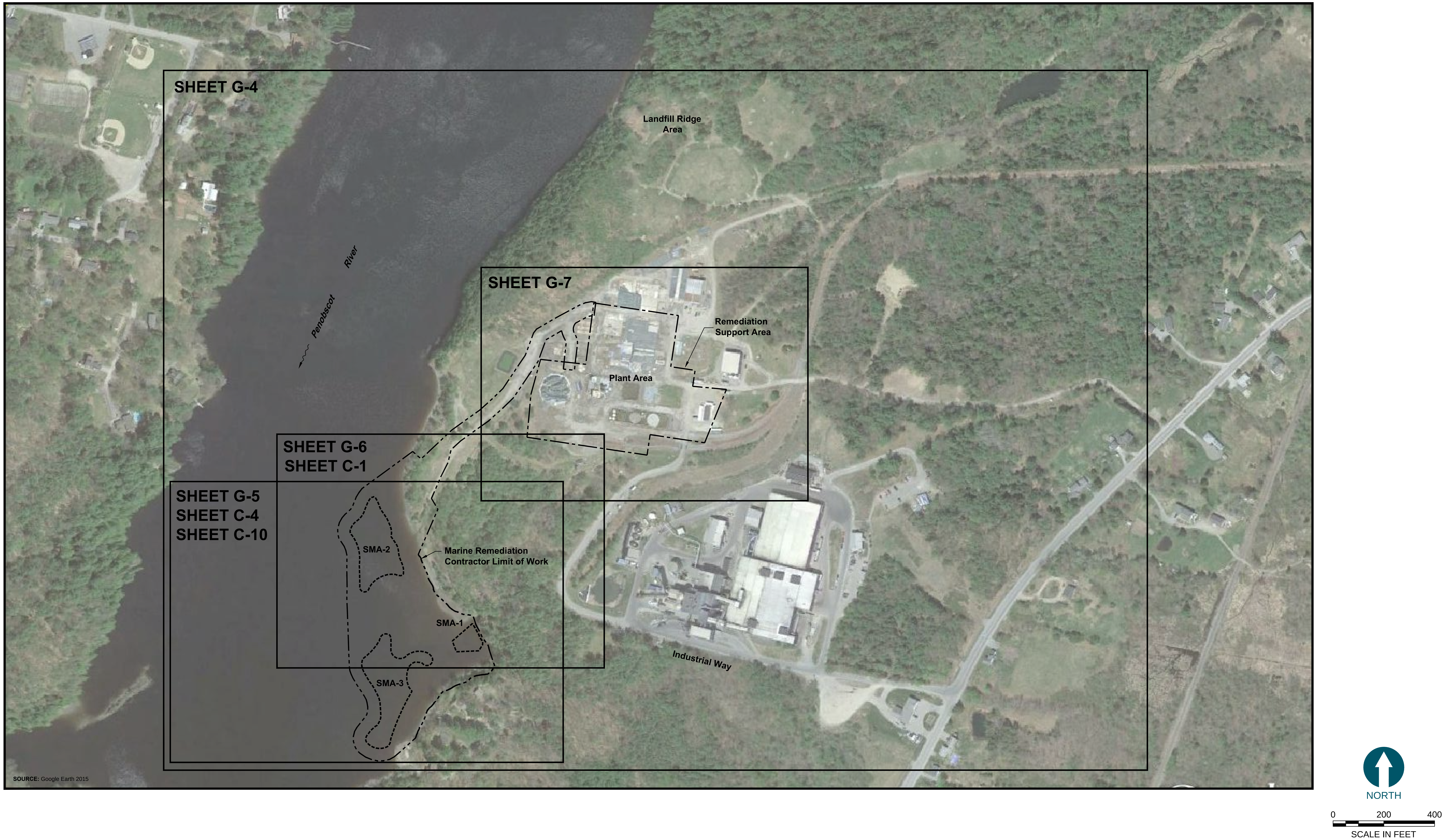
DESIGNED BY: R. PICKERING
DRAWN BY: P. SCIABA
CHECKED BY: R. GARDNER
APPROVED BY: P. LaROSA
SCALE: AS SHOWN
DATE: 8 APRIL 2016

**SOUTHERN COVE CORRECTIVE MEASURES**
**IMPLEMENTATION PLAN, ORRINGTON REMEDIATION SITE**
**ORRINGTON, MAINE**

GENERAL NOTES, LEGEND,
AND ABBREVIATIONS

G-2

SHEET NO. 2 OF 19



**SOURCE:** Google Earth 2015

Apr 21, 2016 4:07pm psciaba A:\CAD - Boston\PROJECTS\0617 - Penobscot River - Orrington Maine\CONSTRUCTION PLANS\0617 - PL-G-3 - SITE-LAYOUT.dwg G-3

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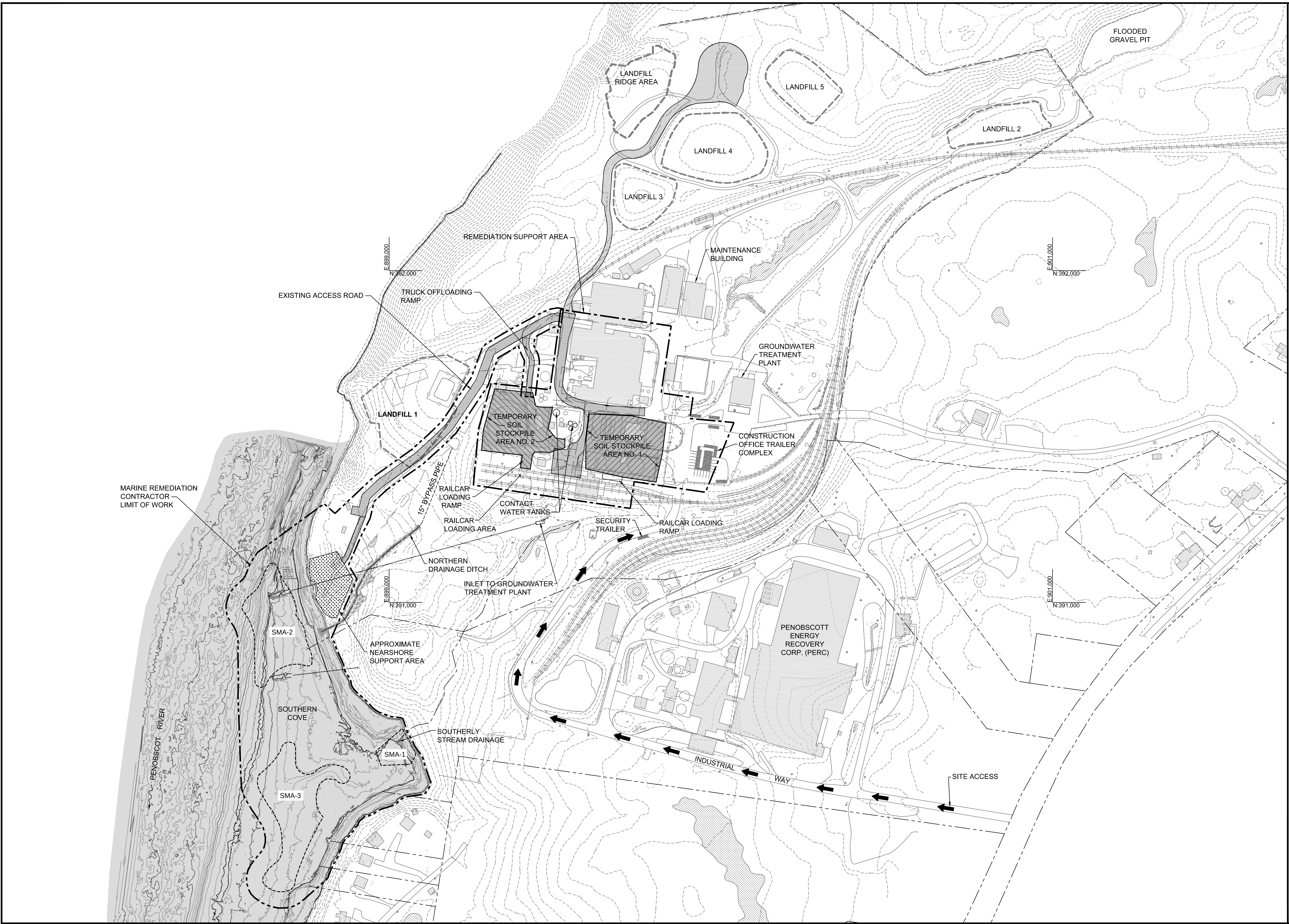
DESIGNED BY: R. PICKERING
DRAWN BY: P. SCIABA
CHECKED BY: R. GARDNER
APPROVED BY: P. LaROSA
SCALE: AS SHOWN
DATE: 8 APRIL 2016

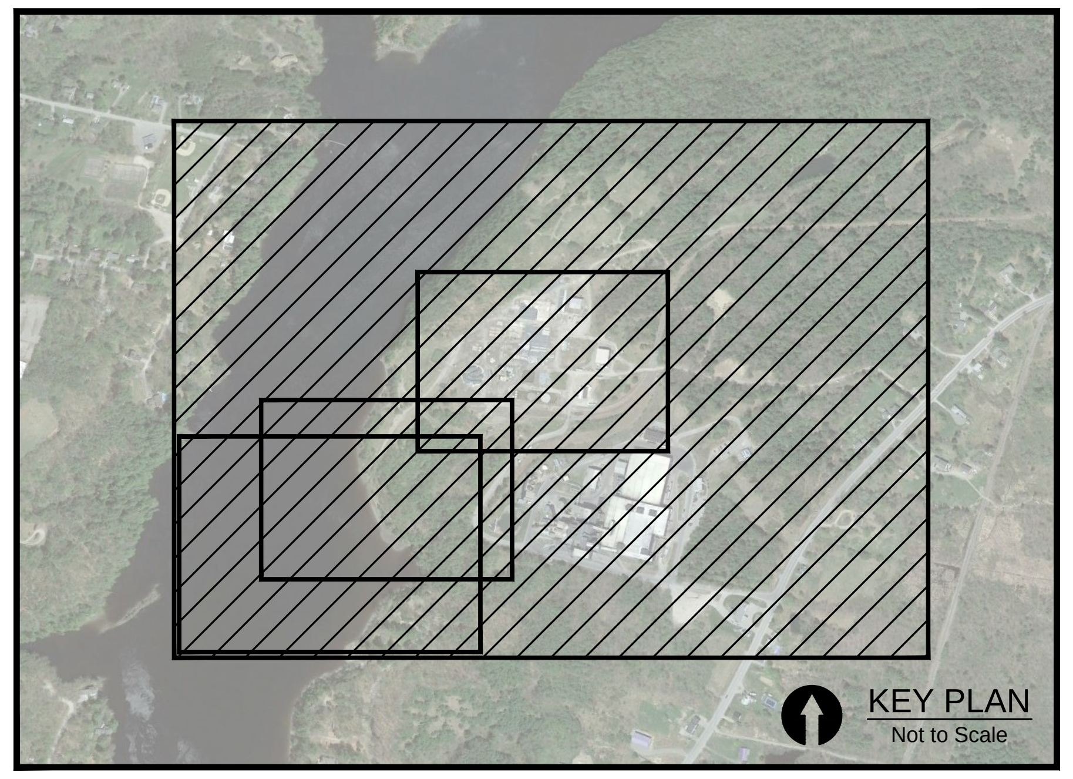
# SOUTHERN COVE CORRECTIVE MEASURES IMPLEMENTATION PLAN, ORRINGTON REMEDIATION SITE
## ORRINGTON, MAINE

## SITE LAYOUT

G-3

SHEET NO. 3 OF 19




KEY PLAN
Not to Scale

**LEGEND:**

| | |
|---|---|
| - - -100- - - <br> - - -111- - - | EXISTING CONTOURS (FEET NAVD88) (1-FOOT INTERVAL) |
| —MHHW— | MEAN HIGHER HIGH WATER (7.13' NAVD88) |
| —MHW— | MEAN HIGH WATER (6.62' NAVD88) |
| —MSL— | MEAN SEA LEVEL (0.20' NAVD88) |
| —MLW— | MEAN LOW WATER (-6.21' NAVD88) |
| —MLLW— | MEAN LOWER LOW WATER (-6.55' NAVD88) |
| — – – — | PROPERTY LINE |
| — - - — | MARINE REMEDIATION CONTRACTOR LIMIT OF WORK |
| — - — - | REMEDIATION SUPPORT AREA |
| ▒ | EXISTING ACCESS ROAD |
| + + + | APPROXIMATE NEARSHORE SUPPORT AREA |
| ▨ | TEMPORARY SOIL STOCKPILE AREA NO. 1 |
| ▧ | TEMPORARY SOIL STOCKPILE AREA NO. 2 |

**HORIZONTAL DATUM:** MAINE STATE PLANE EAST ZONE, NORTH AMERICAN DATUM OF 1983 (NAD83), U.S. SURVEY FEET.

**VERTICAL DATUM:** NORTH AMERICAN VERTICAL DATUM 1988, (NAVD88), U.S. SURVEY FEET.

**NOTES:**

1. SEE SHEET G-1 FOR GENERAL NOTES AND LEGEND.
2. CURRENT SITE STRUCTURES INCLUDE MAINTENANCE BUILDING, GROUNDWATER TREATMENT PLANT, AND CONSTRUCTION TRAILERS AND FACILITIES SHOWN ON SHEET G-7. ALL OTHER BUILDINGS HAVE BEEN DEMOLISHED, HOWEVER FOUNDATIONS REMAIN IN-PLACE.

NORTH

0 150 300
SCALE IN FEET

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Apr 21, 2016 4:11pm psciaba

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**08 APRIL 2016**

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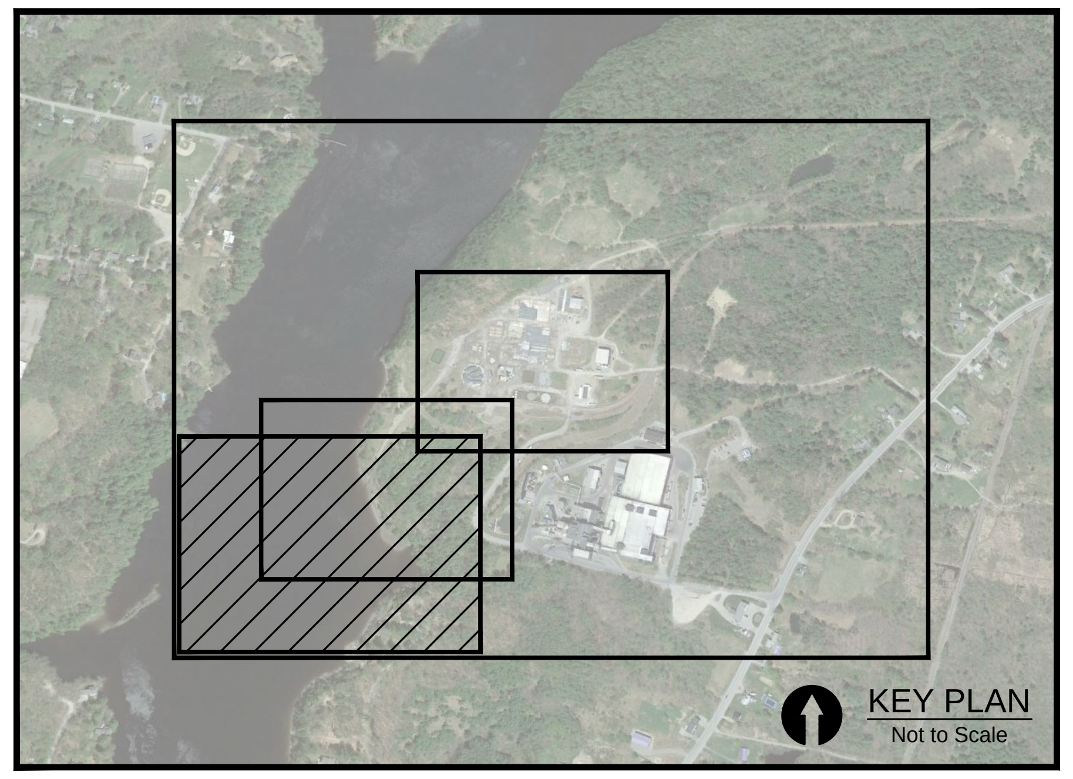
| DESIGNED BY: | R. PICKERING |
| DRAWN BY: | P. SCIABA |
| CHECKED BY: | R. GARDNER |
| APPROVED BY: | P. LaROSA |
| SCALE: | AS SHOWN |
| DATE: | 8 APRIL 2016 |

**SOUTHERN COVE CORRECTIVE MEASURES**
**IMPLEMENTATION PLAN, ORRINGTON REMEDIATION SITE**
**ORRINGTON, MAINE**

OVERVIEW OF WORK

G-4

SHEET NO. 4 OF 19



**LEGEND:**

| | |
|---|---|
| 100 / 111 | EXISTING CONTOURS (FEET NAVD88) (1-FOOT INTERVAL) |
| MHHW | MEAN HIGHER HIGH WATER (7.13' NAVD88) |
| MHW | MEAN HIGH WATER (6.62' NAVD88) |
| MSL | MEAN SEA LEVEL (0.20' NAVD88) |
| MLW | MEAN LOW WATER (-6.21' NAVD88) |
| MLLW | MEAN LOWER LOW WATER (-6.55' NAVD88) |
| | PROPERTY LINE |
| TS | SPARSE THREE-SQUARE SEDGE |
| MS | HIGH MARSH/SEDGE BED |
| HS | DENSE HARDSTEM BULRUSH |
| ISP | INDUSTRIAL SEWER PIPE (APPROXIMATE) |
| | MARINE REMEDIATION CONTRACTOR LIMIT OF WORK |
| ▨ | EXISTING ACCESS ROAD |
| SD-SC-15 ● | SEDIMENT SAMPLE LOCATION |
| ⁘ | APPROXIMATE NEARSHORE SUPPORT AREA |

**HORIZONTAL DATUM:** MAINE STATE PLANE EAST ZONE, NORTH AMERICAN DATUM OF 1983 (NAD83), U.S. SURVEY FEET.

**VERTICAL DATUM:** NORTH AMERICAN VERTICAL DATUM 1988, (NAVD88), U.S. SURVEY FEET.

**NOTES:**

1. SEE SHEET G-2 FOR GENERAL NOTES AND LEGEND.
2. REMEDIATION CONTRACTOR SHALL VERIFY LOCATIONS AND CONFIGURATIONS OF THE NPDES AND PERC OUTFALLS AND ASSOCIATED UNDERGROUND PIPING.
3. REMEDIATION CONTRACTOR SHALL MAINTAIN POSITIVE FLOW OF THE NORTHERN DITCH AND SOUTHERY STREAM NATURAL DRAINAGES.

NORTH

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SCALE IN FEET

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Apr 21, 2016 4:15pm psciaba

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**08 APRIL 2016**

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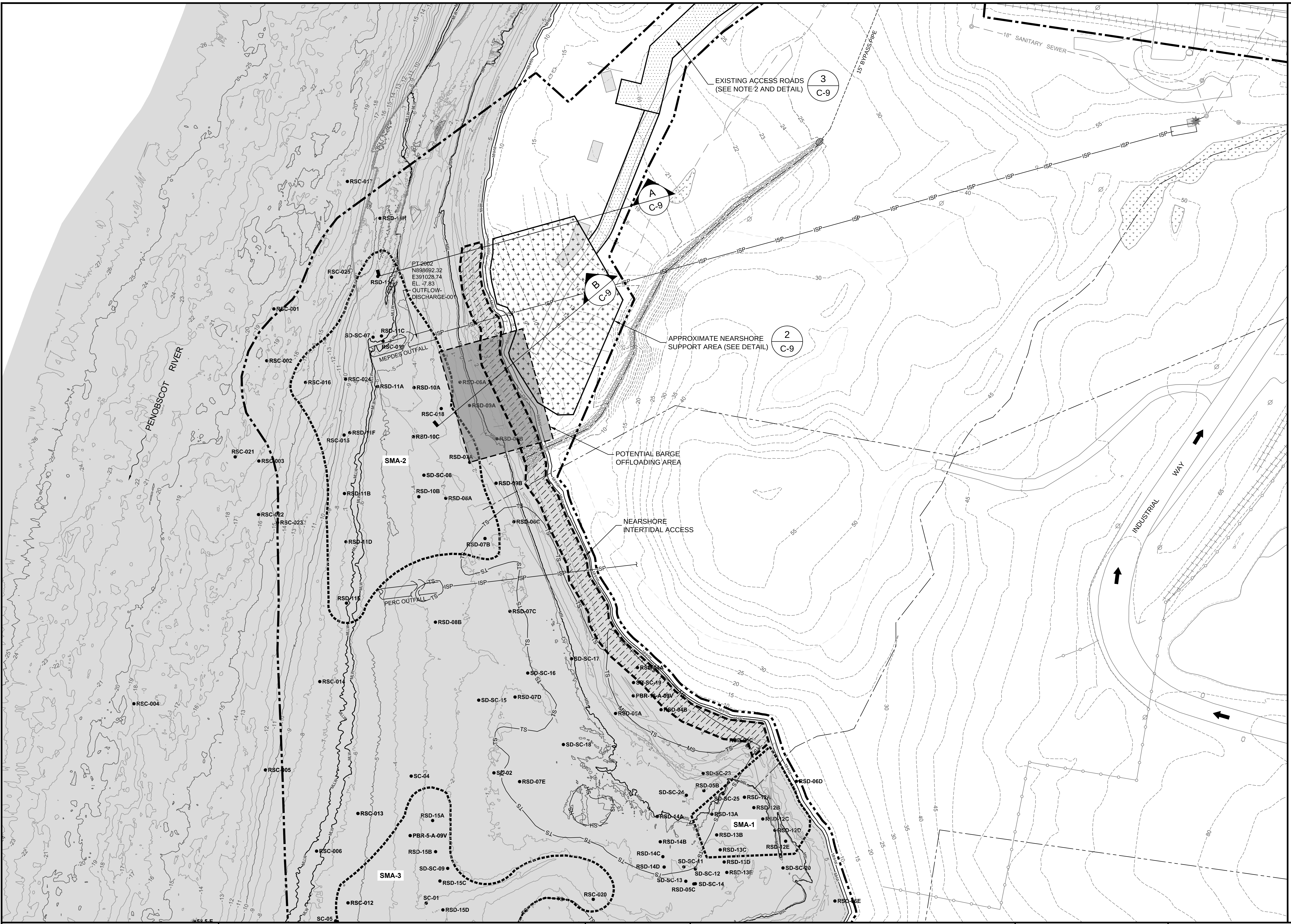
DESIGNED BY: R. PICKERING
DRAWN BY: P. SCIABA
CHECKED BY: R. GARDNER
APPROVED BY: P. LaROSA
SCALE: AS SHOWN
DATE: 8 APRIL 2016

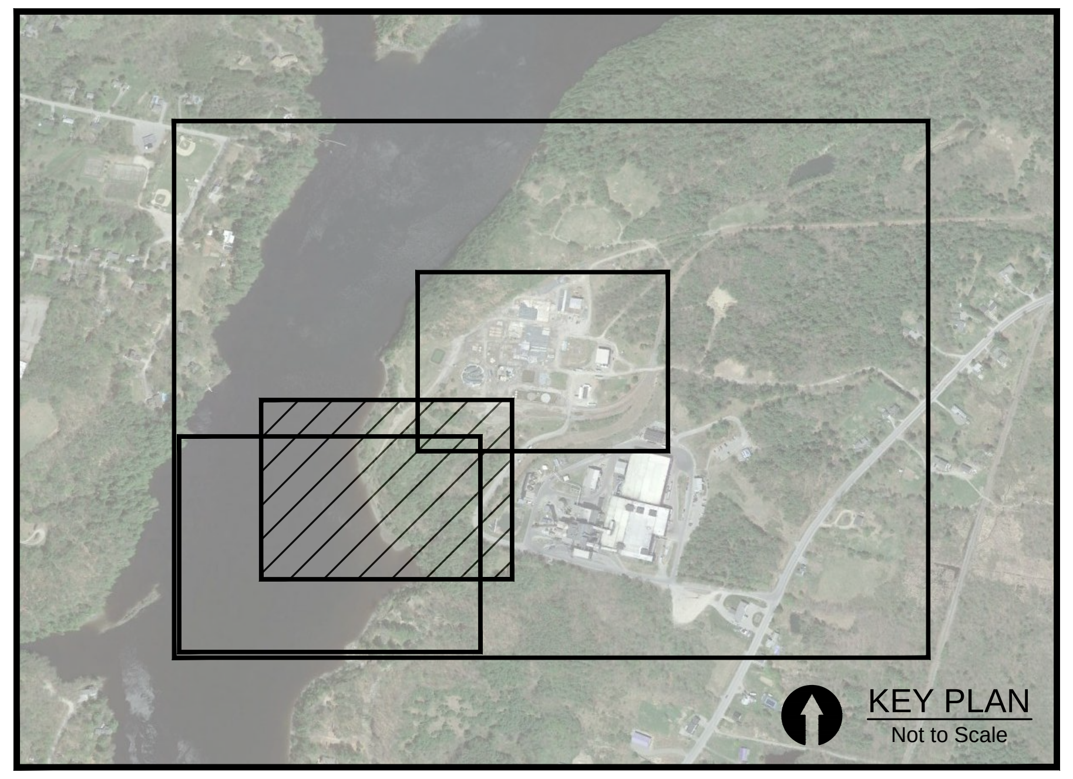
**SOUTHERN COVE CORRECTIVE MEASURES**
**IMPLEMENTATION PLAN, ORRINGTON REMEDIATION SITE**
**ORRINGTON, MAINE**

EXISTING CONDITIONS PLAN
SOUTHERN COVE REMEDIATION AREA

G-5

SHEET NO. 5 OF 19





**LEGEND:**

| | |
|---|---|
| 100<br>111 | EXISTING CONTOURS (FEET NAVD88)<br>(1-FOOT INTERVAL) |
| MHHW | MEAN HIGHER HIGH WATER (7.13' NAVD88) |
| MHW | MEAN HIGH WATER (6.62' NAVD88) |
| MSL | MEAN SEA LEVEL (0.20' NAVD88) |
| MLW | MEAN LOW WATER (-6.21' NAVD88) |
| MLLW | MEAN LOWER LOW WATER (-6.55' NAVD88) |
| — — — | PROPERTY LINE |
| TS | SPARSE THREE-SQUARE SEDGE |
| MS | HIGH MARSH/SEDGE BED |
| HS | DENSE HARDSTEM BULRUSH |
| ISP | INDUSTRIAL SEWER PIPE (APPROXIMATE) |
| — · — | MARINE REMEDIATION CONTRACTOR LIMIT OF WORK |
| — · — · | REMEDIATION SUPPORT AREA |
| ▒ | EXISTING ACCESS ROAD |
| ▨ | NEARSHORE INTERTIDAL ACCESS |
| ▭ | POTENTIAL BARGE OFFLOADING AREA |
| ⁘ | APPROXIMATE NEARSHORE SUPPORT AREA |

**HORIZONTAL DATUM:** MAINE STATE PLANE EAST ZONE, NORTH AMERICAN DATUM OF 1983 (NAD83), U.S. SURVEY FEET.

**VERTICAL DATUM:** NORTH AMERICAN VERTICAL DATUM 1988, (NAVD88), U.S. SURVEY FEET.

**NOTES:**

1. SEE SHEET G-2 FOR GENERAL NOTES AND LEGEND.
2. ACCESS ROADS CONSTRUCTED BY OTHERS AND MAINTAINED PER THE SPECIFICATION SECTION 01 50 20 - CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS.
3. LOCATIONS OF OUTFALLS AND ASSOCIATED UNDERGROUND PIPING ARE APPROXIMATE AND SHALL BE FIELD VERIFIED BY REMEDIATION CONTRACTOR.

NORTH

0 50 100
SCALE IN FEET

ANCHOR QEA

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**08 APRIL 2016**

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DESIGNED BY: R. PICKERING
DRAWN BY: P. SCIABA
CHECKED BY: R. GARDNER
APPROVED BY: P. LaROSA
SCALE: AS SHOWN
DATE: 8 APRIL 2016

# SOUTHERN COVE CORRECTIVE MEASURES IMPLEMENTATION PLAN, ORRINGTON REMEDIATION SITE
## ORRINGTON, MAINE

## SOUTHERN COVE STAGING AND ACCESS

G-6

SHEET NO. 6 OF 19

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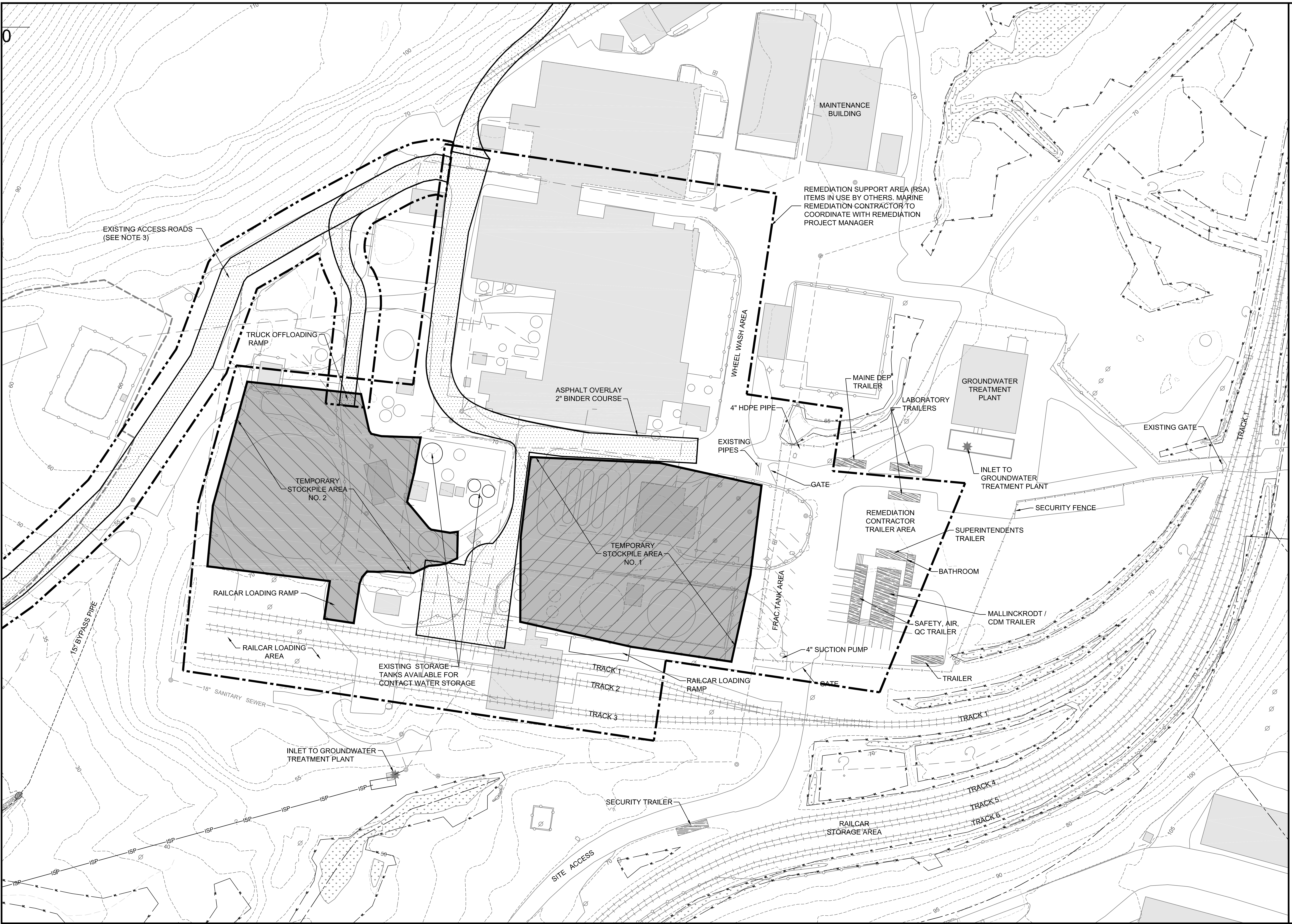

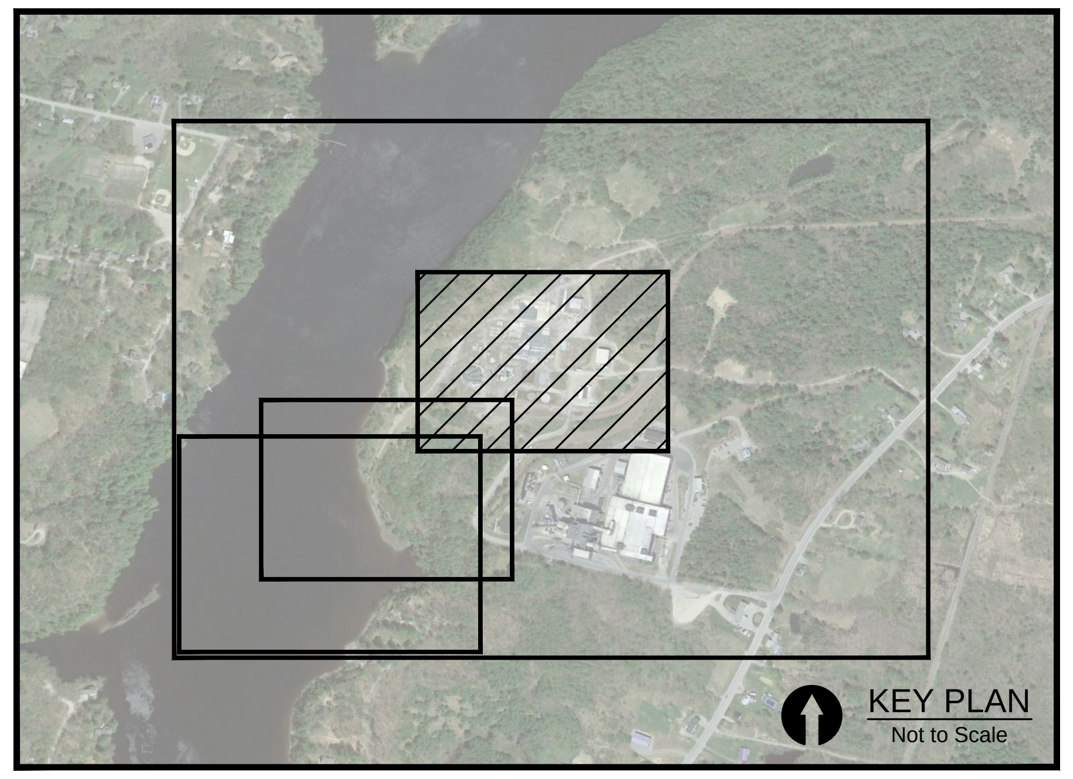

**LEGEND:**

| | |
|---|---|
| - - -100- - - <br> - - -111- - - | EXISTING CONTOURS (FEET NAVD88) (1-FOOT INTERVAL) |
| —— WL —— | WETLAND BOUNDARY |
| —— – – —— | PROPERTY LINE |
| ▬ ▪ ▪ ▬ | MARINE REMEDIATION CONTRACTOR LIMIT OF WORK |
| ▬ ▪ ▬ ▪ ▬ | REMEDIATION SUPPORT AREA |
| ░ | EXISTING ACCESS ROAD |
| ▨ | TEMPORARY SOIL STOCKPILE AREA NO. 1 |
| ▧ | TEMPORARY SOIL STOCKPILE AREA NO. 2 |

**HORIZONTAL DATUM:** MAINE STATE PLANE EAST ZONE, NORTH AMERICAN DATUM OF 1983 (NAD83), U.S. SURVEY FEET.

**VERTICAL DATUM:** NORTH AMERICAN VERTICAL DATUM 1988, (NAVD88), U.S. SURVEY FEET.

**NOTES:**

1. SEE SHEET G-2 FOR GENERAL NOTES AND LEGEND.
2. CURRENT SITE STRUCTURES INCLUDE MAINTENANCE BUILDING, GROUNDWATER TREATMENT PLANT, AND CONSTRUCTION TRAILERS AND FACILITIES SHOWN ON SHEET G-7. ALL OTHER BUILDINGS HAVE BEEN DEMOLISHED, HOWEVER FOUNDATIONS REMAIN IN-PLACE.
3. ACCESS ROADS CONSTRUCTED BY OTHERS AND MAINTAINED PER THE SPECIFICATION SECTION 01 50 20 - CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS.

NORTH

0 50 100
SCALE IN FEET

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**08 APRIL 2016**

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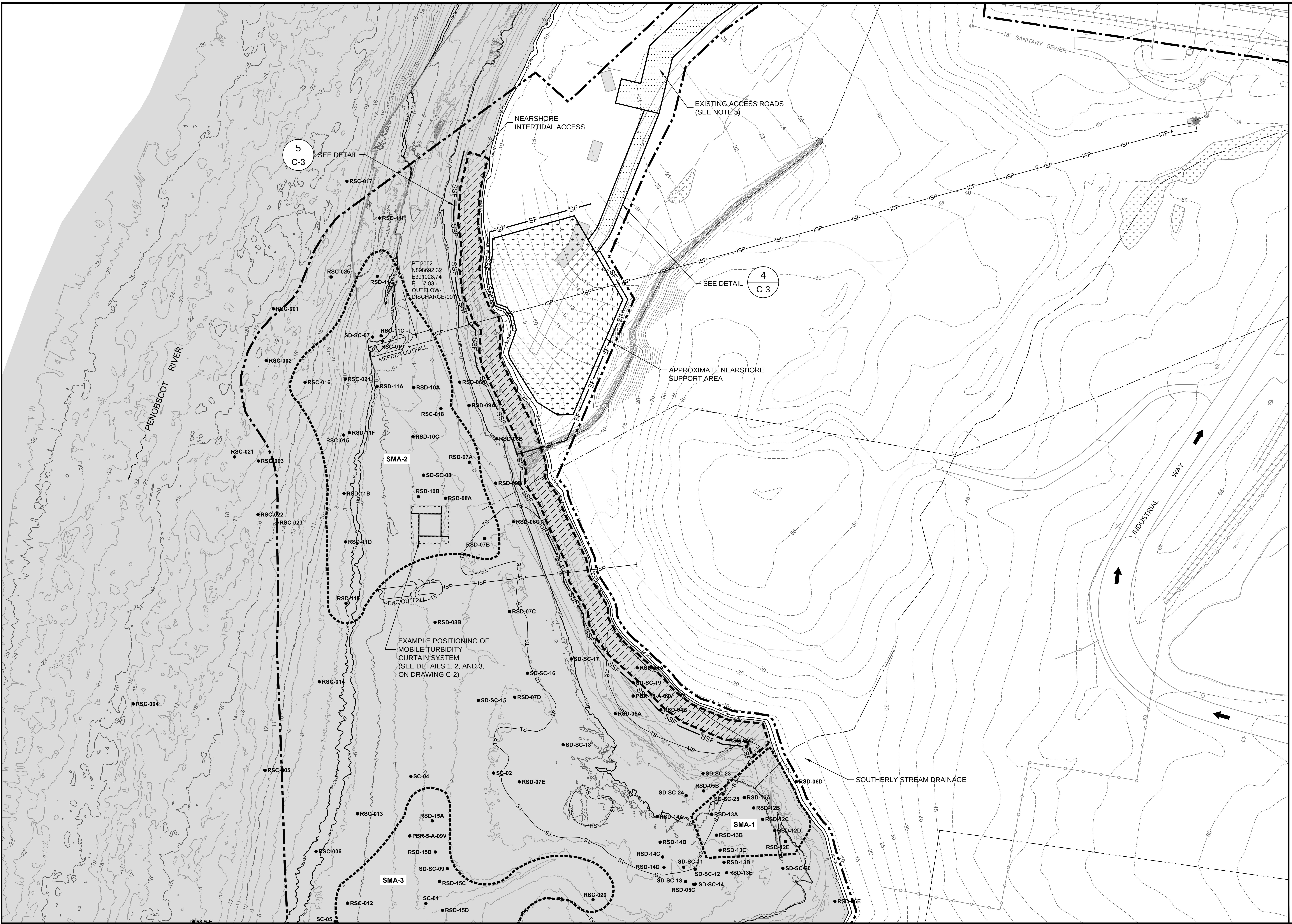
DESIGNED BY: R. PICKERING
DRAWN BY: P. SCIABA
CHECKED BY: R. GARDNER
APPROVED BY: P. LaROSA
SCALE: AS SHOWN
DATE: 8 APRIL 2016

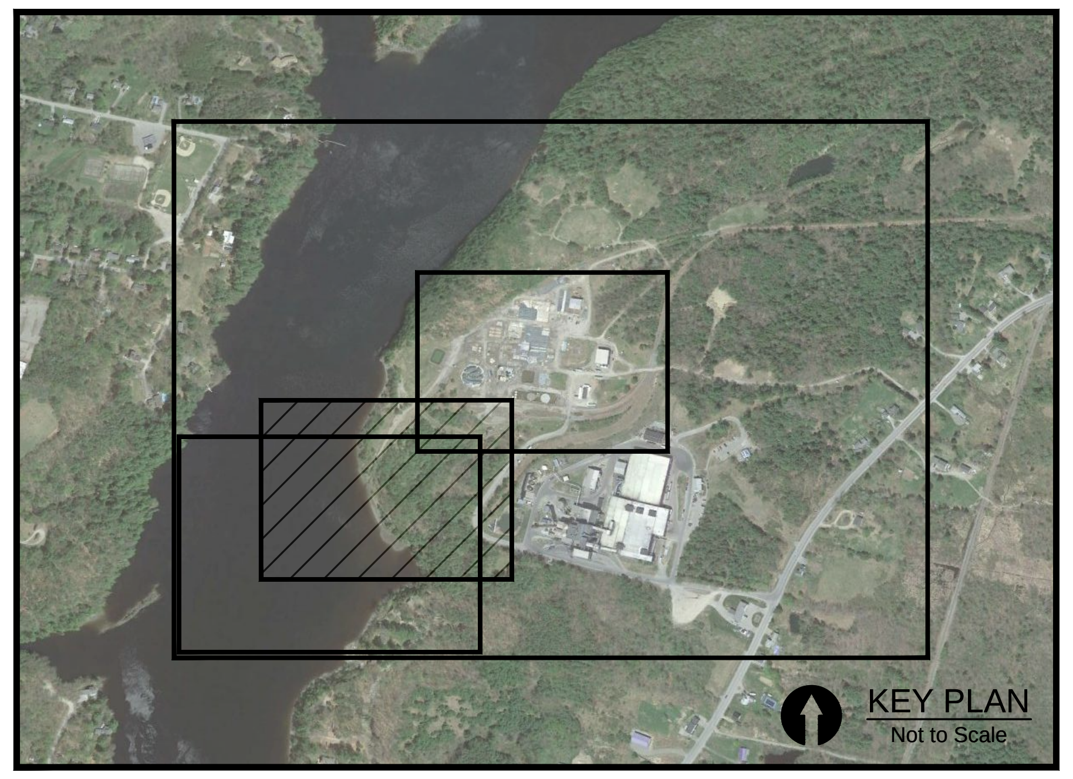
## SOUTHERN COVE CORRECTIVE MEASURES IMPLEMENTATION PLAN, ORRINGTON REMEDIATION SITE
## ORRINGTON, MAINE

UPLAND SITE STAGING AND ACCESS

G-7

SHEET NO. 7 OF 19





**LEGEND:**

| | |
|---|---|
| 100<br>111 | EXISTING CONTOURS (FEET NAVD88)<br>(1-FOOT INTERVAL) |
| MHHW | MEAN HIGHER HIGH WATER (7.13' NAVD88) |
| MHW | MEAN HIGH WATER (6.62' NAVD88) |
| MSL | MEAN SEA LEVEL (0.20' NAVD88) |
| MLW | MEAN LOW WATER (-6.21' NAVD88) |
| MLLW | MEAN LOWER LOW WATER (-6.55' NAVD88) |
| — – – — | PROPERTY LINE |
| TS | SPARSE THREE-SQUARE SEDGE |
| MS | HIGH MARSH/SEDGE BED |
| HS | DENSE HARDSTEM BULRUSH |
| ISP | INDUSTRIAL SEWER PIPE (APPROXIMATE) |
| — - - — | MARINE REMEDIATION CONTRACTOR LIMIT OF WORK |
| — - — - — | REMEDIATION SUPPORT AREA |
| ▒ | EXISTING ACCESS ROAD |
| ▨ | NEARSHORE INTERTIDAL ACCESS |
| ⁘ | APPROXIMATE NEARSHORE SUPPORT AREA |
| SF | SILT FENCE |
| SSF | SUPER SILT FENCE |

**HORIZONTAL DATUM:** MAINE STATE PLANE EAST ZONE, NORTH AMERICAN DATUM OF 1983 (NAD83), U.S. SURVEY FEET.

**VERTICAL DATUM:** NORTH AMERICAN VERTICAL DATUM 1988, (NAVD88), U.S. SURVEY FEET.

**NOTES:**

1. SEE SHEET G-2 FOR GENERAL NOTES AND LEGEND.
2. EROSION, SEDIMENTATION, AND TURBIDITY CONTROLS SHALL BE DEPLOYED PRIOR TO THE START OF WORK IN THE DESIGNATED AREAS SHOWN HEREIN AND SHALL NOT BE REMOVED UNTIL THE WORK IS COMPLETED AND ACCEPTED BY THE REMEDIATION PROJECT MANAGER.
3. ENDS OF SILT FENCE TO BE DETERMINED IN FIELD BY REMEDIATION PROJECT MANAGER.
4. SUPER SILT FENCE SHALL BE INSTALLED AT LOW TIDE FOR EQUIPMENT UTILIZING NEARSHORE INTERTIDAL ACCESS.
5. ACCESS ROADS CONSTRUCTED BY OTHERS AND MAINTAINED PER THE SPECIFICATION SECTION 01 50 20 - CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS.
6. LOCATIONS OF OUTFALLS AND ASSOCIATED UNDERGROUND PIPING ARE APPROXIMATE AND SHALL BE FIELD VERIFIED BY REMEDIATION CONTRACTOR.

NORTH

0 50 100

SCALE IN FEET

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Apr 21, 2016 4:27pm psciaba

ANCHOR QEA

**DRAFT DESIGN SUBMITTAL**
**NOT FOR CONSTRUCTION**
**08 APRIL 2016**

**PRELIMINARY**

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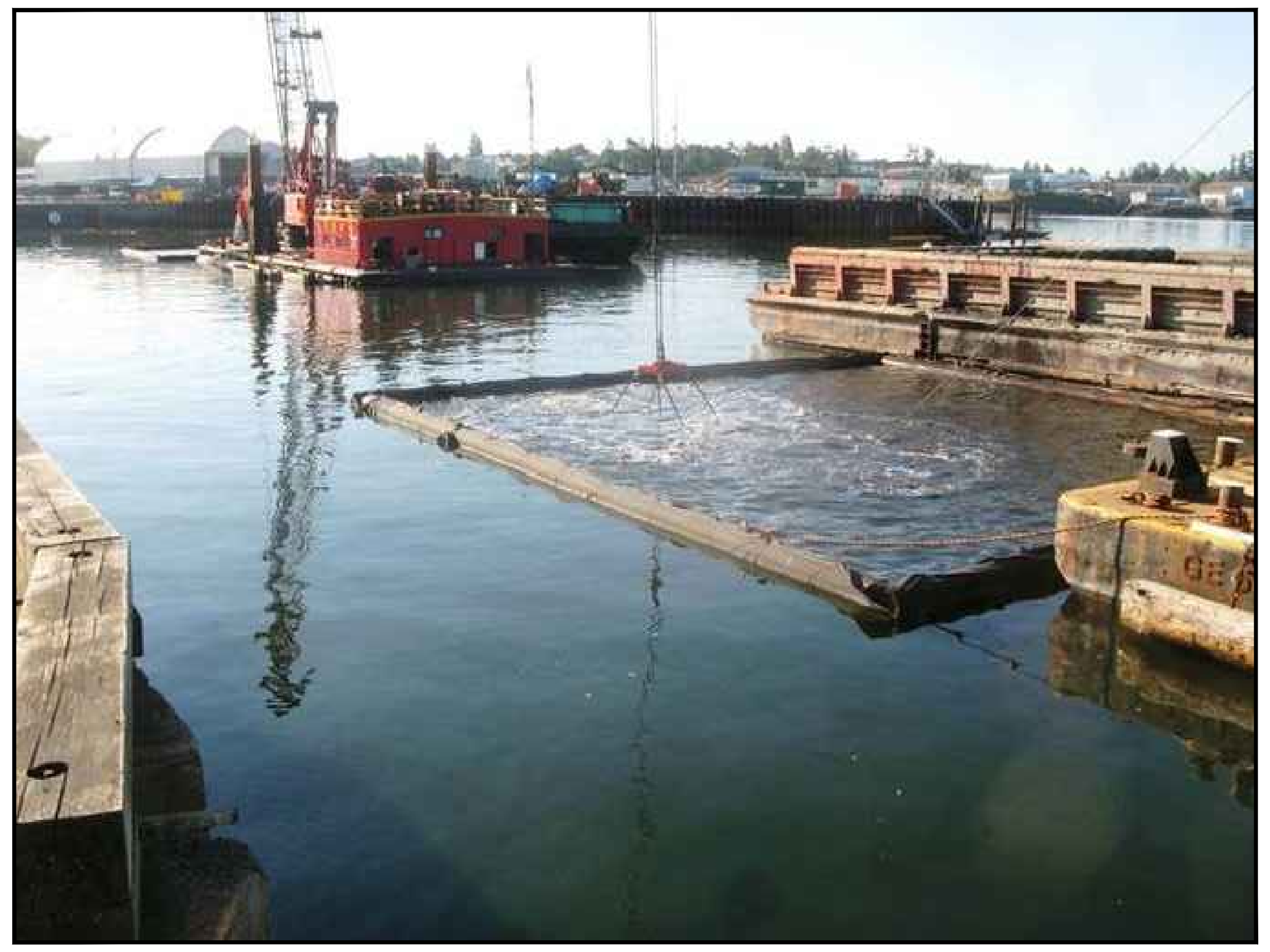
DESIGNED BY: R. PICKERING
DRAWN BY: P. SCIABA
CHECKED BY: R. GARDNER
APPROVED BY: P. LaROSA
SCALE: AS SHOWN
DATE: 8 APRIL 2016

# SOUTHERN COVE CORRECTIVE MEASURES IMPLEMENTATION PLAN, ORRINGTON REMEDIATION SITE
# ORRINGTON, MAINE

## EROSION AND ENVIRONMENTAL CONTROLS PLAN

C-1

SHEET NO. 8 OF 19

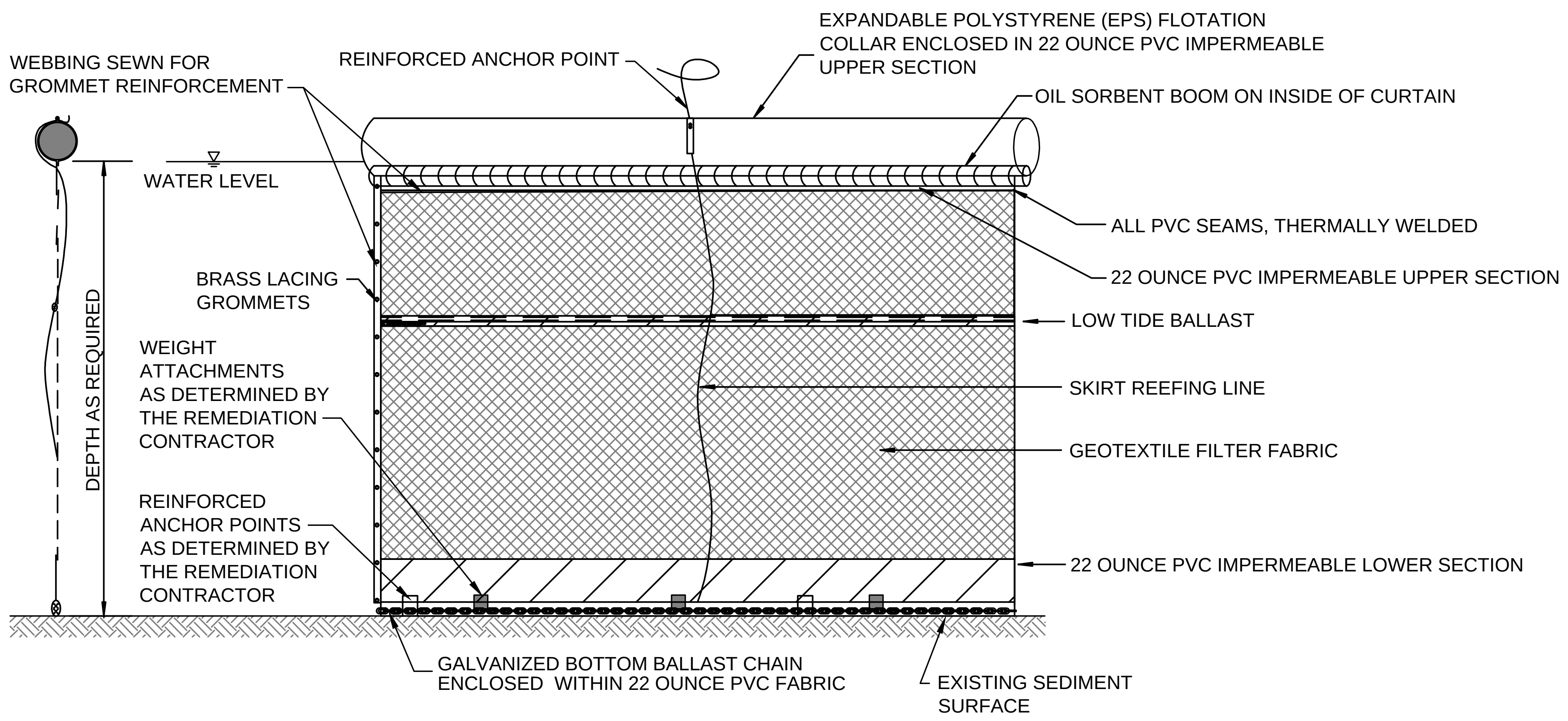


NOTES:

1. SILT CURTAIN EXAMPLES SHOWN ARE FOR REMEDIATION CONTRACTOR INFORMATION ONLY AND INTENDED TO SHOW EXAMPLE BEST MANAGEMENT PRACTICES.
2. SPILLS THAT OCCUR DURING OFFLOADING AND TRANSFER SHALL DRAIN ONTO BARGE. SPILL PROTECTION SHALL BE CONSTRUCTED FROM IMPERVIOUS MATERIAL.
3. BUCKET SWING RADIUS SHOULD NOT EXTEND PAST SPILL PREVENTION FEATURES.

1
C-1
EXAMPLE SILT CURTAIN ARRANGEMENT FOR MATERIAL TRANSFER (DREDGE TO BARGE)
TURBIDITY CURTAIN AFFIXED TO DREDGE BARGE (MOBILE TURBIDITY CURTAIN SYSTEM)

NOT TO SCALE

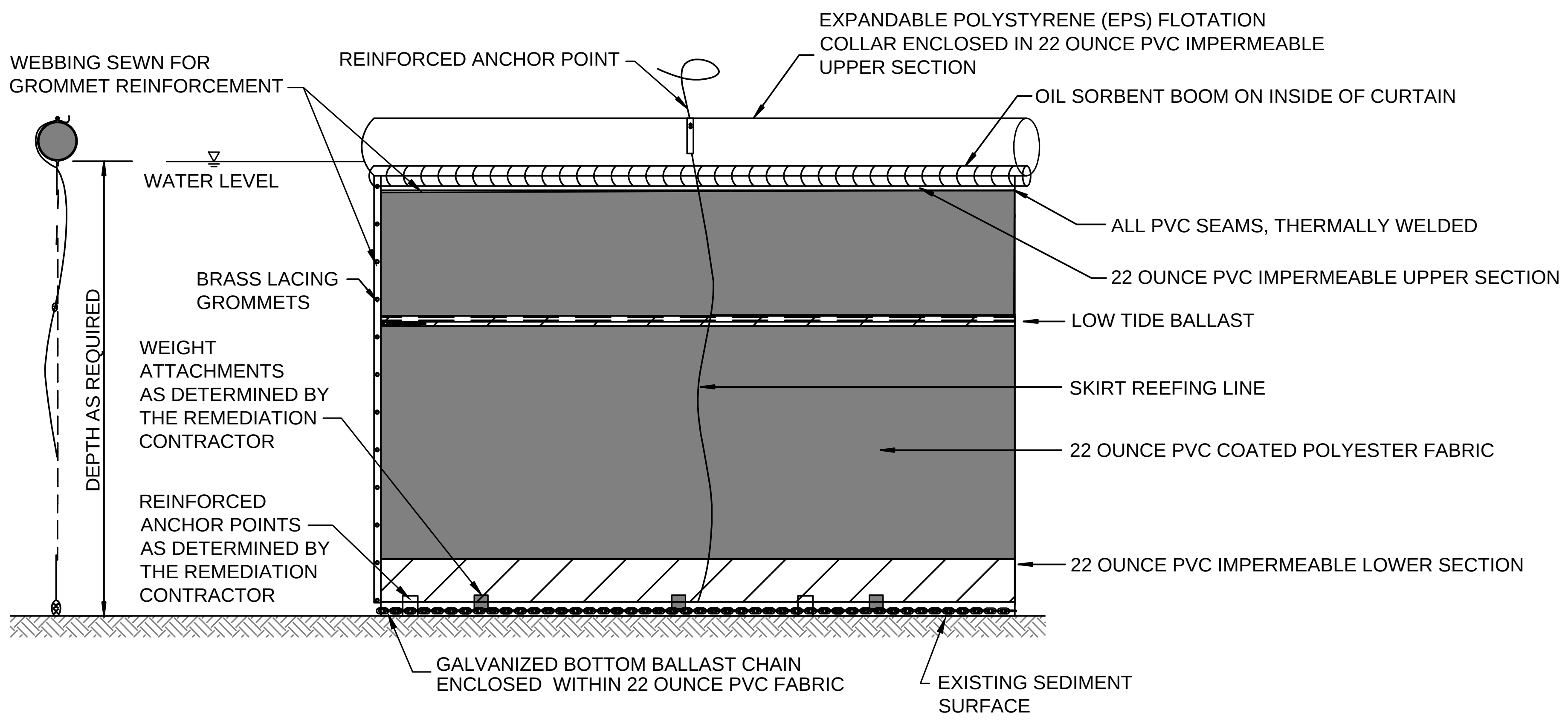


NOTES:

1. PERMEABLE TURBIDITY CURTAINS INCLUDED IN THE MOBILE TURBIDITY CURTAIN SYSTEM.
2. REMEDIATION CONTRACTOR SHALL MAINTAIN THE BOTTOM OF THE TURBIDITY CURTAIN ALONG THE SEDIMENT SURFACE.

2
C-1
PERMEABLE TURBIDITY CURTAIN DETAIL

NOT TO SCALE



NOTES:

1. IMPERMEABLE TURBIDITY CURTAINS INCLUDED IN THE MOBILE TURBIDITY CURTAIN SYSTEM.
2. REMEDIATION CONTRACTOR SHALL MAINTAIN THE BOTTOM OF THE TURBIDITY CURTAIN ALONG THE SEDIMENT SURFACE.

3
C-1
IMPERMEABLE TURBIDITY CURTAIN DETAIL

NOT TO SCALE

A:\CAD - Boston\PROJECTS\0617 - Penobscot River - Orrington Maine\CONSTRUCTION PLANS\0617 - PL-DETAILS.dwg C-2

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**08 APRIL 2016**

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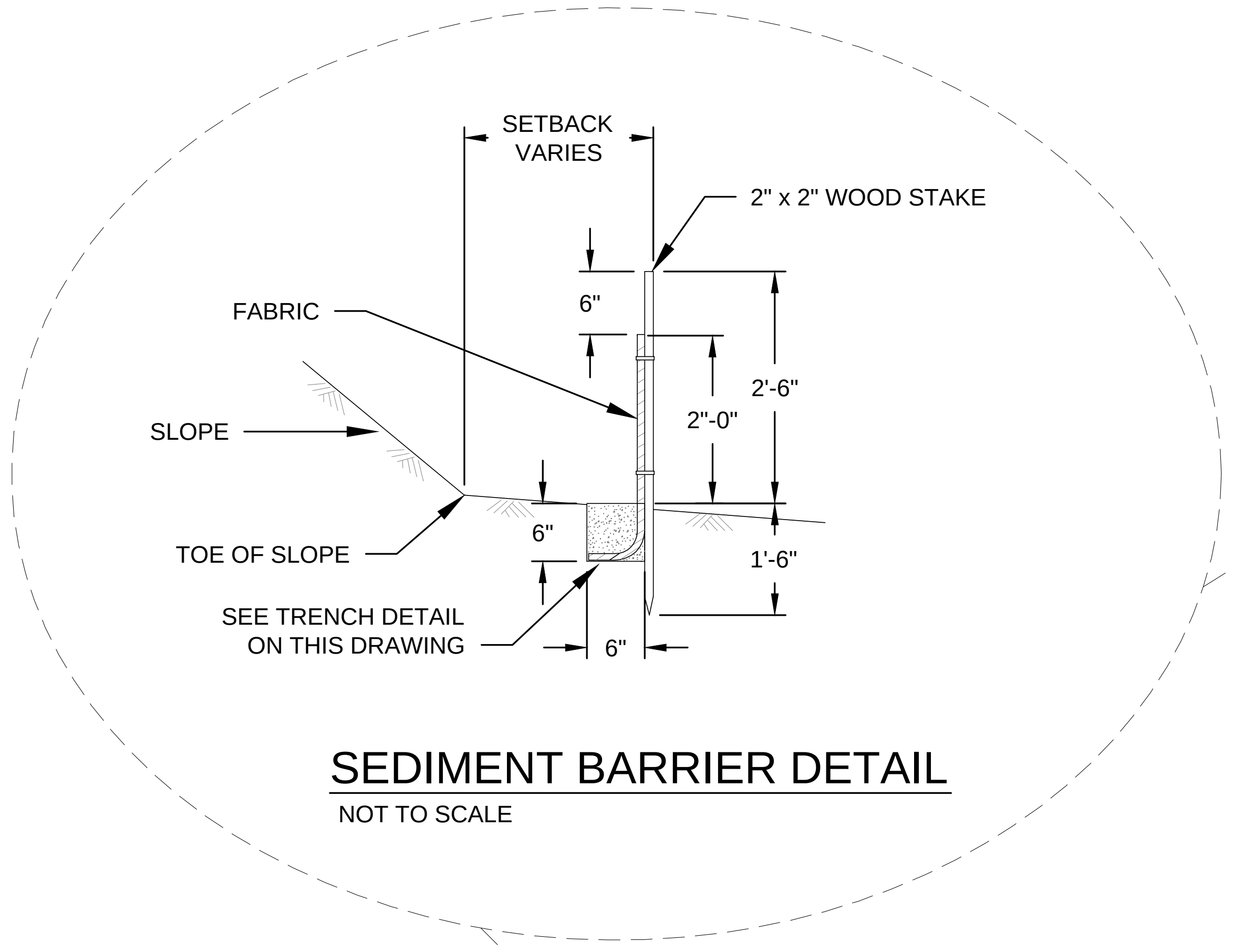
DRAWN BY: P. SCIABA
CHECKED BY: R. GARDNER
APPROVED BY: P. LaROSA
SCALE: AS SHOWN
DATE: 8 APRIL 2016

**SOUTHERN COVE CORRECTIVE MEASURES**
**IMPLEMENTATION PLAN, ORRINGTON REMEDIATION SITE**
**ORRINGTON, MAINE**

ENVIRONMENTAL AND ENVIRONMENTAL
CONTROL DETAILS (1 OF 2)

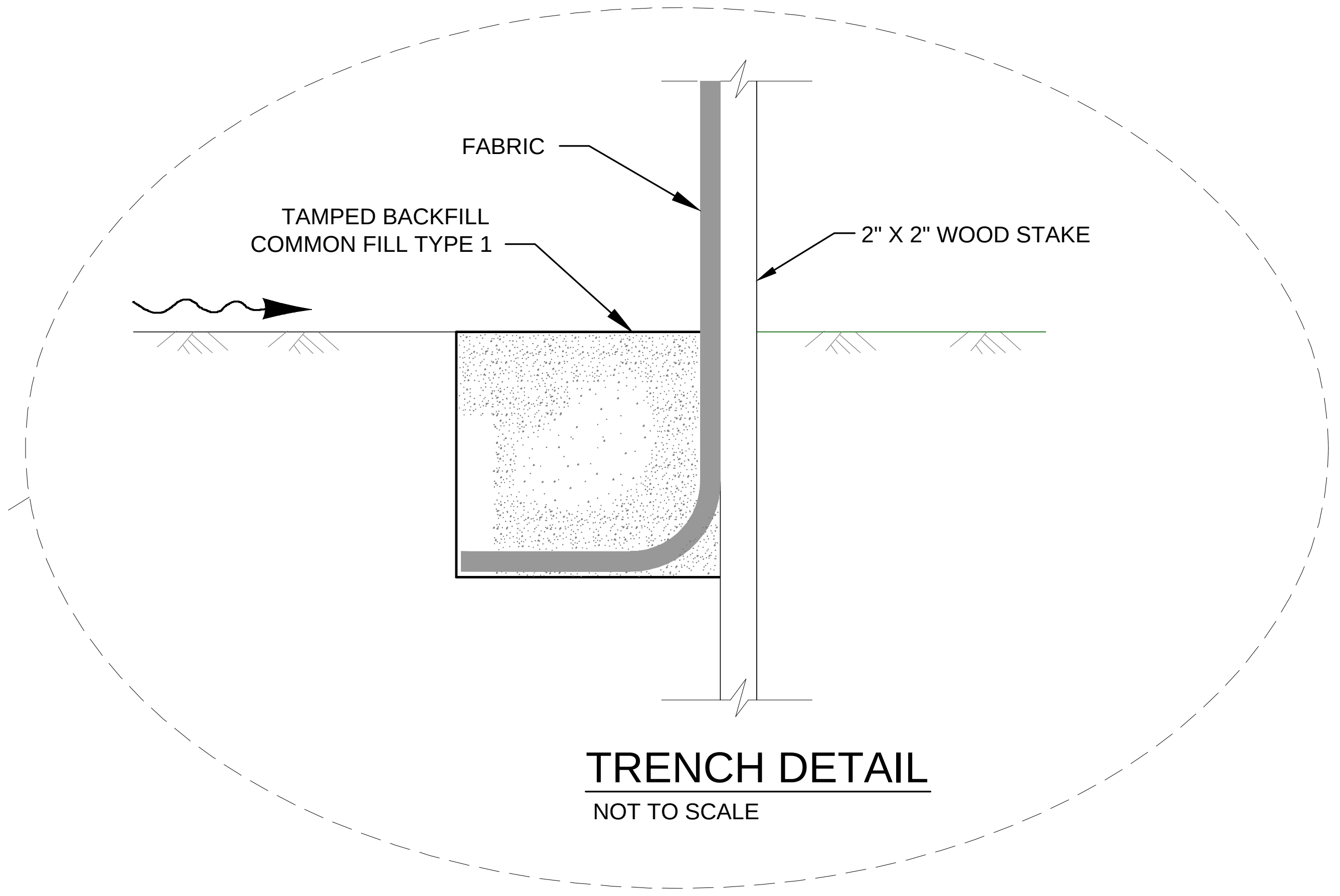
C-2

SHEET NO. 9 OF 19



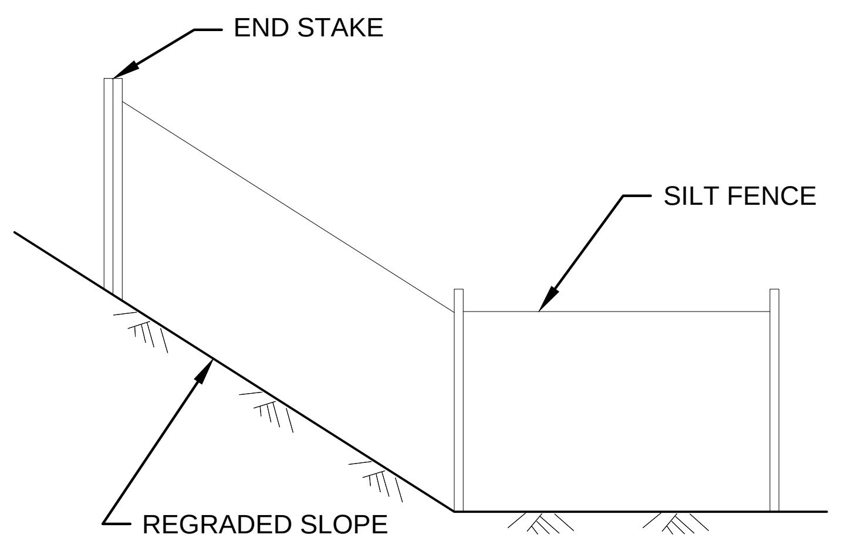
### SEDIMENT BARRIER DETAIL

NOT TO SCALE



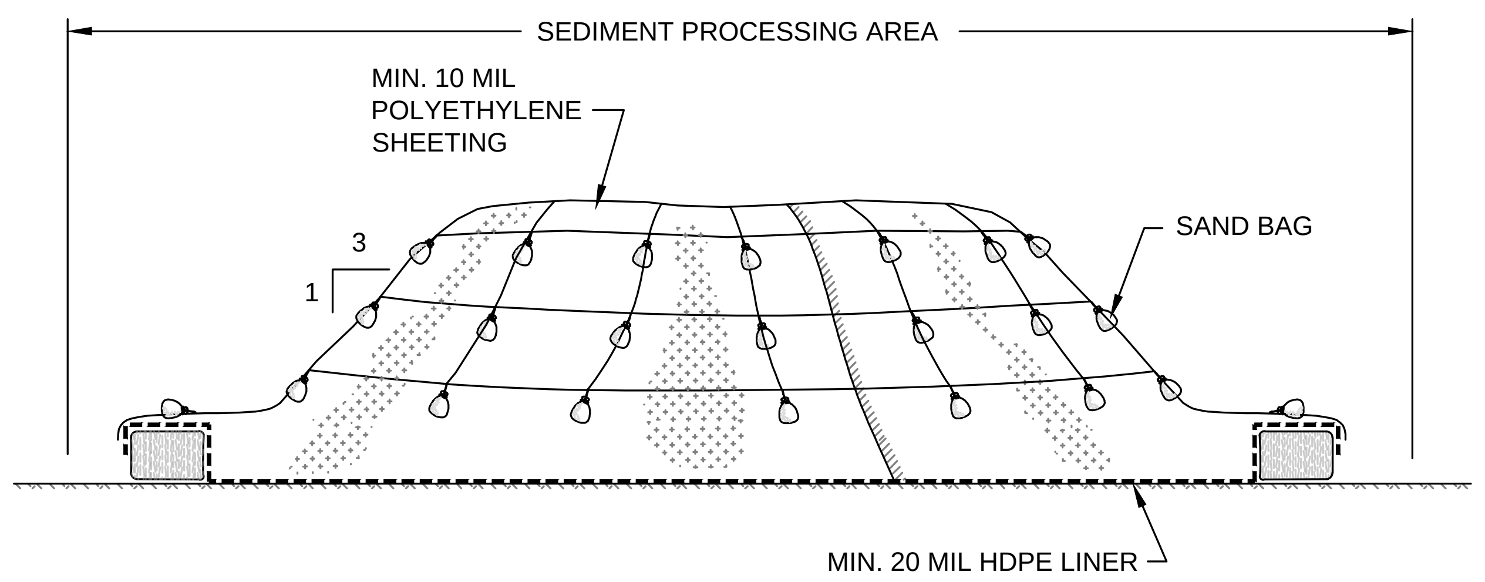
### TRENCH DETAIL

NOT TO SCALE



### A / C-3 END DETAIL

NOT TO SCALE

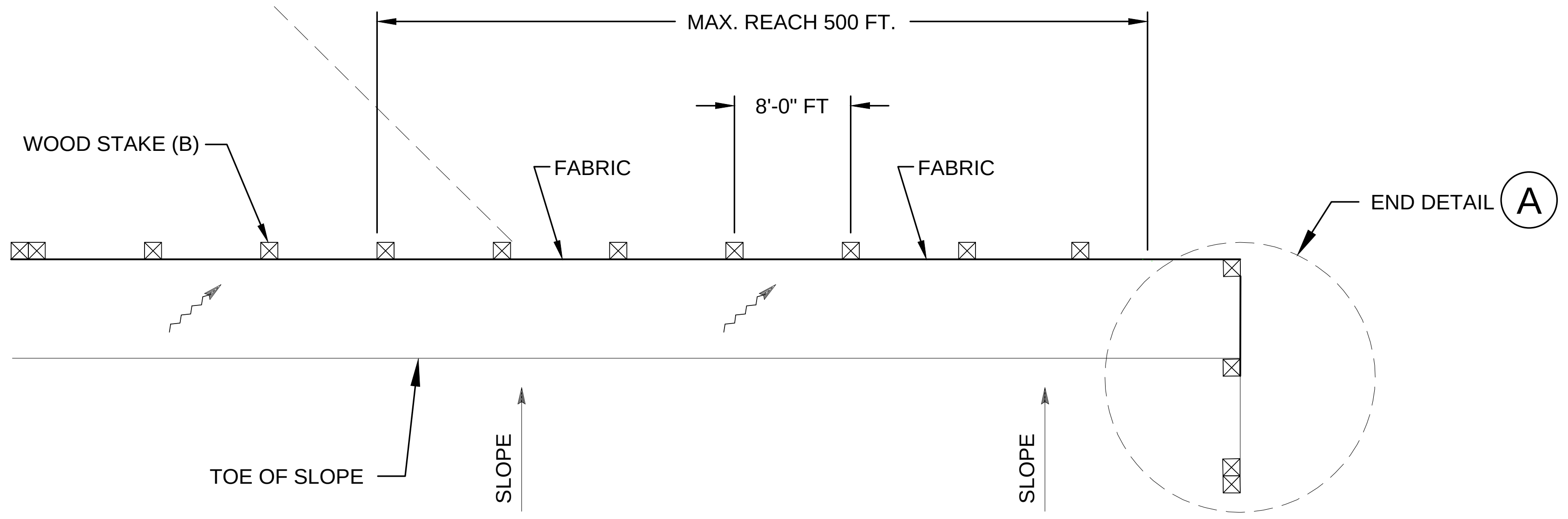


NOTES:

1. STOCKPILES OUTSIDE OF THE SPA, IF THE REMEDIATION CONTRACTOR ELECTS, SHALL BE PLACED ON MINIMUM 20 MIL HDPE LINER.
2. STOCKPILES SHALL BE COVERED WITH MINIMUM 10 MIL POLYETHYLENE SHEETING WHENEVER LOADING OR PLACEMENT IS NOT OCCURING.
3. STOCKPILE AREAS SHALL BE SUBJECT TO DUST CONTROLS WHENEVER LOADING OR PLACEMENT IS OCCURING AND AS DIRECTED BY REMEDIATION PROJECT MANAGER.
4. SHEETING COVERING STOCKPILE SHALL BE MAINTAINED TIGHTLY IN PLACE BY USING SAND BAGS ON ROPES WITH A MAXIMUM 10'-0" GRID SPACING IN ALL DIMENSIONS.
5. MINIMUM 12" OVERLAP OF ALL SEAMS REQUIRED.
6. STOCKPILE SIDE SLOPES SHALL BE NO STEEPER THAN 3 (HORIZONTAL) TO 1 (VERTICAL).

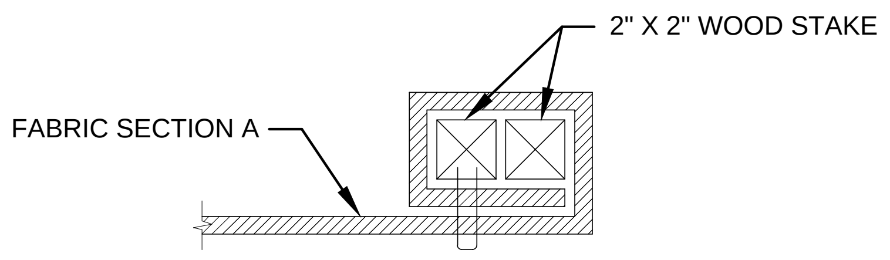
### 6 / C-7 TYPICAL STOCKPILE DETAIL INSIDE OF SPA

NOT TO SCALE

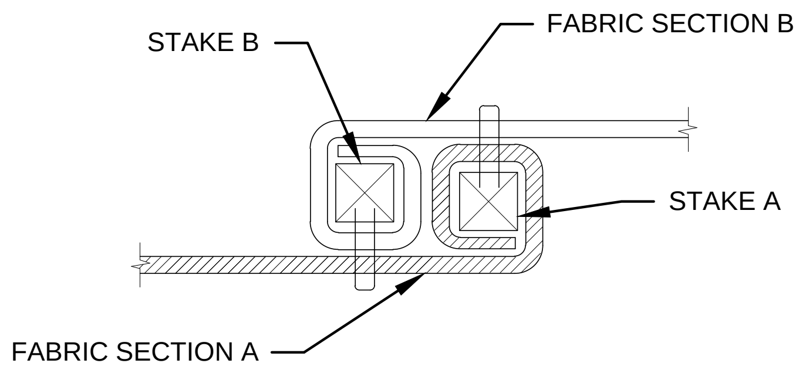


### 4 / C-1 SILT FENCE DETAIL

NOT TO SCALE



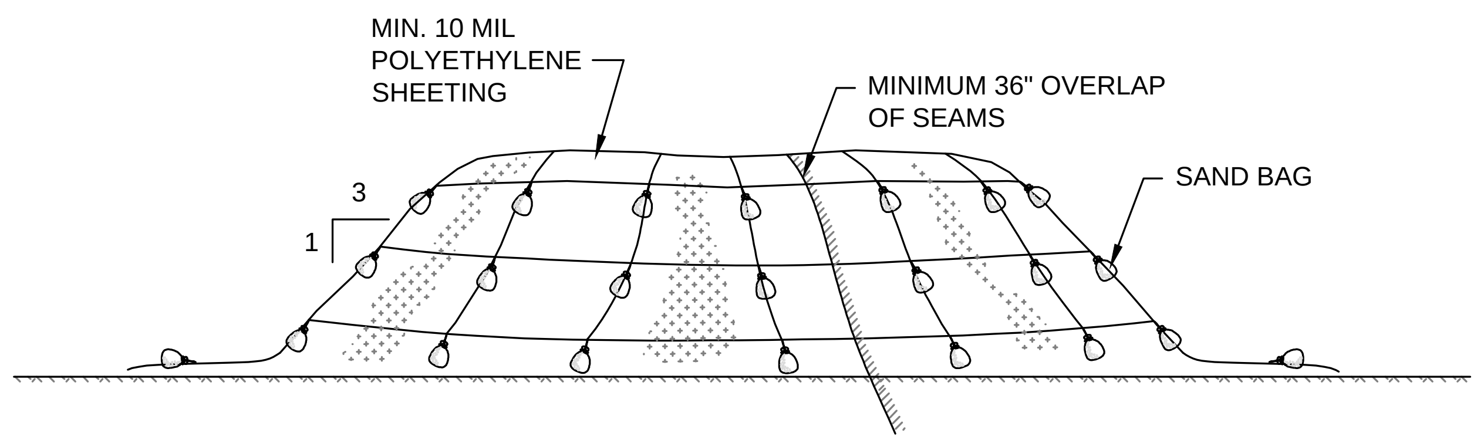
SECTION (TOP VIEW)



PLAN VIEW

### B / C-3 WOOD STAKE DETAIL

NOT TO SCALE

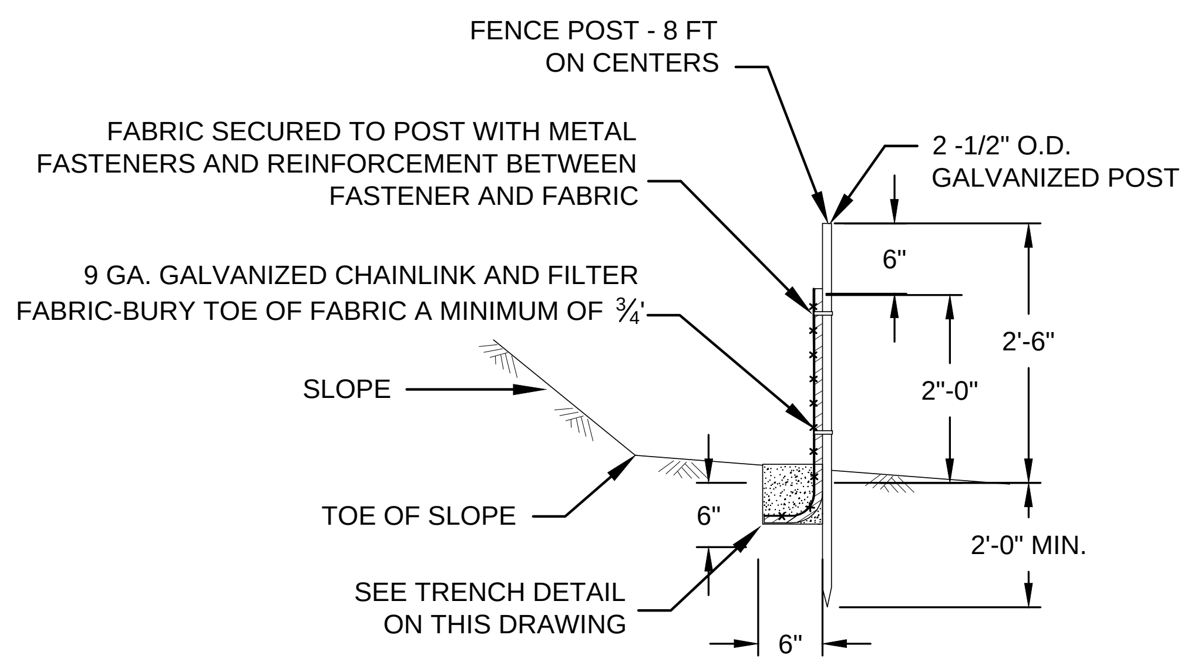


NOTES:

1. STOCKPILES SHALL BE COVERED WITH MINIMUM 10 MIL POLYETHYLENE SHEETING WHENEVER LOADING OR PLACEMENT IS NOT OCCURRING.
2. STOCKPILE AREAS SHALL BE SUBJECT TO DUST / ODOR CONTROLS WHENEVER LOADING, STABILIZATION, OR PLACEMENT IS OCCURING AND AS DIRECTED BY REMEDIATION PROJECT MANAGER.
3. SHEETING COVERING STOCKPILE SHALL BE MAINTAINED TIGHTLY IN PLACE BY USING SAND BAGS ON ROPES WITH A MAXIMUM 10'-0" GRID SPACING IN ALL DIMENSIONS.
4. MINIMUM 12" OVERLAP OF ALL SEAMS REQUIRED.
5. STOCKPILE SIDE SLOPES SHALL BE NO STEEPER THAN 3 (HORIZONTAL) TO 1 (VERTICAL).
6. STOCKPILING OF CLEAN MATERIALS WILL NOT BE PERMITTED UNTIL REQUIREMENTS HAVE BEEN ACHIEVED AS SPECIFIED IN SECTION 01 57 19 - TEMPORARY ENVIRONMENTAL CONTROLS.
7. REMEDIATION CONTRACTOR SHALL PLACE STRAW BALE BERMS AROUND STOCKPILES. STRAW BALE BERMS, AS SHOWN ON THE DETAIL.
8. REFER TO SHEET G-7 FOR SPA LOCATION.

### 8 / C-7 TYPICAL CLEAN MATERIAL STOCKPILE DETAIL

NOT TO SCALE

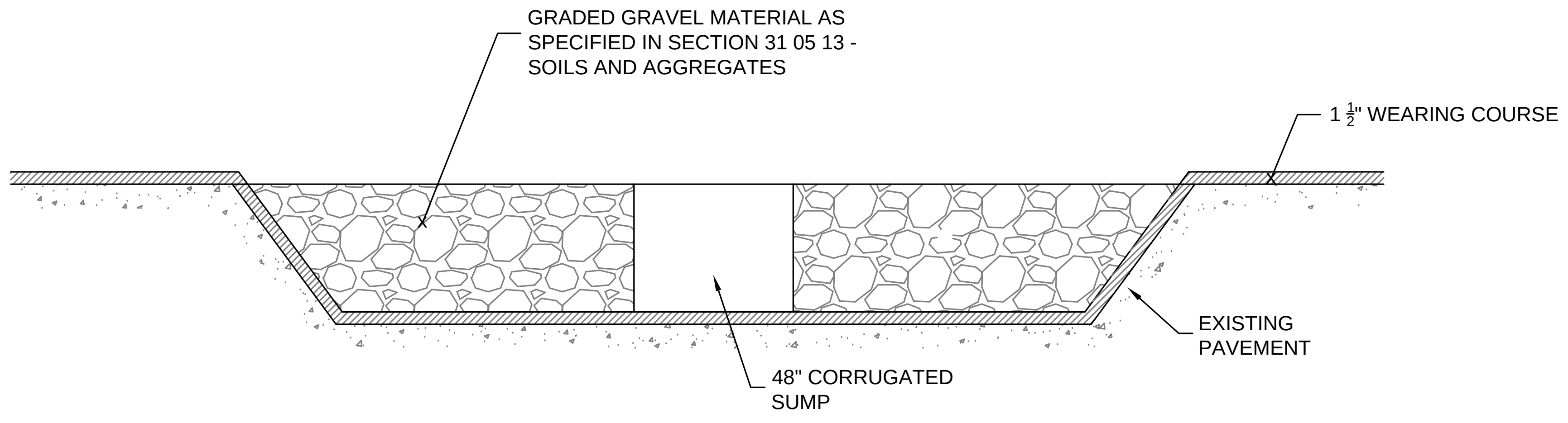


NOTE:

1. SEE DETAIL 4 ON THIS SHEET FOR ADDITIONAL INSTALLATION DETAILS.

### 5 / C-1 SUPER SILT FENCE

NOT TO SCALE



### 7 / G-7 SEDIMENT PROCESSING AREA SUMP DETAIL

NOT TO SCALE

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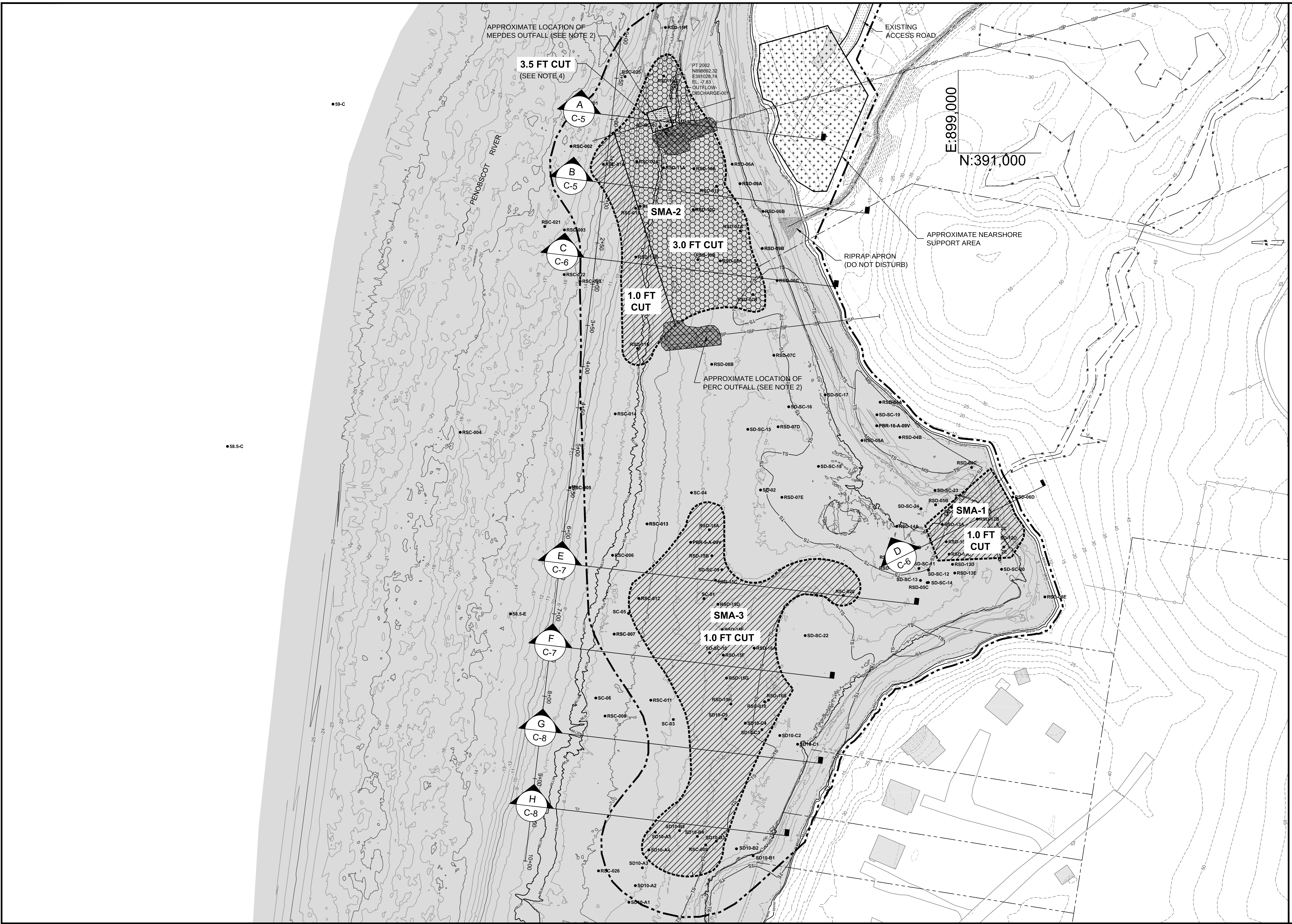
DESIGNED BY: R. PICKERING
DRAWN BY: P. SCIABA
CHECKED BY: R. GARDNER
APPROVED BY: P. LaROSA
SCALE: AS SHOWN
DATE: 8 APRIL 2016

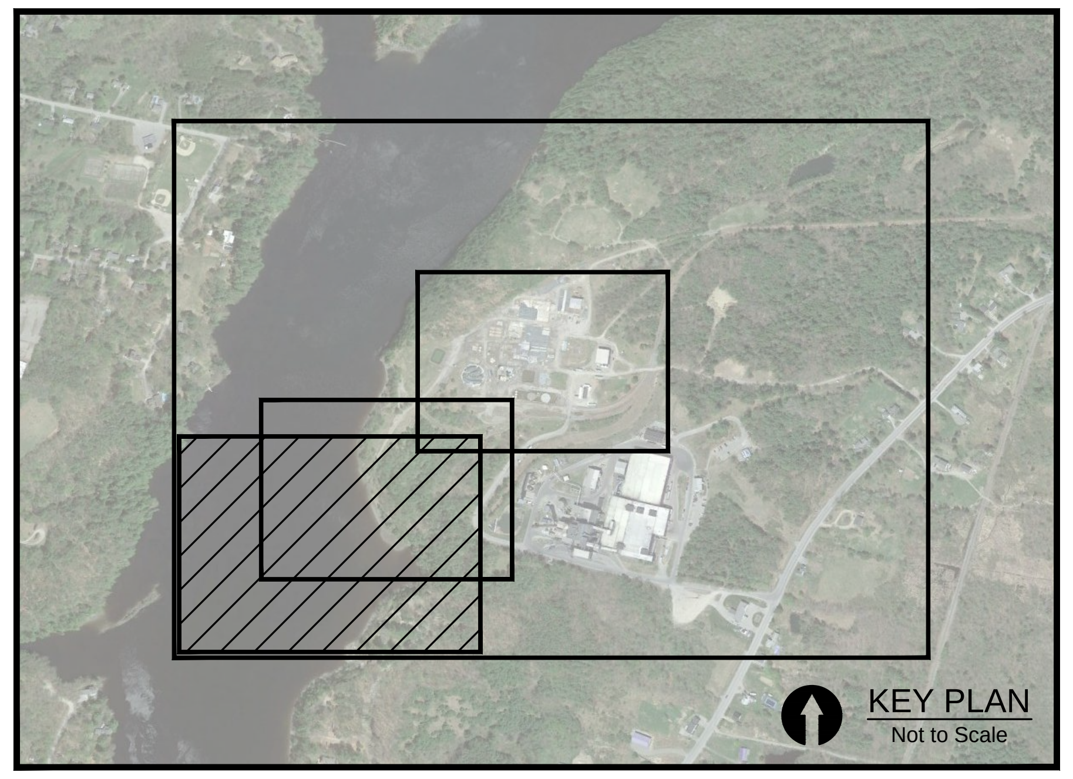
**SOUTHERN COVE CORRECTIVE MEASURES**
**IMPLEMENTATION PLAN, ORRINGTON REMEDIATION SITE**
**ORRINGTON, MAINE**

EROSION AND ENVIRONMENTAL
CONTROL DETAILS (2 OF 2)

C-3

SHEET NO. 10 OF 19





**LEGEND:**

| | |
|---|---|
| - - -100- - - <br> - - -111- - - | EXISTING CONTOURS (FEET NAVD88) <br> (1-FOOT INTERVAL) |
| ——MHHW—— | MEAN HIGHER HIGH WATER (7.13' NAVD88) |
| ——MHW—— | MEAN HIGH WATER (6.62' NAVD88) |
| ——MSL—— | MEAN SEA LEVEL (0.20' NAVD88) |
| ——MLW—— | MEAN LOW WATER (-6.21' NAVD88) |
| ——MLLW—— | MEAN LOWER LOW WATER (-6.55' NAVD88) |
| ——WL—— | WETLAND BOUNDARY |
| —— – – —— | PROPERTY LINE |
| ——TS—— | SPARSE THREE-SQUARE SEDGE |
| ——MS—— | HIGH MARSH/SEDGE BED |
| ——HS—— | DENSE HARDSTEM BULRUSH |
| ——ISP—— | INDUSTRIAL SEWER PIPE (APPROXIMATE) |
| ━━ ▪ ▪ ━━ | MARINE REMEDIATION CONTRACTOR LIMIT OF WORK |
| ▒ | EXISTING ACCESS ROAD |
| ⊞ | APPROXIMATE NEARHSORE SUPPORT AREA |
| ▩ | EXCAVATION AND IMMEDIATE BACKFILL WITHIN OUTFALL OFFSET |
| ▨ | 1 FOOT DREDGE CUT BELOW EXISTING BATHYMETRY |
| ⬡ | 3 FOOT DREDGE CUT BELOW EXISTING BATHYMETRY |
| ⋯ | 3.5 FOOT DREDGE CUT BELOW EXISTING BATHYMETRY |

**HORIZONTAL DATUM:** MAINE STATE PLANE EAST ZONE, NORTH AMERICAN DATUM OF 1983 (NAD83), U.S. SURVEY FEET.

**VERTICAL DATUM:** NORTH AMERICAN VERTICAL DATUM 1988, (NAVD88), U.S. SURVEY FEET.

**NOTES:**

1. SEE SHEET G-2 FOR GENERAL NOTES AND LEGEND.
2. REMEDIATION CONTRACTOR SHALL VERIFY LOCATIONS OF MEPDES AND PERC OUTFALLS. DREDGING AND BACKFILLING SHALL OCCUR IN INTERVALS IN ACCORDANCE WITH SECTION 35 20 23 - DREDGING AND EXCAVATION.
3. LOCATIONS OF OUTFALLS AND ASSOCIATED UNDERGROUND PIPING ARE APPROXIMATE AND SHALL BE FIEL VERIFED BY REMEDIATION CONTRACTOR.
4. THE CU SURROUNDING SD-SC-07 SHALL BE DREDGED TO 3.5 FEET BELOW EXISTING GROUND SURFACE.

NORTH

0 60 120
SCALE IN FEET

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SCALE: AS SHOWN
DATE: 8 APRIL 2016

## SOUTHERN COVE CORRECTIVE MEASURES IMPLEMENTATION PLAN, ORRINGTON REMEDIATION SITE
## ORRINGTON, MAINE

DREDGE / EXCAVATION PLAN

C-4

SHEET NO. 11 OF 19

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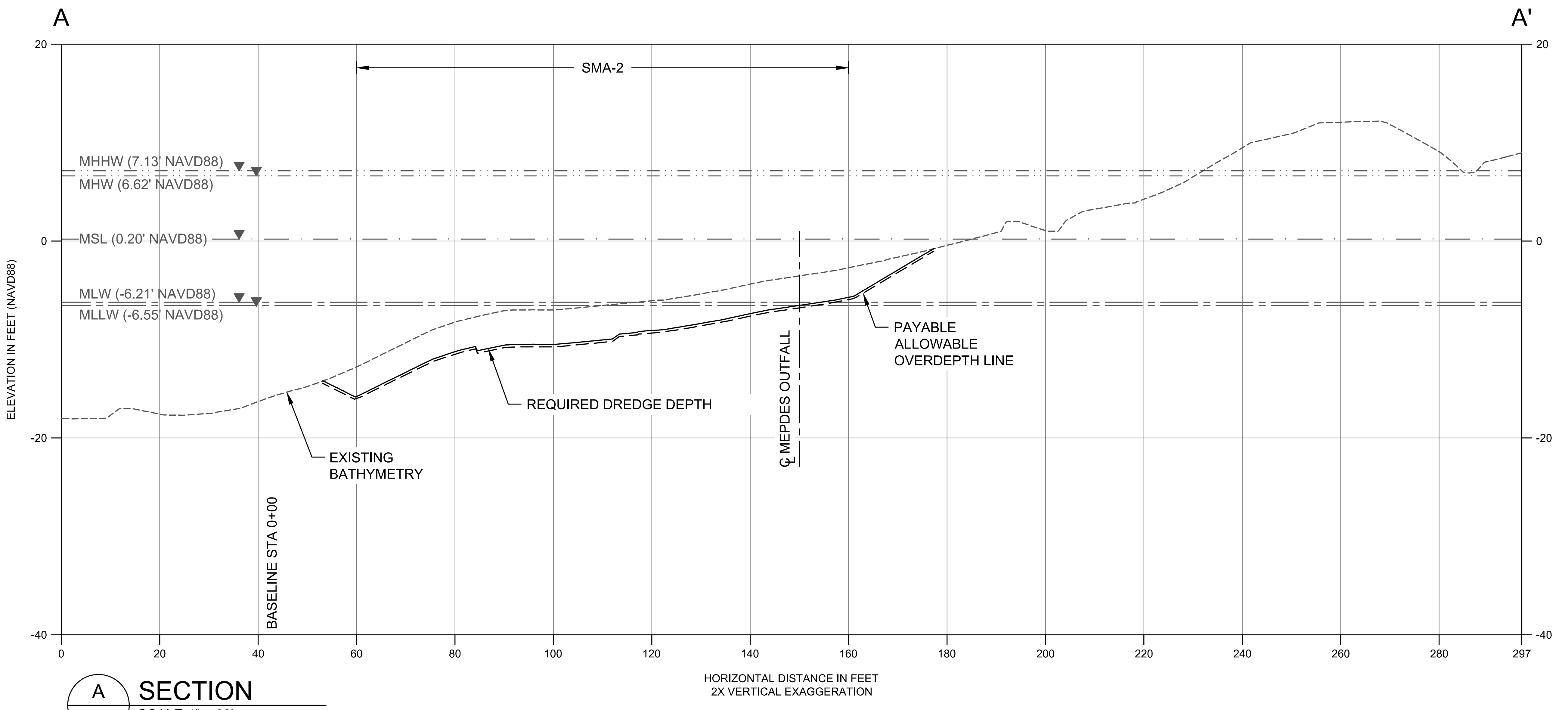
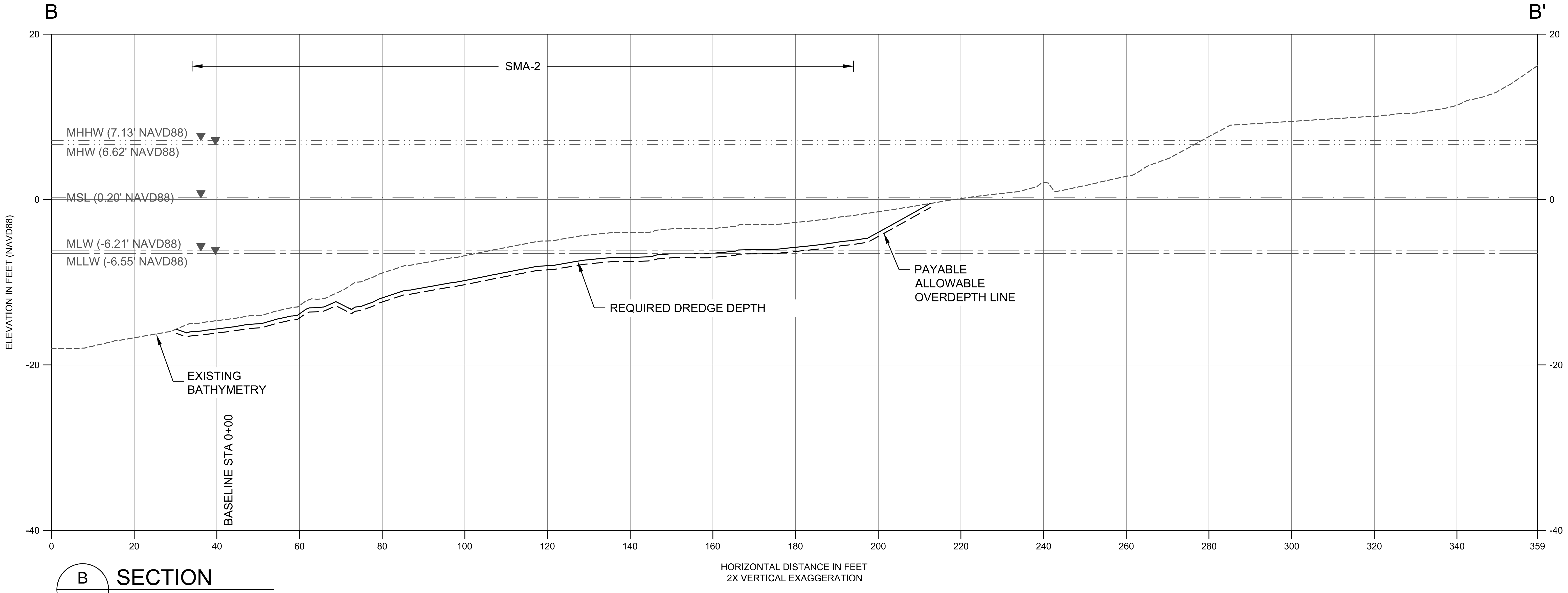


A
C-4
**SECTION**
SCALE:1" = 20'



B
C-4
**SECTION**
SCALE:1" = 20'

**LEGEND:**

| | |
|---|---|
| - - - - - - | EXISTING BATHYMETRY |
| ——— | REQUIRED DREDGE DEPTH |
| - - - - - - | PAYABLE ALLOWABLE OVERDEPTH LINE |

**VERTICAL DATUM:** NORTH AMERICAN VERTICAL DATUM 1988, (NAVD88), U.S. SURVEY FEET.

0 20 40
SCALE IN FEET

ANCHOR QEA

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SCALE: AS SHOWN
DATE: 8 APRIL 2016

**SOUTHERN COVE CORRECTIVE MEASURES IMPLEMENTATION PLAN, ORRINGTON REMEDIATION SITE**
**ORRINGTON, MAINE**

DREDGE / EXCAVATION CROSS SECTIONS
A-A' AND B-B'

C-5

SHEET NO. 12 OF 19

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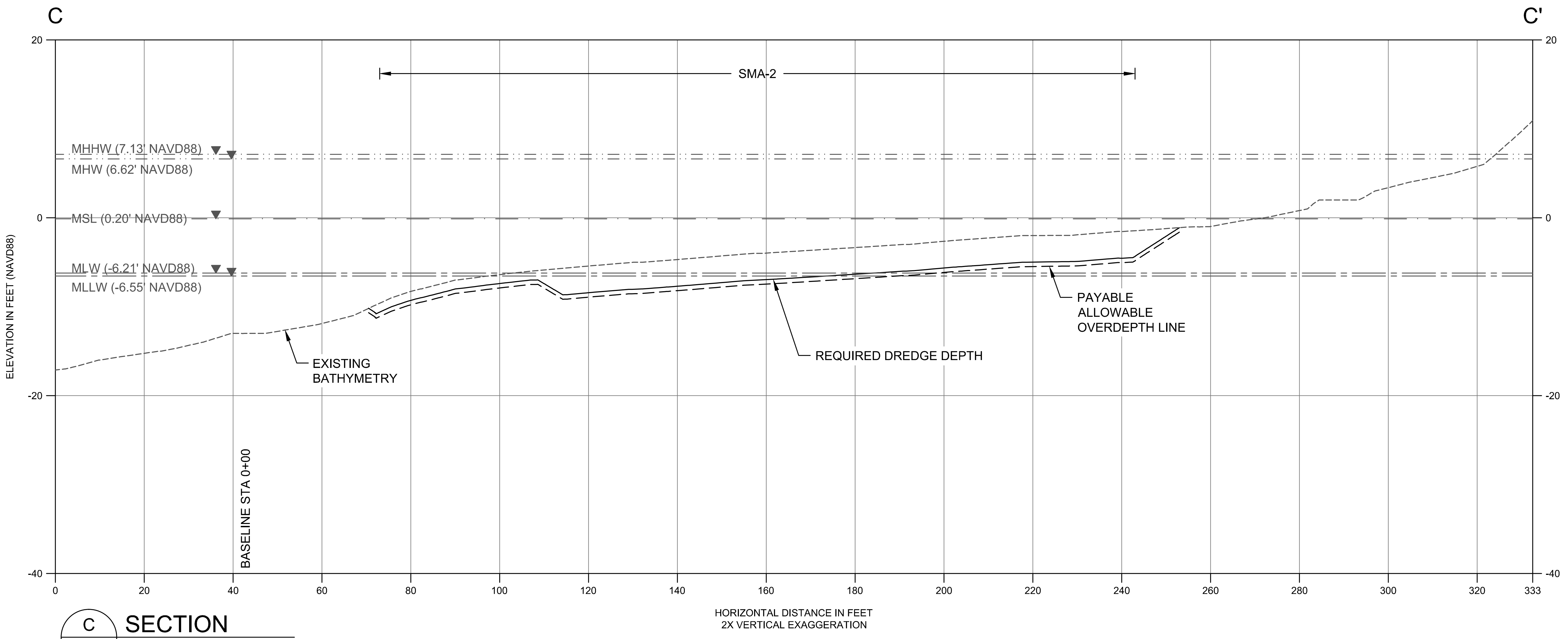
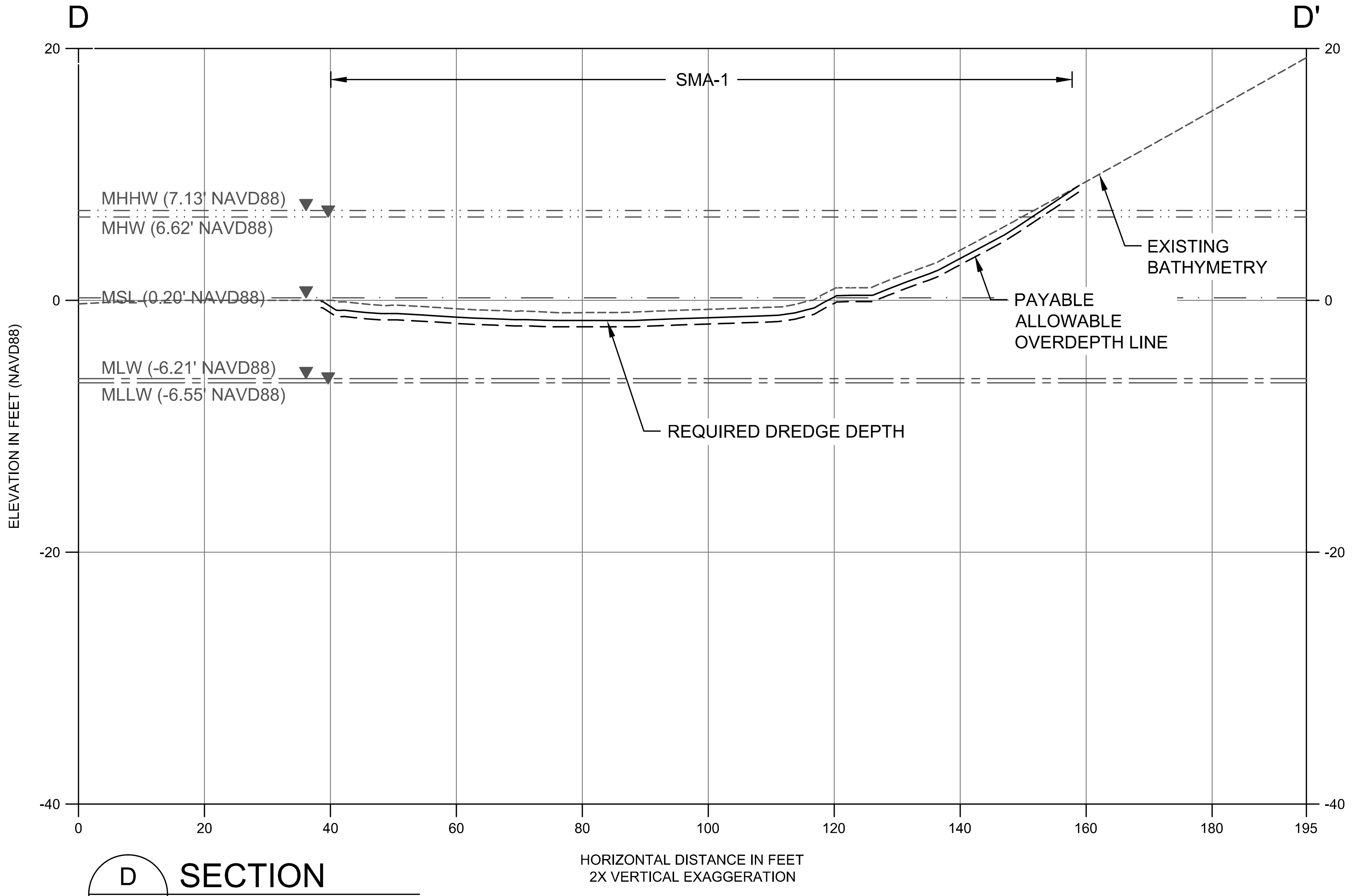


C SECTION
C-4 SCALE:1" = 20'



D SECTION
C-4 SCALE:1" = 20'

**LEGEND:**

- - - - - - EXISTING BATHYMETRY

———— REQUIRED DREDGE DEPTH

- - - - - - PAYABLE ALLOWABLE OVERDEPTH LINE

**VERTICAL DATUM:** NORTH AMERICAN VERTICAL DATUM 1988, (NAVD88), U.S. SURVEY FEET.

0 20 40
SCALE IN FEET

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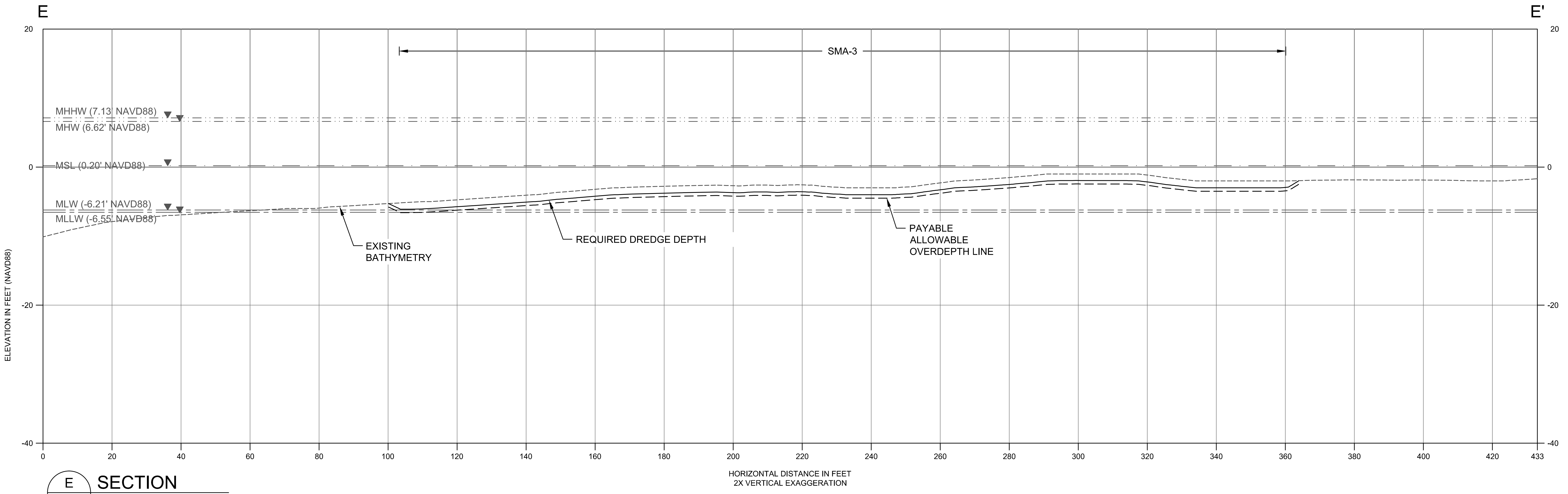
**SOUTHERN COVE CORRECTIVE MEASURES**
**IMPLEMENTATION PLAN, ORRINGTON REMEDIATION SITE**
**ORRINGTON, MAINE**

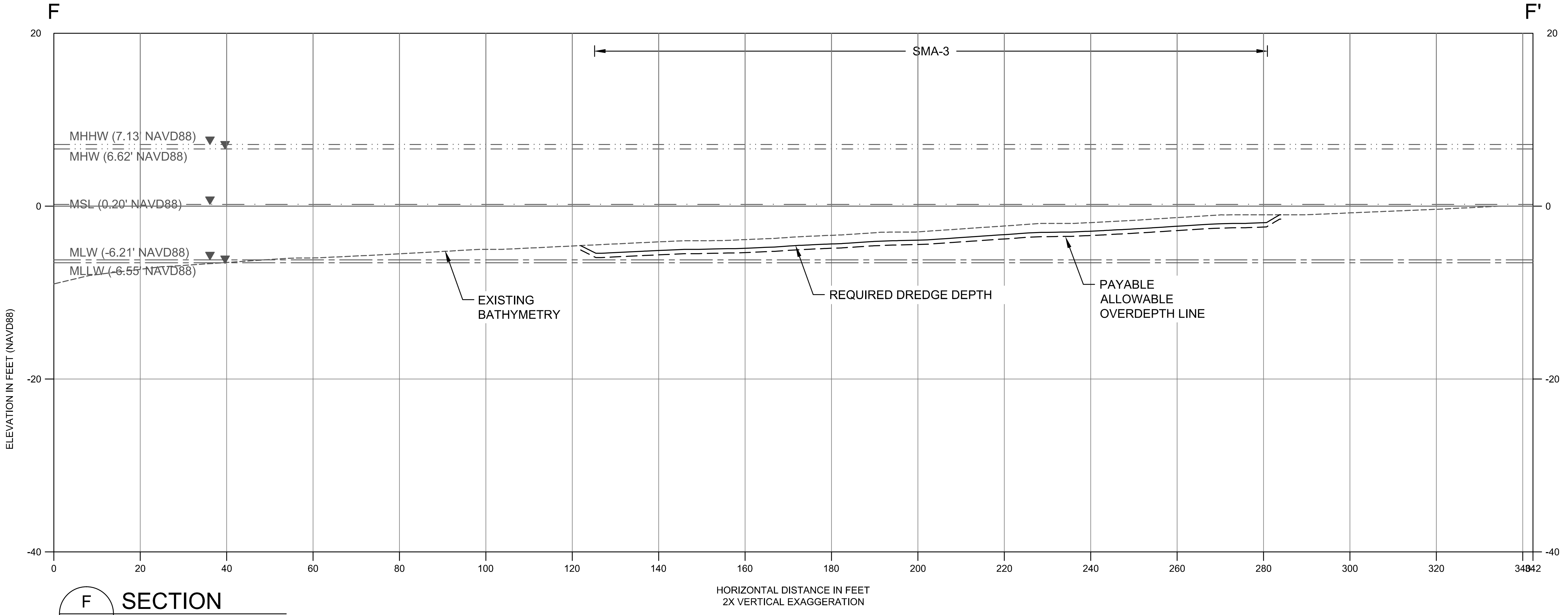
DREDGE / EXCAVATION CROSS SECTIONS
C-C' AND D-D'

C-6

SHEET NO. 13 OF 19



E
C-4
**SECTION**
SCALE:1" = 20'

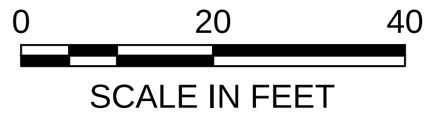


F
C-4
**SECTION**
SCALE:1" = 20'

**LEGEND:**

- - - - - - EXISTING BATHYMETRY
——— REQUIRED DREDGE DEPTH
- - - - - - PAYABLE ALLOWABLE OVERDEPTH LINE

**VERTICAL DATUM:** NORTH AMERICAN VERTICAL DATUM 1988, (NAVD88), U.S. SURVEY FEET.



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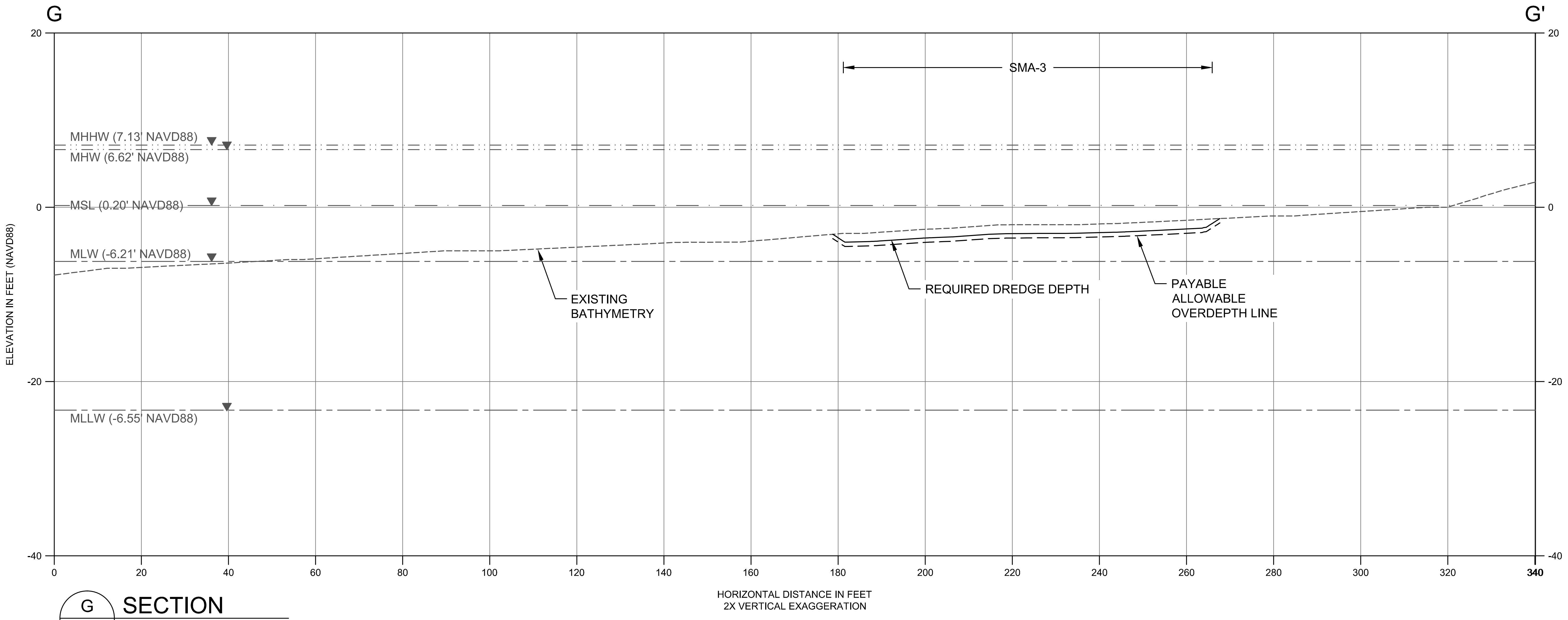
**SOUTHERN COVE CORRECTIVE MEASURES**
**IMPLEMENTATION PLAN, ORRINGTON REMEDIATION SITE**
**ORRINGTON, MAINE**

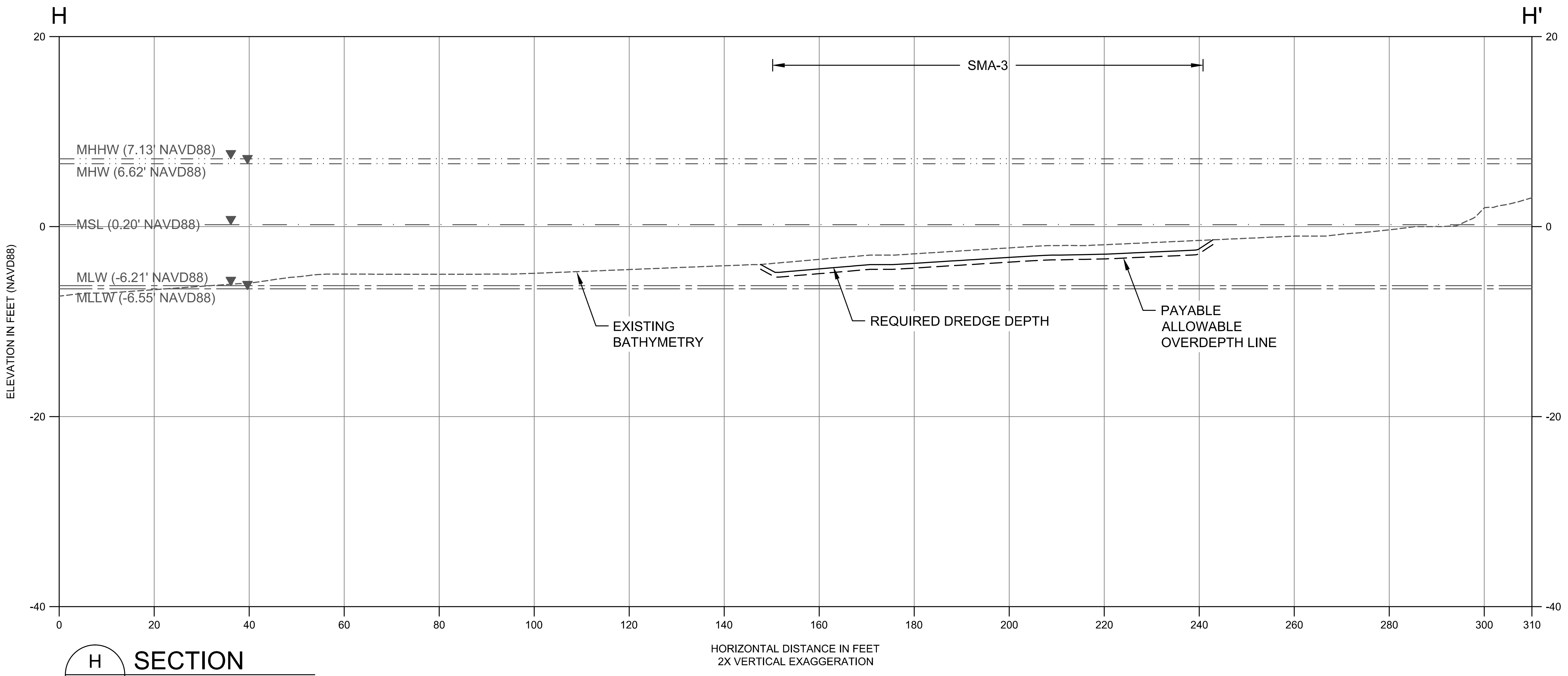
DREDGE / EXCAVATION CROSS SECTIONS
E-E' AND F-F'

C-7

SHEET NO. 14 OF 19



G
C-4
SECTION
SCALE: 1" = 20'

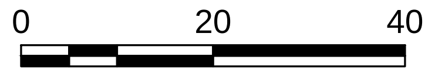


H
C-4
SECTION
SCALE: 1" = 20'

**LEGEND:**

| | |
|---|---|
| - - - - - - - | EXISTING BATHYMETRY |
| ——————— | REQUIRED DREDGE DEPTH |
| - - - - - - - | PAYABLE ALLOWABLE OVERDEPTH LINE |

**VERTICAL DATUM:** NORTH AMERICAN VERTICAL DATUM 1988, (NAVD88), U.S. SURVEY FEET.



SCALE IN FEET

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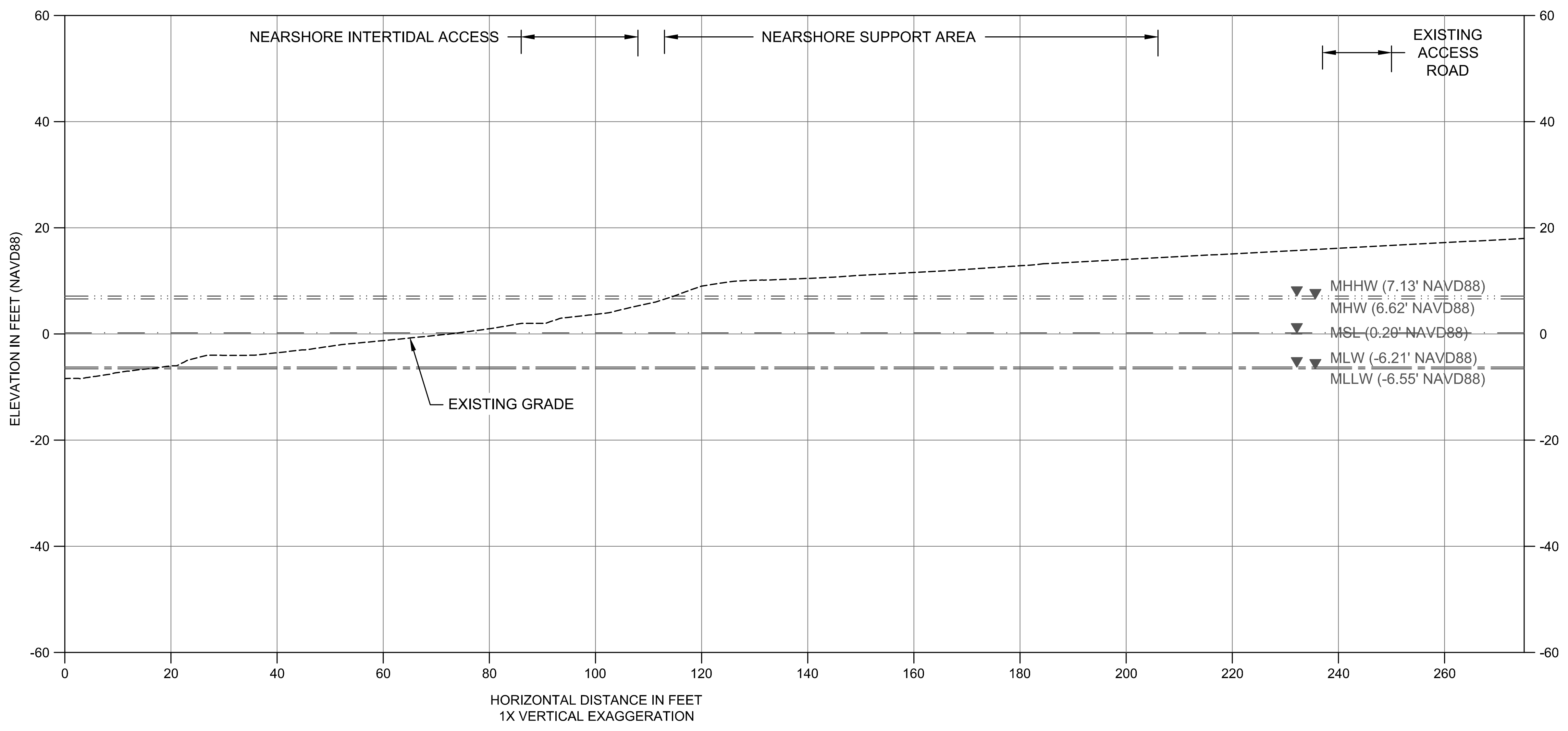
DATE: 8 APRIL 2016

## SOUTHERN COVE CORRECTIVE MEASURES IMPLEMENTATION PLAN, ORRINGTON REMEDIATION SITE
## ORRINGTON, MAINE

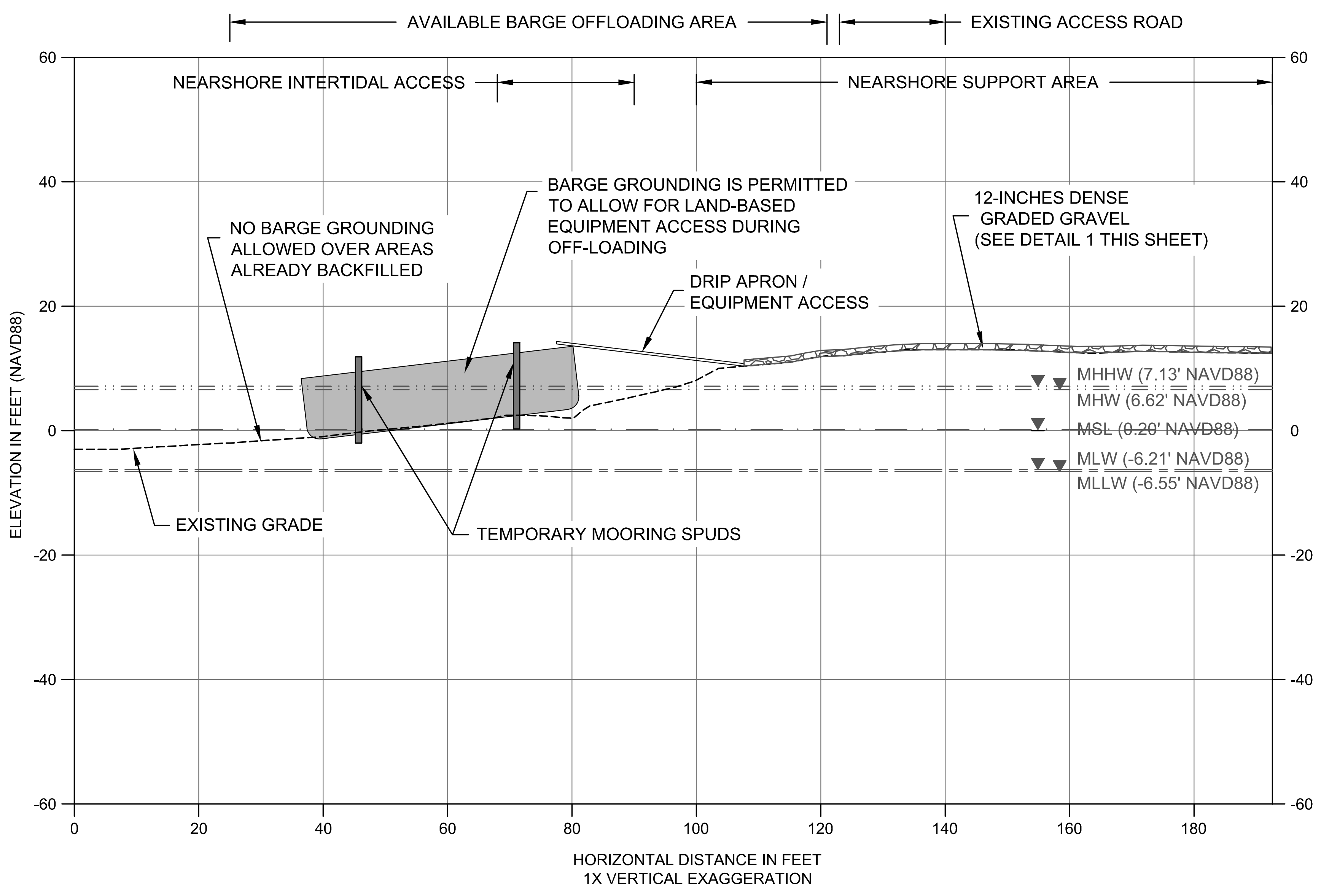
DREDGE / EXCAVATION CROSS SECTIONS
G-G' AND H-H'

C-8

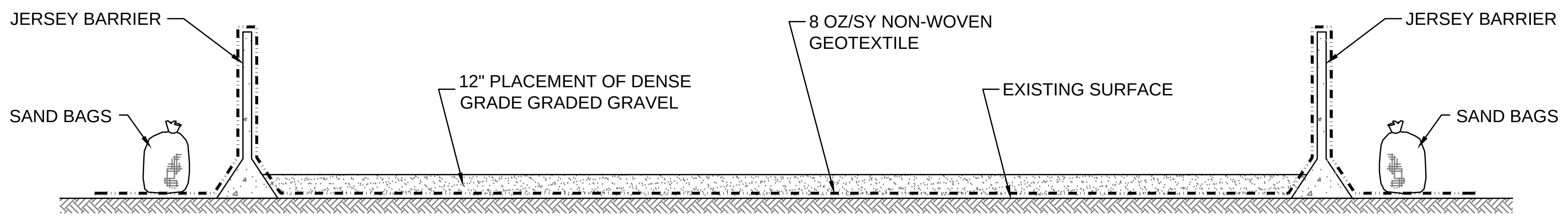
SHEET NO. 15 OF 19



A SECTION
G-6
SCALE:1" = 20'



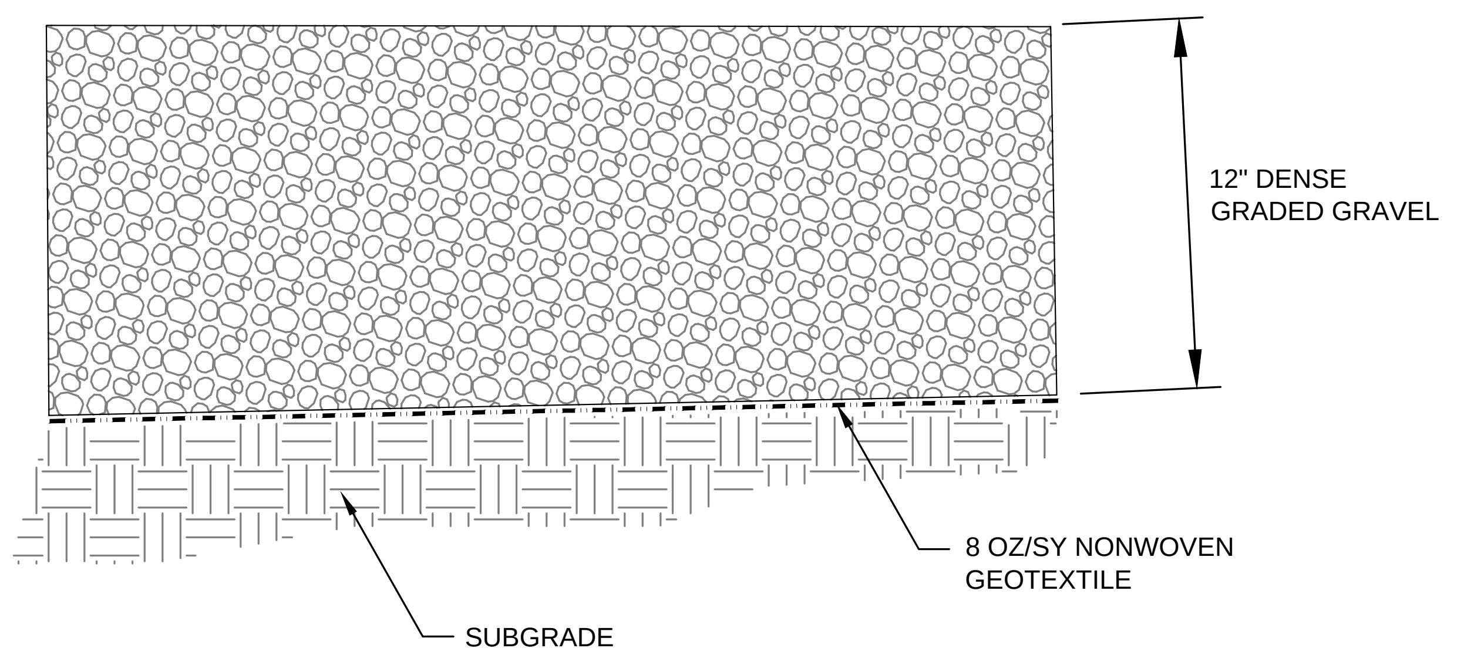
B SECTION
G-6
SCALE:1" = 20'



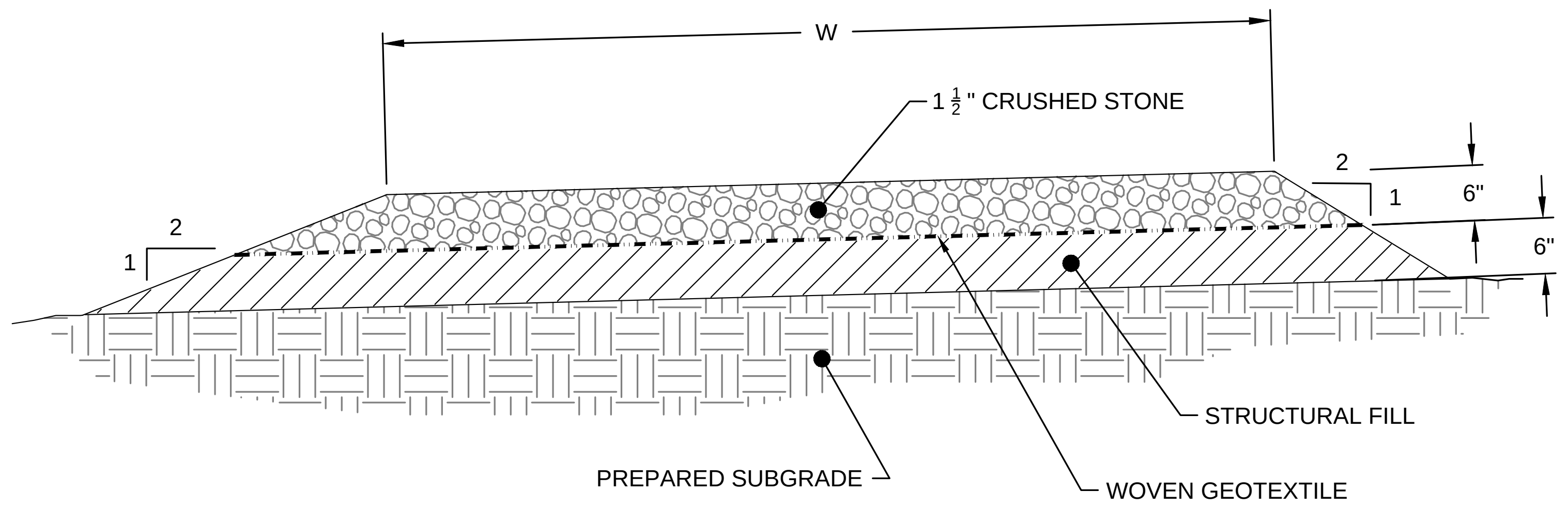
NOTES:

1. CONSTRUCT ACCESS FOR LAND BASE EQUIPMENT ACCESS BETWEEN BARGE AND NEARSHORE SUPPORT AREA.
2. AT THE COMPLETION OF THE WORK, RESTORE TO EXISTING CONDITIONS.

1 BARGE ACCESS TYPICAL SECTION
C-6
NOT TO SCALE



2 STAGING AREA DETAIL
G-6
NOT TO SCALE



NOTES:

1. W = 15' FOR ONE-WAY ROAD AND 25' FOR TWO-WAY ROAD.
2. SLOPE SURFACE 1% TO DRAIN.

3 ACCESS ROAD DETAIL
G-6
NOT TO SCALE

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**08 APRIL 2016**

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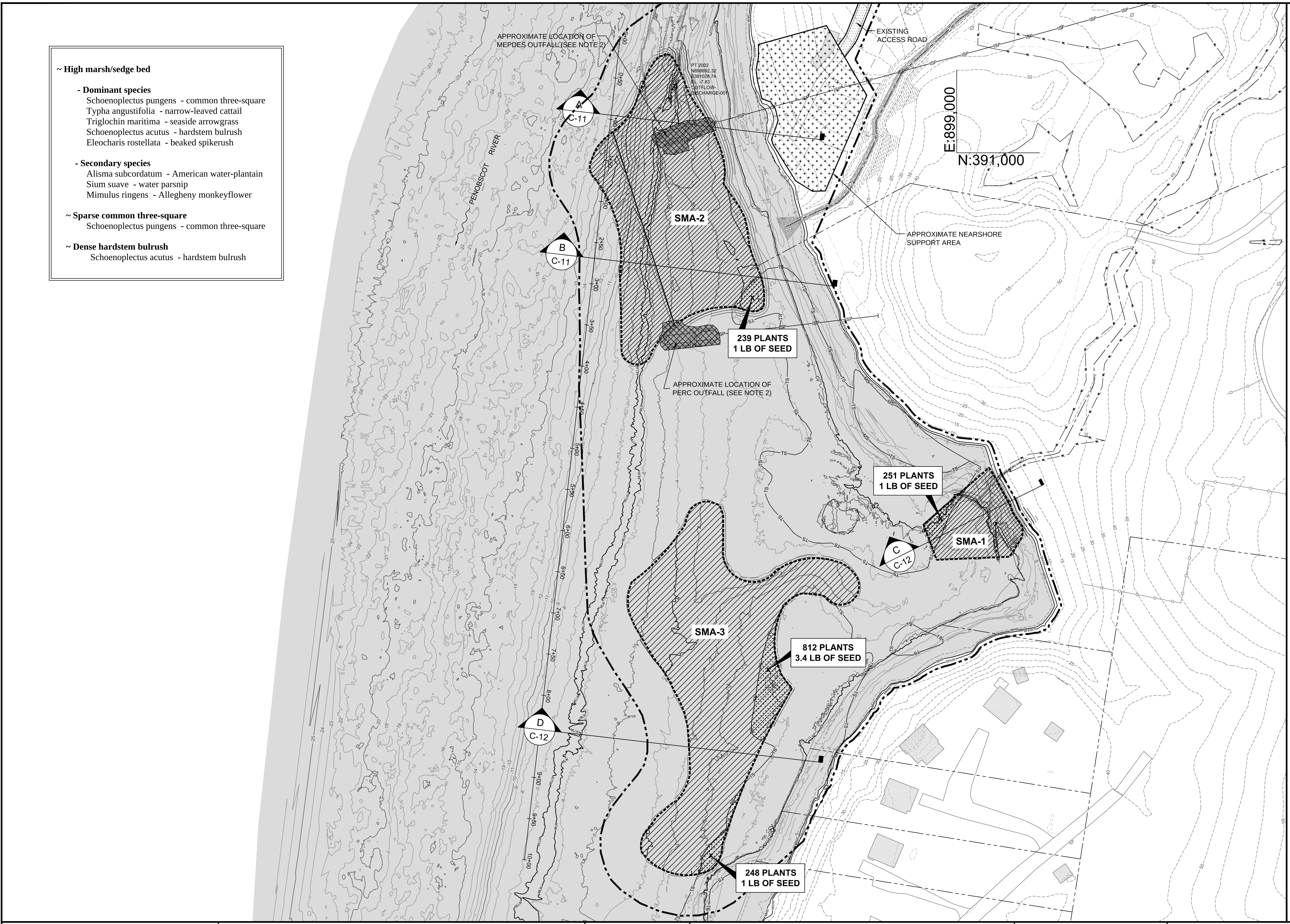
DESIGNED BY: R. PICKERING
DRAWN BY: P. SCIABA
CHECKED BY: R. GARDNER
APPROVED BY: P. LaROSA
SCALE: AS SHOWN
DATE: 8 APRIL 2016

**SOUTHERN COVE CORRECTIVE MEASURES**
**IMPLEMENTATION PLAN, ORRINGTON REMEDIATION SITE**
**ORRINGTON, MAINE**

BARGE OFFLOADING TEMPORARY
CONSTRUCTION AND DETAILS

C-9

SHEET NO. 16 OF 19



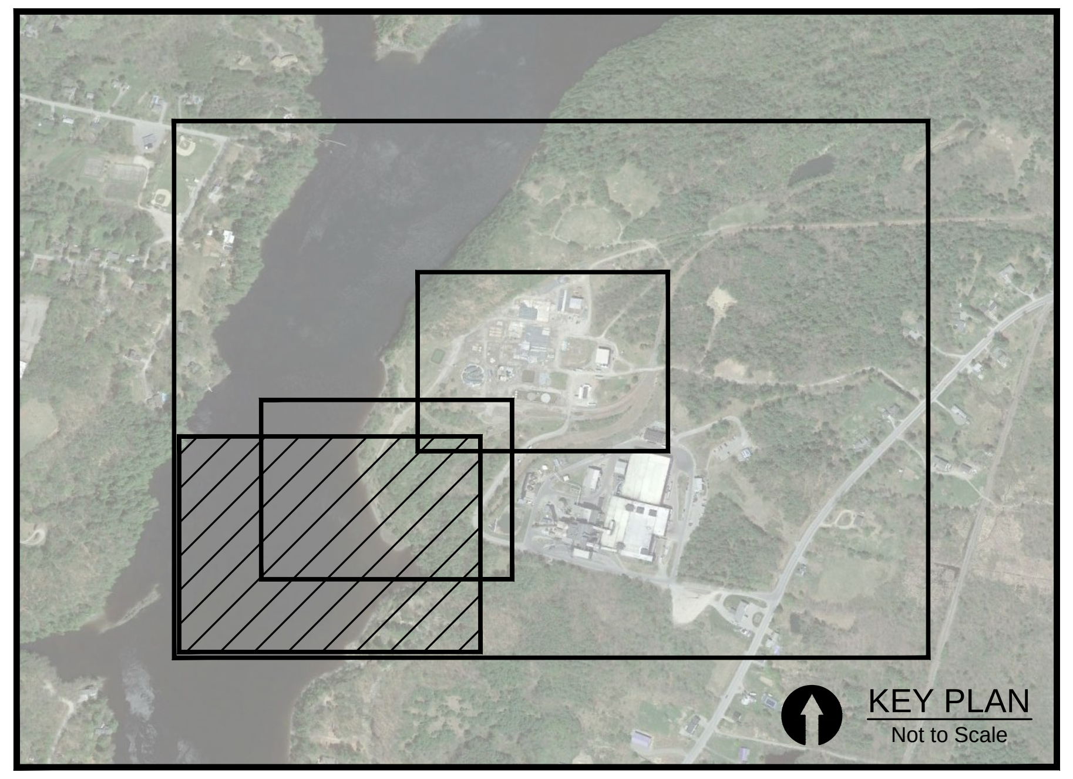
**~ High marsh/sedge bed**

**- Dominant species**
Schoenoplectus pungens - common three-square
Typha angustifolia - narrow-leaved cattail
Triglochin maritima - seaside arrowgrass
Schoenoplectus acutus - hardstem bulrush
Eleocharis rostellata - beaked spikerush

**- Secondary species**
Alisma subcordatum - American water-plantain
Sium suave - water parsnip
Mimulus ringens - Allegheny monkeyflower

**~ Sparse common three-square**
Schoenoplectus pungens - common three-square

**~ Dense hardstem bulrush**
Schoenoplectus acutus - hardstem bulrush



**LEGEND:**

| | |
|---|---|
| - - -100- - - <br> - - -111- - - | EXISTING CONTOURS (FEET NAVD88) (1-FOOT INTERVAL) |
| —MHHW— | MEAN HIGHER HIGH WATER (7.13' NAVD88) |
| —MHW— | MEAN HIGH WATER (6.62' NAVD88) |
| —MSL— | MEAN SEA LEVEL (0.20' NAVD88) |
| —MLW— | MEAN LOW WATER (-6.21' NAVD88) |
| —MLLW— | MEAN LOWER LOW WATER (-6.55' NAVD88) |
| —WL— | WETLAND BOUNDARY |
| — - - — | PROPERTY LINE |
| —TS— | SPARSE THREE-SQUARE SEDGE |
| —MS— | HIGH MARSH/SEDGE BED |
| —HS— | DENSE HARDSTEM BULRUSH |
| —■ ■— | MARINE REMEDIATION CONTRACTOR LIMIT OF WORK |
| ▒ | EXISTING ACCESS ROAD |
| ⊞ | APPROXIMATE NEARSHORE SUPPORT AREA |
| ▩ | EXCAVATION AND IMMEDIATE BACKFILL WITHIN OUTFALL OFFSET |
| ▨ | BACKFILL AREAS (RESTORE TO APPROXIMATE PRE-DREDGE/EXCAVATION GRADES) |
| ░ | WETLAND COMMUNITY PLANTING AREA |

**HORIZONTAL DATUM:** MAINE STATE PLANE EAST ZONE, NORTH AMERICAN DATUM OF 1983 (NAD83), U.S. SURVEY FEET.

**VERTICAL DATUM:** NORTH AMERICAN VERTICAL DATUM 1988, (NAVD88), U.S. SURVEY FEET.

**NOTES:**

1. SEE SHEET G-2 FOR GENERAL NOTES AND LEGEND.
2. REMEDIATION CONTRACTOR SHALL VERIFY LOCATIONS OF MEPDES AND PERC OUTFALLS. DREDGING AND BACKFILLING SHALL OCCUR IN INTERVALS IN ACCORDANCE WITH SECTION 35 20 23 - DREDGING AND EXCAVATION.
3. MUDFLAT WETLAND COMMUNITY DELINEATED MAY 28, 2015.
4. WETLAND IMPACTS ARE ESTIMATED BASED ON THE DREDGE DESIGN. FINAL IMPACTS AND PLANT/SEED QUANTITIES SHALL BE VERIFIED WITH THE REMEDIATION PROJECT MANAGER AFTER DREDGING AND BACKFILL ARE COMPLETE.
5. THE REMEDIATION IS CURRENTLY ONLY ANTICIPATED TO IMPACT AREAS OF SCHOENOPLECTUS PUNGENS AND PLANTING IS ASSUMED TO BE IN-KIND, BUT THE FINAL SPECIES TO BE PLANTED WILL DEPEND ON FINAL REMEDIAL IMPACTS AND SHALL BE CONFIRMED WITH THE REMEDIATION PROJECT MANAGER.
6. PLANTING QUANTITIES BASED ON A PLANTING DENSITY OF 2-FT ON CENTER (10,890 PLANTS/ACRE).
7. SEEDING DENSITY IS ASSUMED AT 45 LBS/ACRE.
8. PLACE 6 INCHES OF HABITAT AMENDED BACKFILL WITHIN WETLAND COMMUNITY PLANTING AREAS IN ACCORDANCE WITH SPECIFICATION SECTION 32 91 00 - REVEGETATION.

NORTH

0 60 120
SCALE IN FEET

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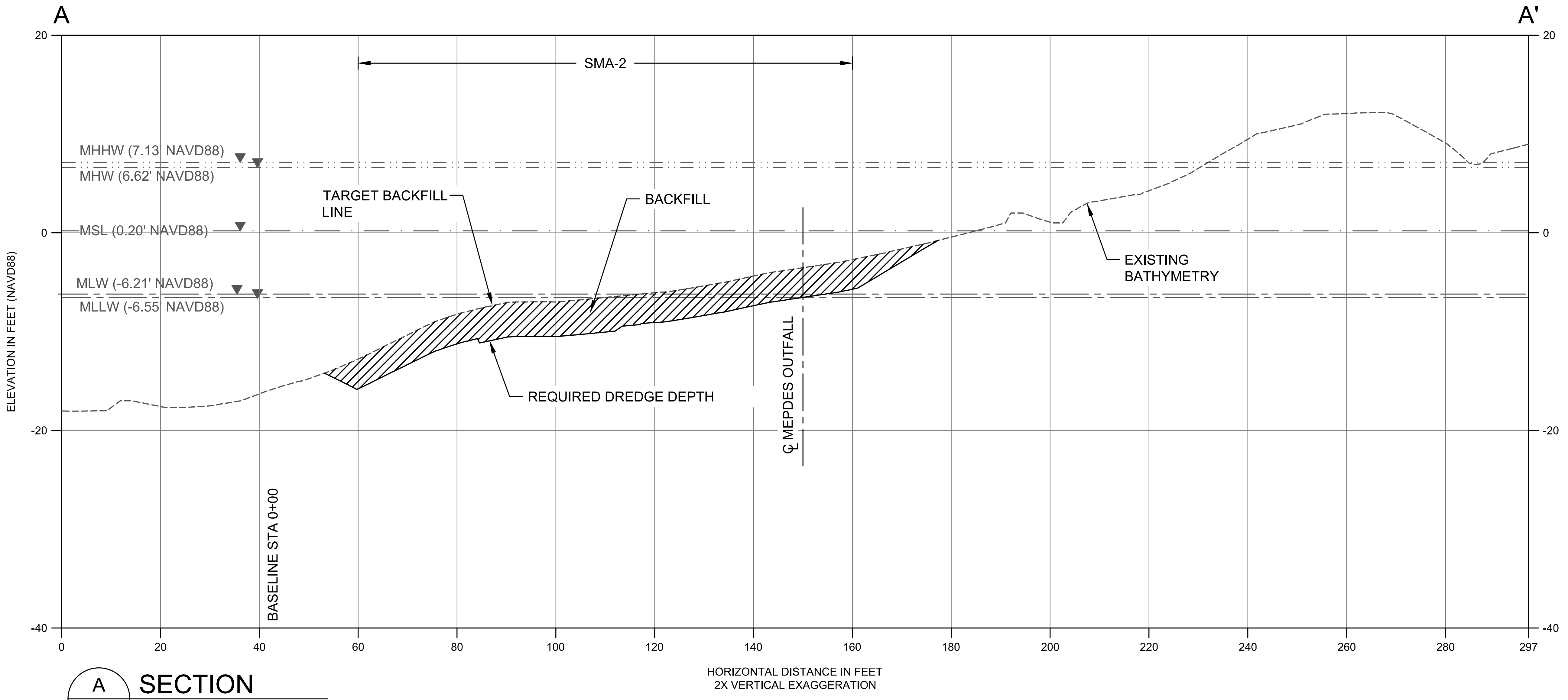
DESIGNED BY: R. PICKERING / N. KELSALL
DRAWN BY: P. SCIABA
CHECKED BY: R. GARDNER / R. DAVIS
APPROVED BY: P. LaROSA
SCALE: AS SHOWN
DATE: 8 APRIL 2016

## SOUTHERN COVE CORRECTIVE MEASURES IMPLEMENTATION PLAN, ORRINGTON REMEDIATION SITE
## ORRINGTON, MAINE

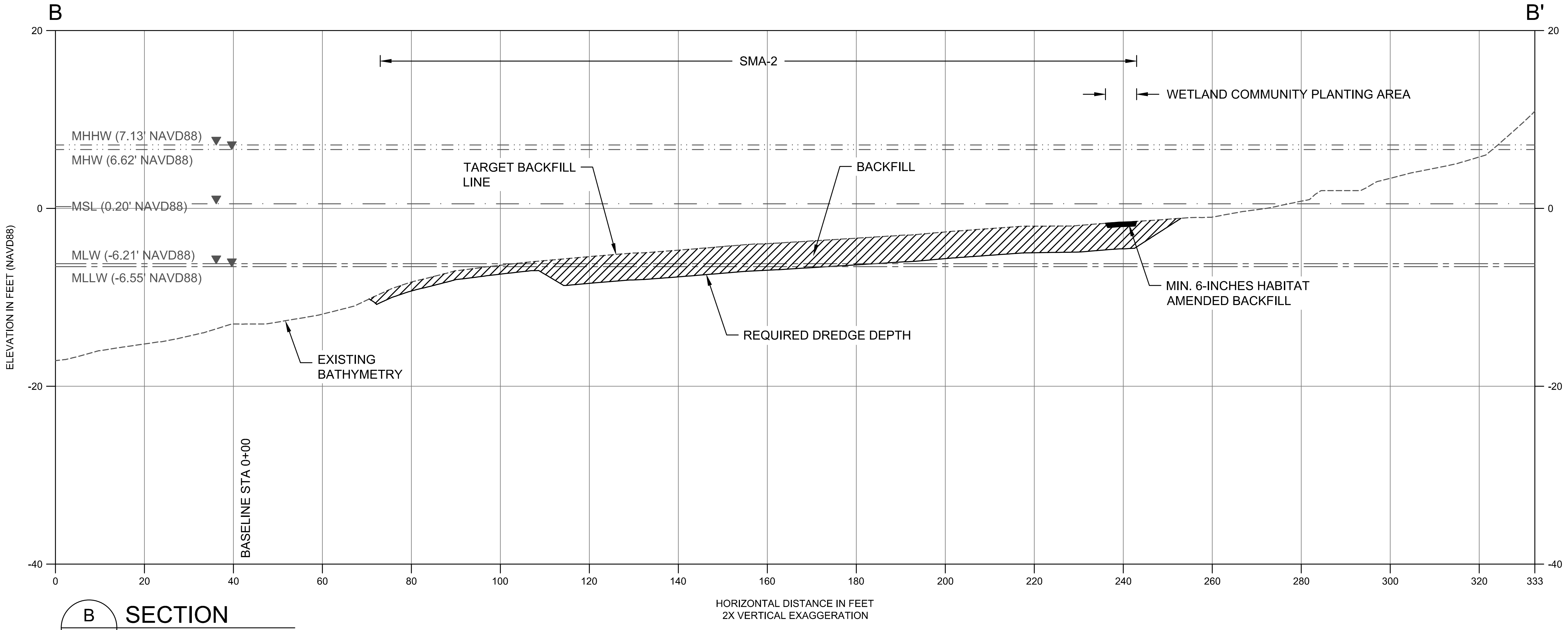
BACKFILL AND RESTORATION PLAN

C-10

SHEET NO. 17 OF 19



A SECTION
C-10
SCALE: 1" = 20'



B SECTION
C-10
SCALE: 1" = 20'

**LEGEND:**

- - - - - EXISTING BATHYMETRY
——— REQUIRED DREDGE DEPTH

**VERTICAL DATUM:** NORTH AMERICAN VERTICAL DATUM 1988, (NAVD88), U.S. SURVEY FEET.

0 20 40
SCALE IN FEET

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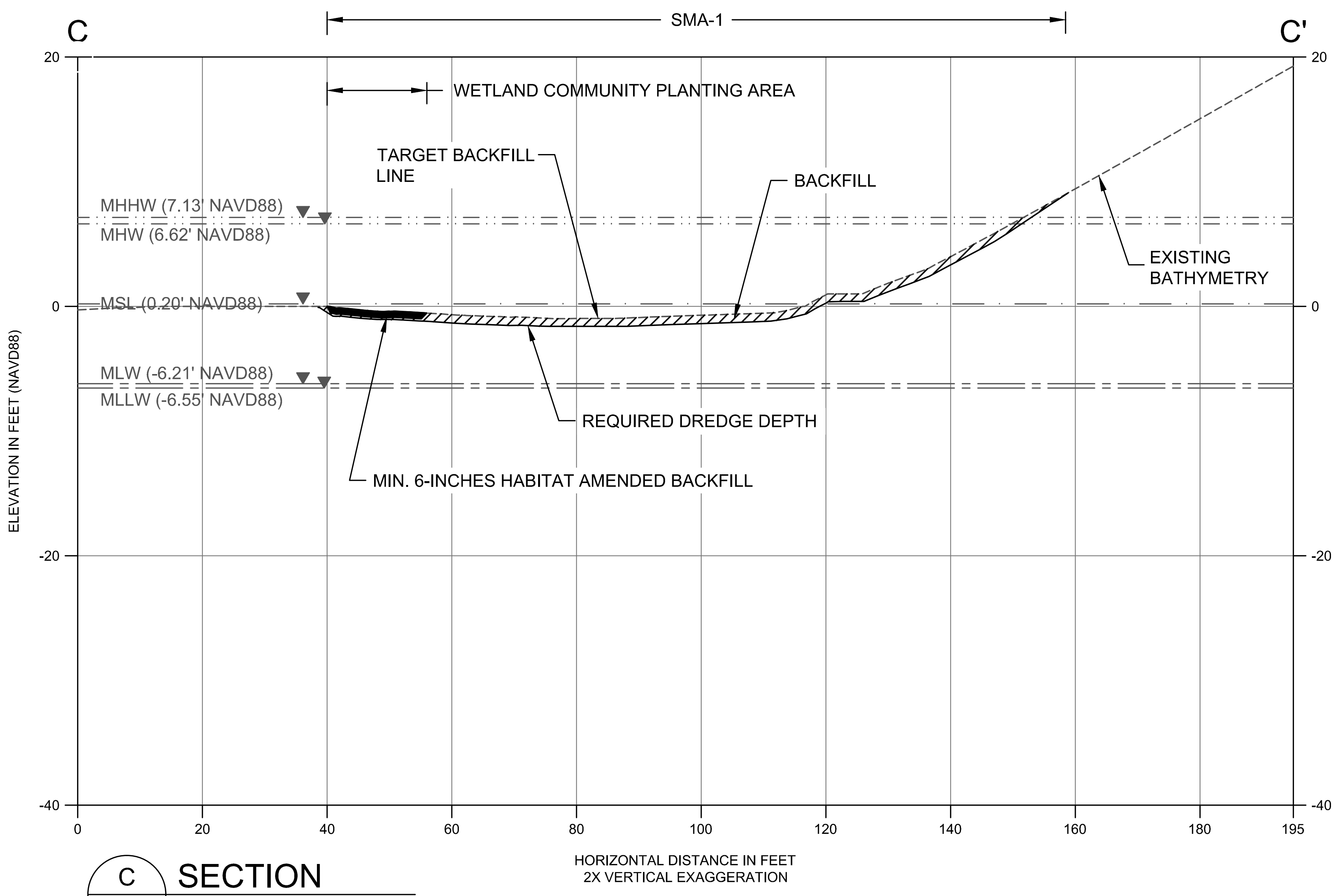
DESIGNED BY: R. PICKERING
DRAWN BY: P. SCIABA
CHECKED BY: R. GARDNER
APPROVED BY: P. LaROSA
SCALE: AS SHOWN
DATE: 8 APRIL 2016

**SOUTHERN COVE CORRECTIVE MEASURES**
**IMPLEMENTATION PLAN, ORRINGTON REMEDIATION SITE**
**ORRINGTON, MAINE**

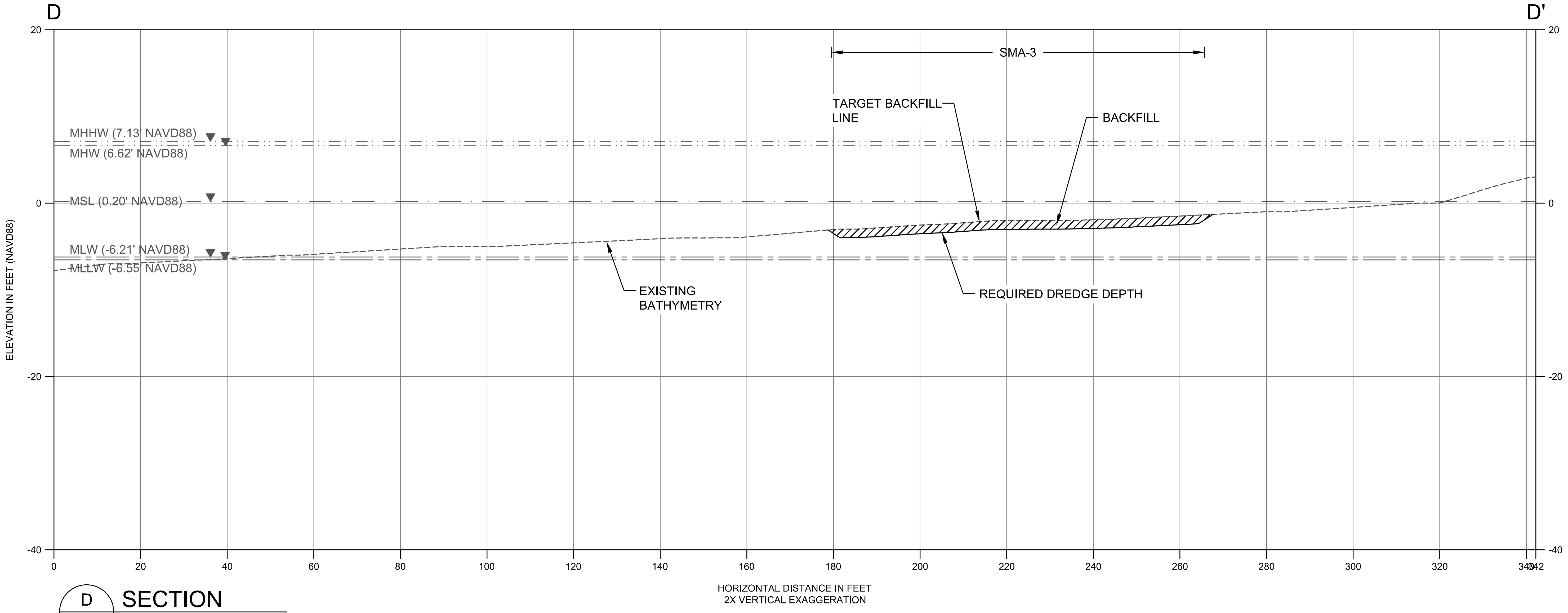
BACKFILL PLAN AND RESTORATION
CROSS SECTIONS A-A' AND B-B'

C-11

SHEET NO. 18 OF 19



C
C-10
SECTION
SCALE: 1" = 20'



D
C-10
SECTION
SCALE: 1" = 20'

**LEGEND:**

| | |
|---|---|
| - - - - - - | EXISTING BATHYMETRY |
| ———— | REQUIRED DREDGE DEPTH |

**VERTICAL DATUM:** NORTH AMERICAN VERTICAL DATUM 1988, (NAVD88), U.S. SURVEY FEET.

0 20 40
SCALE IN FEET

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**PRELIMINARY**

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DESIGNED BY: R. PICKERING
DRAWN BY: P. SCIABA
CHECKED BY: R. GARDNER
APPROVED BY: P. LaROSA
SCALE: AS SHOWN
DATE: 8 APRIL 2016

**SOUTHERN COVE CORRECTIVE MEASURES**
**IMPLEMENTATION PLAN, ORRINGTON REMEDIATION SITE**
**ORRINGTON, MAINE**

BACKFILL PLAN AND RESTORATION
CROSS SECTIONS C-C' AND D-D'

C-12

SHEET NO. 19 OF 19

# Appendix F

# Technical Specifications

**END OF SECTION**

## PART 1 – GENERAL

### 1.01 DEFINITIONS

A. **As-built Drawings**: As-built Drawings are Site plans that are provided by the Remediation Contractor during and at the conclusion of the construction work to show as-built conditions of the Corrective Measures.

B. **Barge Offloading Area**: The area along the shoreline where the Remediation Contractor is allowed to ground barges and offload sediment barges or load clean backfill material onto barges as shown on the Drawings using the environmental controls and best management practices (BMPs) required in Section 01 57 19 – Temporary Environmental Controls. No grounding of barges shall occur within the Maine Pollutant Discharge Elimination System (MEPDES) and Penobscot Energy Recovery Company (PERC) outfall areas or within areas of established wetland vegetation shown on the Drawings.

C. **Bid**: The offer of a Bidder, on the prescribed Bid Form, properly executed, setting forth the price or prices for the Work to be performed.

D. **Certification Unit (CU)**: A subarea within the Sediment Management Area (SMA) boundaries shown on the Drawings used to assess compliance with the required dredging elevations and/or excavation grades. CUs for dredge areas will be defined by the work area within the dimensions of the mobile silt curtain system to allow for dredging, surveying, verification, and immediate placement of interim backfill material after dredging is completed within the silt curtain system and prior to moving the mobile silt curtain system to a new work area. CUs for excavation areas will be defined by the area to be excavated and backfilled to final grade “in the dry” and within a single tide cycle. CUs will be finalized after consultation and verification by the Remediation Project Manager (RPM).

E. **Change Order**: A written document issued by the Owner on or after the date of the execution of the Agreement that authorizes and directs an addition, deletion, or other revision in the Work, or an adjustment in the Contract Time or Contract Sum.

F. **Contract**: The Contract is the legal relationship between the Owner and the Remediation Contractor and describes the rights, duties, and obligations of each as set forth in the Contract Documents.

G. **Contract Documents**: Contract Documents include the General Terms and Conditions, Prime Contract, Request for Proposal, Drawings, Specifications, exhibits, attachments, modifications, amendments, and change orders.

H. **Day**: The term day shall mean a calendar day unless otherwise specifically designated.

I. **Debris**: Debris including, but not limited to, timber piles, blocks, brick, plastics, tires, wire/cable, sheet metal, wood debris, and other miscellaneous materials as designated by the RPM.

J. **Drawings**: The graphic presentation of the Work or parts thereof that indicate the size, form, location, and arrangement of the various elements of the Work. The Drawings means the final design drawings issued for construction, titled Southern Cove Corrective Measures Implementation Plan (CMI Plan), Orrington Remediation Site, Orrington, Maine, dated June 2016, that are part of the Contract Documents.

K. **Dredging**: The removal of material using marine dredging equipment in subtidal areas or intertidal areas accomplished with overlying water present and with the use of a mobile turbidity control system.

L. **Excavation**: The removal of material without overlying water present using either conventional land-based earthwork equipment via shoreline access or marine dredging equipment that may be grounded during low-tide conditions.

M. **Excessive Backfilling**: Material placed outside of the backfilling limits shown on the Drawings and/or above the overplacement allowance.

N. **Excessive Dredging**: Material removed from outside of the lateral limits of the SMA boundaries and/or below the Maximum Allowable Overdepth Line within a SMA boundary.

O. **Final Backfill**: Final backfill is defined as backfill material placed in lifts not to exceed 2 feet, following completion of dredging and initial backfill lift placement in all SMAs as shown on the Drawings. Within excavation areas with no overlying water, final backfill shall be placed to finished grade during the same tidal cycle as excavation work and prior to the incoming tide.

P. **Final Completion**: Occurs when the RPM determines that all items on the approved Punch List are completed or otherwise considers all physical work to be fully completed in accordance with the Contract Documents, and the Remediation Contractor has submitted all documentation required by the Contract and required by law, to allow the Owner to process final acceptance of the Contract.

Q. **Finished Grade(s)**: The post-backfill grade that shall be compared to the pre-backfill placement survey grades. This comparison will verify material placement thickness requirements as specified on the Drawings.

R. **Hazardous Materials**: Any hazardous or toxic substances, materials, and wastes listed in the U.S. Department of Transportation Hazardous Materials Table (49 CFR 172.101) or listed by the U.S. Environmental Protection Agency as hazardous substances (40 CFR Part 302) and any amendments thereto, and any substances, materials, or wastes that are or become regulated under federal, state, or local law. Hazardous Materials (or substances) shall also include, but not be limited to: regulated substances, petroleum products, pollutants, and any and all other environmental contamination as defined by, and in, any and all federal, state, and/or local laws, rules, regulations, ordinances, or statutes now existing or hereinafter enacted relating to air, soil, water, environmental, or health and safety conditions.

S. **Initial Backfill Lift**: Initial backfill lift material is defined as an average 6-inch layer of backfill material placed after the dredging in a CU that is complete as determined by the RPM's verification of the post-dredge survey. Initial backfill lift placement does not apply to areas excavated in the dry (i.e., with no overlying water). CUs within excavation areas shall be backfilled with final backfill to finished grade during the same tidal cycle as excavation work and prior to the incoming tide.

T. **Limits of Work**: As defined on the Drawings.

U. **Liquidated Damages**: The amount of money set forth in the Contract Documents, if any, for failure of the Remediation Contractor to comply with certain provisions of the Contract Documents.

V. **Manufacturer**: The manufacturer refers to the manufacturer of geosynthetics (i.e., geogrid and geotextile).

W. **Marine Area**: The Marine Area includes the portion of the Site waterward of the mean high water (MHW) line (elevation 6.62 feet North American Vertical Datum of 1988 [NAVD88]) and portions of the Penobscot River within the Marine Remediation Contractor Limit of Work.

X. **Marine Remediation Contractor**: The Marine Remediation Contractor (generally referred to as the Remediation Contractor in these Specifications) is (insert). The scope of the Marine Remediation Contractor's activities is to construct and perform the work to satisfy the Final Design as set forth in the Contract Documents. The term Remediation Contractor does not include the Landfill Remediation Contractor or the Transportation and Disposal Contractor in the Southern Cove Corrective Measures Contract Documents.

Y. **Maximum Allowable Overdepth Line**: A grade 1 foot below the Required Dredge Depth that will be allowed for the Remediation Contractor to accomplish its means and methods for dredging. Volume removed between the Payable Allowable Overdepth Line and Maximum Allowable Overdepth Line shall not be paid. The Maximum Allowable Overdepth Line does not apply to Excavation work.

Z. **Nearshore Intertidal Access**: The Nearshore Intertidal Access shall be constructed and used by the Remediation Contractor as specified in Section 01 50 00 – Construction Facilities and Temporary Controls, if necessary, and located to facilitate land equipment access to intertidal excavation areas within SMAs 1 through 3.

AA. **Nearshore Support Area**: The upland portion of the Site as shown on the Drawings that is used for the temporary staging of materials to be transported to the Temporary Soil Stockpile Area (TSSA) No. 2.. The Nearshore Support Area shall be improved, if necessary, and used by the Remediation Contractor as specified in Section 01 50 00 – Construction Facilities and Temporary Controls and located as shown on the Drawings.

BB. **Owner**: The Owner of the Site is Mallinckrodt US, LLC, and is referred to as Mallinckrodt. Mallinckrodt is responsible for Orrington Remediation Site and has contracted with CDM Smith Inc. (CDM Smith), to serve as the RPM for implementation of Corrective Measures at the Southern Cove area of the Site.

CC. **Pay Volume**: The quantity of dredged material calculated on an in situ basis above the Payable Allowable Overdepth Line using pre- and post-dredge surveys.

DD. **Payable Allowable Overdepth Line**: A vertical distance of 6 inches, as shown on the Drawings, below the Required Dredging Elevation and grades that will be paid for Dredging. No payment for excavation in the dry below the Required Dredge Elevation shall be paid. The Remediation Contractor shall select its means and methods to conduct its dredging work to stay within the Payable Allowable Overdepth Line to the extent practicable. Material dredged beyond the Payable Allowable Overdepth Line will not qualify for separate payment. Dredging beyond the Payable Allowable Overdepth Line but above the Maximum Allowable Overdepth Line is allowable but will not be paid.

EE. **Product Data**: The illustrations, standard schedules, performance charts, brochures, diagrams, and other information furnished by the Remediation Contractor to illustrate a material, product, or system for some portion of the Work.

FF. **Project**: The particular work described in the Contract Documents.

GG. **Provide**: The all-inclusive actions required to furnish, install, connect, adjust, test, and make ready for use or occupancy.

HH. **Quality Assurance**: Refers to inspection and testing of work by the RPM as set for in the Construction Quality Assurance (CQA) Plan.

II. **Quality Control**: Refers to inspection and testing of work by the Remediation Contractor and their suppliers and Subcontractors as set for in these Specifications.

JJ. **Remediation Project Manager, or RPM**: The RPM (CDM Smith) will retain all Remediation Contractor(s) (to be determined) required to implement the Southern Cove Corrective Measures. The RPM is also responsible for implementing the

CQA program and coordinating all remediation activities performed by others at the Site. In some cases, the RPM may choose to self-implement some of the required Work described in these Specifications. The RPM will be the Owner's Representative and Site Superintendent during construction.

KK. **Remediation Support Area**: Maintained by the RPM as specified in Section 01 50 00 – Construction Facilities and Temporary Controls. The Remedial Support Area is located within the upland portion of the Site as shown on the Drawings and includes TSSA No. 2.

LL. **Required Dredge Depth**: The depth below the existing riverbed within an area above which the Remediation Contractor is required to remove all material for Dredging or Excavation work, including associated side slopes or slough materials.

MM. **Samples**: Physical examples that illustrate materials, equipment, or workmanship and establish standards by which the Work will be judged.

NN. **Schedule of Prices**: Means the unit prices set forth in the Contract Documents.

OO. **Sediment Management Area (SMA)**: A subarea of the Site as shown on the Drawings that defines the horizontal limits of Dredging and/or Excavation. There shall be no Dredging or Excavation outside of the SMA boundaries unless approved or directed by the RPM.

PP. **Side Slope**: The slope to be excavated between the outer edge of the dredge cut at design depth (toe) and the intersect point at original ground level (top of cut).

QQ. **Site**: The Site refers to the Orrington Remediation Site in Orrington, Maine.

RR. **Specifications**: Those portions of the Contract Documents consisting of the written technical descriptions of materials, equipment, construction systems, standards, workmanship, and other requirements that govern the quality and performance of the Work.

SS. **Subcontractor**: The term "Subcontractor" refers to those entities used by the Remediation Contractor(s) or the Transportation/Disposal Contractor to aid in completion of the work. Terms "the Subcontractor" and "Subcontractors," if used, all refer back to Subcontractor.

TT. **Submittals**: Submittals consist of those items required by these Specifications to be presented to the Owner in advance of beginning Work that is contractually dependent on Owner review and approval of the defined submittal content.

UU. **Supplier**: A vendor, supplier, distributor, or material supplier that supplies material or equipment used in the performance of the Work.

VV. **Surveyor**: The Surveyor is an independent registered land surveyor, licensed in the State of Maine, who is subcontracted with the Remediation Contractor.

WW. **Target Backfill Line:** The target backfill line is defined as the target elevation that the Remediation Contractor shall place backfill material with a placement tolerance of +/- 3 inches to restore dredge/excavation areas to pre-construction grades as shown on the Drawings. Overplacement of backfill material, if required by the Remediation Contractor, to meet the target backfill line and beyond the placement tolerance is considered excessive backfilling and will not be paid.

XX. **Transportation and Disposal Contractor**: The Transportation and Disposal Contractor has been retained by the RPM. The Transportation/Disposal Contractor will be responsible for transportation and disposal services related to the Southern Cove Corrective Measures at the direction of the RPM.

YY. **Work**: All services, labor, materials, equipment, and incidentals necessary to successfully complete the work and service required by or reasonably inferable from the Contract Documents, including all materials and equipment to be incorporated in the construction.

## 1.02 ACRONYMS

A. The following acronyms are used throughout these Specifications and on the Drawings.

| | |
|---|---|
| ANSI | American National Standards Institute |
| ASCII | American Standard Code for Information Interchange |
| ASTM | American Society for Testing and Materials |
| BMP | best management practice(s) |
| CAD | Computer Aided Design |
| CBR | California Bearing Ratio |
| CD | cross-machine Direction |
| CFR | Code of Federal Regulations |
| CHASP | Contractor Health and Safety Plan |
| CMI Plan | Corrective Measures Implementation Plan |
| COC | chemical of concern |

| | |
|---|---|
| CQA | Construction Quality Assurance |
| CQC | Construction Quality Control |
| CRZ | Contaminant Reduction Zone |
| CWA | Clean Water Act |
| CU | Certification Unit |
| cy | cubic yard |
| DAR | Daily Activity Report |
| DOT | Department of Transportation |
| DTM | digital terrain model |
| EPP | Environmental Protection Plan |
| EZ | Exclusion Zone |
| $gal/min/ft^2$ | gallons per minute per square foot |
| GWTP | groundwater treatment plant |
| H:V | horizontal to vertical |
| HAZWOPER | Hazardous Waste Operations and Emergency Response |
| HSO | Health and Safety Officer |
| Maine DEP | Maine Department of Environmental Protection |
| MARV | minimum average roll value |
| MD | machine direction |
| MEPDES | Maine Pollutant Discharge Elimination System |
| mg/kg | milligrams per kilogram |
| mg/L | milligrams per liter |
| MHHW | mean higher high water |
| MHW | mean high water |

| | |
|---|---|
| mil | millimeter |
| min | minute |
| MLLW | mean lower low water |
| mm | millimeter |
| MPS | Media Protection Standard |
| NAD83 | North American Datum of 1983 |
| NAVD88 | North American Vertical Datum of 1988 |
| NFPA | National Fire Protection Act |
| NIOSH | National Institute of Occupational Safety and Health |
| OSHA | Occupational Safety and Health Administration |
| oz/yd$^2$ | ounce per square yard |
| PAMP | Perimeter Air Monitoring Plan |
| PC | personal computer |
| PDF | portable document format |
| PERC | Penobscot Energy Recovery Company |
| PPE | Personal Protective Equipment |
| ppm | parts per million |
| QA/QC | quality assurance/quality control |
| RAG | Remedial Action Guidelines |
| RMS | root-mean square |
| RPM | Remediation Project Manager |
| RTK-GPS | real-time kinematic-GPS |
| SMA | Sediment Management Area |
| SPCC | Spill Prevention, Control, and Countermeasures |

| | |
|---|---|
| SWPPP | Stormwater Pollution Prevention Plan |
| SZ | Support Zone |
| TESC | Temporary Erosion and Sedimentation Control |
| TIN | triangulated irregular network |
| TOC | total organic carbon |
| TSS | total suspended solids |
| TSSA | Temporary Soil Stockpile Area |
| USACE | U.S. Army Corps of Engineers |
| USCG | U.S. Coast Guard |
| USEPA | U.S. Environmental Protection Agency |
| UV | ultraviolet |
| VHF | very high frequency |
| WINOPS | Windows Offshore Positioning Software |
| WQMP | Water Quality Monitoring Plan |
| WWTP | waste water treatment plant |
| XPM | Excavator Position Monitor |

## PART 2 – PRODUCTS

Not used.

## PART 3 – EXECUTION

Not used.

**END OF SECTION**

## PART 1 – GENERAL

### 1.01 RELATED SECTIONS

A. General requirements regarding conduct of the Work described in this Section apply to all work included in these Specifications.

### 1.02 REFERENCES

A. CQA Plan submitted as Appendix G of the CMI Plan (Anchor QEA, June 2016).

B. Southern Cove CMI Plan, Orrington Remediation Site, Orrington, Maine, dated June 2016

C. Project Health and Safety Plan (HASP; CDM Smith, October 9, 2014).

D. Perimeter Air Monitoring Plan (CDM Smith, June 25, 2015).

E. Permits (listed in Article 1.05).

### 1.03 SITE AND PROJECT BACKGROUND

A. The Owner requires remediation of contaminated sediment within portions of the Penobscot River (SMA-1, -2, and -3 as shown on the Drawings) as part of the Orrington Remediation Site – Southern Cove remediation project at the former HoltraChem Manufacturing facility in Orrington, Maine.

### 1.04 SITE CONDITIONS

A. The Work under this Contract includes excavation and dredging of contaminated sediments with low to moderate concentrations of mercury, ranging from 2.2 to 460 mg/kg. As summarized in the Site Investigation Report (CDM, Revised August 15, 2001) and the Corrective Measures Study (CDM, Revised September 19, 2003), these mercury concentrations exceed cleanup standards and are located within the SMAs defined on the Drawings.

B. Additional details on Site conditions are provided in the Appendices to these Specifications and the CMI Plan. Current data indicate that the sediment to be dredged is not designated as hazardous waste.

C. Ambient Conditions:

1. The sediment removal areas are within the intertidal zone with tidal ranges of up to 16 feet with accompanying high water velocities.

2. The location is subject to seasonal air and water temperature fluctuations, with below freezing temperatures possible from mid-fall to late spring.

3. The Site location is subject to formation of large ice on the river, and ice floes may accumulate on the shoreline and within the Limit of Work from late fall to late spring.

4. It is the Remediation Contractor's responsibility to familiarize itself with the local conditions and, as necessary, coordinate with local authorities regarding river conditions.

## 1.05 REGULATORY REQUIREMENTS

A. The Remediation Contractor shall keep fully informed of all local ordinances, as well as state and federal laws, that in any manner affect the Work specified herein. The Remediation shall comply with said ordinances, laws, and regulations at all times, and protect and indemnify the Owner and its officers and agents against any claim or liability arising from, or based on, the violation of such laws, ordinances, or regulations. The Remediation Contractor shall secure and pay for any permits, licenses, and inspection fees necessary for prosecution and completion of the Work that have not otherwise been obtained by the Owner.

B. The Remediation Contractor shall comply with all conditions required and response actions attached to applicable county, federal, state, and local permits and project requirements in Appendix A. The permits to be obtained by the Owner include the following:

1. USACE Maine Individual Permit, which includes the following approvals and consultations:
    a) Section 10 of the Rivers and Harbors Act of 1899
    b) CWA Section 401 Water Quality Certification
    c) CWA Section 404
    d) Section 7 consultations with National Oceanic and Atmospheric Administration, National Marine Fisheries Service, and U.S. Fish and Wildlife Service for Endangered Species Act and Essential Fish Habitat
    e) Section 106 National Historic Preservation Act consultation
2. Maine Natural Resource Protection Act Permit by Rule
3. Orrington Shoreland Protection Act Permit
4. MEPDES Permit #ME0000639 and Waste Discharge License #W0001048-5N-D-R
5. MEPDES Construction Stormwater General Permit

C. Any apparent or perceived conflicts between the Contract Documents and issued permits shall be brought to the attention of the RPM. Nothing in the Contract Documents shall be interpreted as authorizing violation of these permits.

D. The Remediation Contractor shall obtain and submit any and all remaining permits required for the Work, above and beyond those already secured by the Owner. The Remediation Contractor shall also notify the RPM of any work it believes may not be covered by the permits listed in Article 1.05B.

E. The Remediation Contractor shall make arrangements for all inspections and testing required by the permits and conditions of the permits.

F. The Remediation Contractor shall retain permits at the Site, per requirements in Section 01 70 00 – Project Record Documents and Project Closeout.

## 1.06 ORDER OF PRECEDENCE

A. In the event of a discrepancy either on the Figures, on the Drawings, or in these Specifications, the matter shall be promptly submitted to the Owner, who shall promptly make a determination in writing. Any work performed by the Remediation Contractor impacted by the discrepancy in the documents without such a determination shall be at the Remediation Contractor’s own risk and expense.

B. In the event of a conflict between the Contract Documents and applicable laws, codes, ordinances, regulations, permits, or orders of governmental authorities having jurisdiction over the Work or any portion thereof; or in the event of any conflict between such applicable laws, codes, ordinances, regulations, or orders; the most stringent requirements of any of the above shall govern and be considered as a part of this Contract in order to afford the Owner the maximum benefits thereof.

## 1.07 SCOPE OF WORK BY REMEDIATION CONTRACTOR

A. The Remediation Contractor shall furnish all labor, materials, services, insurance, tools, equipment, temporary facilities, decontamination facilities, and incidentals to perform the Work in accordance with the Contract Documents, including the Drawings and these Specifications and applicable laws, permits, regulations, codes, ordinances, and standards.

B. The accompanying Drawings and these Specifications show and describe the location and type of work to be performed under this Project. The Work for this Project generally includes:

1. Compliance with the conditions of the Contract, including, but not limited to, field supervision and management; QC; administration and home office support; purchasing; site security and emergency services; health and

safety supplies; and temporary facility (e.g., office, equipment, supplies, and incidentals) and utilities for the construction period (e.g., phone, electric, water, and Internet).

2. Development of required submittals including Work Plans, CHASPs, QC, and EPPs.

3. Mobilization, Site Work, and temporary facilities, including mobilization of personnel and equipment; meetings; temporary facilities such as trailers, sanitary facilities, utilities (e.g., electrical and phones), and temporary access; traffic controls; dust; erosion, fugitive emissions and air monitoring and security controls; and surveying.

4. Site preparation, including improvements necessary to establish site access, shoreline access, and the barge offloading area.

5. Dredging and excavation of contaminated sediments and intertidal shoreline soils from the Marine Areas SMA-1, SMA-2, and SMA-3, as described in Section 35 20 23 – Dredging and Excavation. Filtering of excess water generated during dredging or excavation prior to discharge back to the river. Development, operation, and maintenance of methods/equipment to prevent the migration of turbid water during dredging.

6. Offloading of dredged/excavated materials to land and transport from the Nearshore Support Area to TSSA No. 2 within the Remediation Support Area. Development of facilities within the Barge Offloading Area necessary to transload materials in a manner compatible with dredging/excavation methods selected by the Remediation Contractor. Establishment of environmental protection measures to prevent spills during transloading.

7. Placement of clean backfill material from upland sources to restore the sediment surface to pre-construction grades, including placement of a 6-inch Initial Backfill Lift followed by final backfilling as described in Section 35 20 26 – Backfill and Material Placement within CUs dredged with overlying water and placement of Final Backfill materials over the entire post-dredged/excavated surface to restore removal areas to approximate pre-construction grades using clean backfill material from upland sources.

8. Monitoring and verification of construction activities as specified in Section 01 45 00 – Quality Control and Section 02 21 00 – Surveying.

9. Preparation of Record Drawings and other construction documentation as specified in Section 01 70 00 – Project Record Documents and Project

Closeout, Section 01 45 00 – Quality Control, and Section 02 21 00 – Surveying.

10. Site restoration, including planting and revegetation in disturbed intertidal Work areas and upland access and support areas as specified in Section 32 91 00 – Revegetation.

11. Demobilization of personnel, equipment, and materials at the completion of construction, including demobilization of temporary facilities, utilities, and closeout reporting.

C. All Work must be performed in compliance with the Project Permits described in Article 1.05.

## 1.08 SCOPE OF WORK BY RPM

A. Operation and maintenance of TSSA No. 2 for dewatering of dredged/excavated sediment and capture of water generated during the dewatering process. Establishment of facilities necessary to filter generated water.

B. Dewatering of dredged/excavated materials using an additive or soils generated by others during the remediation of other projects at the Site.

C. Management of water generated during the dewatering process and transport of contaminated water to the on-site water treatment facility.

D. Transportation and delivery of dewatered sediments to the TSSA No. 1 shown on the Drawings. The RPM will be responsible for management of the TSSA No. 1 and loading of rail cars for final transportation and disposal.

## 1.09 DESCRIPTION OF WORK AREAS

A. The Marine Area includes the portion of the Site waterward of the MHW line (elevation 6.62 feet NAVD88) and portions of the Penobscot River within the Remediation Contractor's Limit of Work. The following areas are sub-areas of the Marine Area as shown on the Drawings:

1. SMA-1 includes shallow intertidal sediment removal and backfill activities to return to approximate pre-construction grades as shown on the Drawings. SMA-1 may only be accessible by land equipment or by shallow-draft floating equipment at high tide.

2. SMA-2 includes intertidal sediment removal and backfill activities to return to approximate pre-construction grades as shown on the Drawings.

3. SMA-3 includes intertidal and offshore subtidal sediment removal and backfill activities to return to approximate pre-construction grades as shown on the Drawings.

## 1.10 DESCRIPTION OF SUPPORT AREAS

A. The Remediation Support Area was constructed by the RPM during previous phases of Site cleanup. The Remediation Contractor shall maintain access roads to the Remediation Support Area as specified in Section 01 50 00 – Construction Facilities and Temporary Controls. The Remediation Support Area is located within the Plant Area as shown on the Drawings. The Remediation Support Area includes TSSA No. 1 and TSSA No. 2 that will be maintained by the RPM.

B. The Barge Offloading Area shall be constructed and used, if necessary, by the Remediation Contractor as specified in Section 01 50 00 – Construction Facilities and Temporary Controls and located in the immediate vicinity of the terminus of the gravel access road to the Marine Area. Barges may be grounded within intertidal areas to allow for offloading and transloading of materials.

C. The Nearshore Support Area shall be improved, if necessary, and used by the Remediation Contractor as specified in Section 01 50 00 – Construction Facilities and Temporary Controls and located as shown on the Drawings.

D. The Nearshore Intertidal Access shall be constructed and used by the Remediation Contractor as specified in Section 01 50 00 – Construction Facilities and Temporary Controls, if necessary, and located to facilitate land equipment access to intertidal excavation areas within SMA-1, -2, and -3.

## 1.11 REMEDIATION CONTRACTOR'S USE OF THE SITE

A. The Limit of Work shall be confined to the smallest reasonable and practicable area to perform the Work in a safe, efficient manner within the Limit of Work detailed on the Drawings. Equipment staging areas, material storage areas, and decontamination stations shall be within the Remediation Contractor's Limit of Work. Under no circumstances shall the Remediation Contractor perform any Work or conduct any activities at the Site outside of the Remediation Contractor's Limit of Work without prior approval from the RPM. Any disturbed area(s) shall be restored to original conditions by the Remediation Contractor at no additional cost to the Owner.

B. The Remediation Contractor shall:

1. Assume responsibility for site security within the Limit of Work. Prevent entry by non-Project personnel during work hours. Provide sufficient security to prevent trespassing and vandalism during non-working hours. Confine operations to within the Limit of Work shown in the Contract Drawings and not encumber regular operation and maintenance routines of other Site activities and adjacent properties.

2. Protect adjacent properties and the existing Site.

3. Conform to all applicable laws, regulations, codes, ordinances, standards, and Contract Documents.

4. Assume full responsibility for health and safety of the Remediation Contractor's employees and Subcontractor personnel while at the Site and for implementation of the CHASP for the Work.

5. Work harmoniously with site personnel, the RPM, and all other entities engaged by the Owner necessary to complete the Work.

C. The Remediation Contractor shall plan and schedule work activities primarily during daylight hours. However, work until 10 p.m. may be permissible as approved by the RPM. All Work must be conducted in accordance with local ordinances. Night work must be requested in advance (minimum 2 days) and approved in writing by the RPM.

D. The Remediation Contractor shall plan and schedule work activities primarily during weekdays. However, limited weekend work may be permissible as approved by the RPM. Weekend work must be requested in advance (minimum 2 days) and approved in writing by the RPM.

E. The Remediation Contractor shall plan and schedule work activities to meet permit requirements and weather restrictions. Construction activities in the Southern Cove must be completed before ice conditions inhibit in-water work activities, which could be as early as mid-November. Permit requirements will require starting in-water work as late as possible in the year, to meet the end of schedule requirement, with in-water work starting not before mid-July.

F. Owner-required schedule milestones, as follows:

| **Work Element** | **Completion Date Milestones** |
|---|---|
| Mobilization | June 17, 2017 |
| Dredging/excavation and backfilling SMA-1[1] | July 15, 2017 |
| Dredging/excavation and backfilling SMA-2 and SMA-3 | November 3, 2017 (or when ice prohibits construction) |
| Sediment dewatering (by RPM) | November 15, 2017 |
| Demobilization | November 15, 2017 |
| Wetland revegetation[2] | May 31, 2018 |

Notes:

1. Contractor shall schedule dredging work to commence on the first allowable date in the permits.
2. Wetland revegetation may occur between May 1 and July 15.

## 1.12 WORK SEQUENCE

A. The sequence of the Work will be in accordance with the Construction Schedule submitted by the Remediation Contractor and approved by the RPM. The

Construction Schedule shall be based on the requirements of these Contract Documents, including sequencing requirements in these Specifications and Drawings, and on the Remediation Contractor-prepared and Owner- and Maine DEP-approved Work Plans. The Remediation Contractor shall notify the RPM and submit an updated Construction Schedule with any modifications to the sequence of the Work for approval prior to performing the Work.

B. The Remediation Contractor shall perform the Work in a manner that will allow the Site and adjacent property owners to maintain normal activities on their sites. The Remediation Contractor must ensure neighboring operations or activities are not disturbed, interrupted, or prohibited as a result of the Work.

C. The Work shall be sequenced in a manner that prevents contamination or recontamination of areas not contaminated or already decontaminated, and in accordance with the Contract Documents. Any contamination or recontamination of materials that occurs as a result of the Remediation Contractor’s activities shall be restored by the Remediation Contractor at no additional cost to the Owner.

D. The Work shall be sequenced in a manner to coordinate staging, dewatering, and loading of materials to be delivered to the RPM for transport and disposal/recycling off the Site.

E. The sequence of the Work shall include the completion of the dredging, excavation, and dewatering and initial backfill lift and final backfill placement, followed by restoration work.

## 1.13 ACCESS TO SITE

A. The Remediation Contractor will have access to the Site uplands through the main entrance to the Plant Area at 99 Industrial Way, Orrington, Maine 04474, as shown on the Drawings.

B. The Remediation Contractor will have access to the Marine Area via the water from the Penobscot River, subject to the protocols and access areas as described in these Specifications and as shown on the Drawings.

## 1.14 ENGINEERING AND INSPECTION

A. The Owner and/or its designated Representative(s) will perform the necessary inspection work, except as otherwise specified in the Contract Documents. Refer to Section 01 45 00 – Quality Control for general requirements.

B. Regulatory Agency Representatives and the Owner’s Representatives will be allowed into the Work area and on the Remediation Contractor’s equipment to inspect the Work at any time.

## 1.15 COORDINATION WITH OTHERS

A. Construction activities shall be coordinated with the RPM, who will coordinate with other on-site activities and contractors working on upland portions of the Site.

B. All costs associated with coordination of the Work shall be considered incidental to the prices set forth in the Bid Proposal.

## 1.16 OWNER'S CONSTRUCTION QUALITY ASSURANCE

A. All Work will be monitored by the RPM. The Remediation Contractor shall be aware of the activities in the CQA Plan and shall account for these CQA activities in the Construction Schedule.

B. The Remediation Contractor shall assist the RPM in every manner necessary for the proper performance of activities set forth in the CQA Plan.

C. CQA testing or inspections performed by the RPM in no manner relieve the Remediation Contractor of the responsibility to construct all work to conform to the Drawings and these Specifications and implement its own QC program per the requirements of Section 01 45 00 – Quality Control.

D. If QC or quality assurance tests indicate the Work does not meet specified requirements, the Remediation Contractor shall remove, replace, and retest the Work at a cost borne solely by the Remediation Contractor.

## PART 2 – PRODUCTS

Not used.

## PART 3 – EXECUTION

Not used.

**END OF SECTION**

## PART 1 – GENERAL

### 1.01 SCOPE

A. The Remediation Contractor shall coordinate with the RPM regarding work scheduling and progress tracking to ensure efficient, orderly implementation of the Work.

### 1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittal Procedures.

B. Section 01 35 29 – Health, Safety, and Emergency Response Procedures.

C. Section 01 45 00 – Quality Control.

D. Section 01 57 19 – Temporary Environmental Controls.

### 1.03 CONTRACTOR ORGANIZATION

A. The Remediation Contractor shall establish on-site lines of authority and communications and shall comply with procedures for communications and submittals as described in these Specifications.

B. The Remediation Contractor shall prepare and submit an organizational chart at the Pre-Construction Meeting describing the management structure of its on-site and office support personnel, as well as any Subcontractors in accordance with Section 01 33 00 – Submittal Procedures.

### 1.04 CONTACT INFORMATION

A. The Remediation Contractor shall establish and maintain contact information, including email addresses for the Remediation Contractor's Project Manager and Site Superintendent. The Remediation Contractor's Project Manager and Site Superintendent shall have phone, email, and Internet access at the Site.

### 1.05 SCHEDULES AND PROGRESS UPDATES

A. The Remediation Contractor shall submit to the RPM a Baseline Construction Schedule that conforms to the format and content requirements of the schedule submitted with the bid and/or as included in the final Contract Documents. The Baseline Construction Schedule shall:

1. Show specific tasks, dates, and the Critical Path necessary for completion of the Project within the Contract Time limits.

2. Show all significant design, manufacturing, construction, and installation activities.

3. Include sufficient time for cleaning, punch list review, and completion of punch list items prior to the Substantial Completion Date.

4. Clearly show the relationship between the work items and the starting and completion dates, as well as include all details of the Work within the timeframe shown.

B. After construction starts, the Remediation Contractor shall submit to the RPM revised progress schedules prior to or during each weekly progress meeting. Each week's schedule shall be an updated version of the Baseline Construction Schedule submitted by the Remediation Contractor and shall include ongoing and proposed activities within the next 3 weeks (3-week "look ahead").

1. The format for all schedules shall be graphical Gantt (bar) charts using the Critical Path Method with the following characteristics:

    a) Each major work element shall be represented. Significant subtasks shall be broken out from each major work element.

    b) The time scale shall indicate the first work day of each week.

    c) The diagram shall allow space for notations.

    d) The minimum diagram size shall be 11 x 17 inches.

    e) Tasks shall be listed in chronological order with the activities that are to occur first at the top of the schedule.

    f) The critical path shall be clearly indicated.

2. Each progress schedule shall show:

    a) The complete sequence of work by activity.

    b) The dates for the beginning and completion of each major work element and the sequence of significant subtasks.

3. Each revised progress update schedule shall include the following, at a minimum:

    a) Progress of each activity to date of submission.

    b) The projected percent completion for each item, as of the last day of the previous week.

c) Changes occurring since the previous schedule submission, including:

1) Changes in scope.

2) Activities modified since previous submission.

3) Revised projections of progress and completion.

4) Other identifiable changes.

d) A narrative report as needed to define:

1) Problem areas, anticipated delays, and impacts on schedule.

2) Corrective action recommended and its effect.

3) Effect of changes on Subcontractor schedules.

## 1.06 PRE-CONSTRUCTION MEETING

A. The RPM will schedule and conduct one Pre-construction Meeting at the Site prior to the commencement of any work at the Site. The RPM will prepare and distribute an agenda for this meeting and will also prepare the meeting summary/minutes.

B. The Owner, RPM, Remediation Contractor, Remediation Contractor's Superintendent, and all key Subcontractors are required to attend the meeting.

C. Anticipated Agenda:

1. Submission of executed bonds and insurance certificates.

2. Distribution of the Contract Documents.

3. Submission of the list of Subcontractors, list of products, schedule of values, progress schedule, example of weekly progress meeting agenda and minutes, and example of Daily Activity Reports (DARs) as required by this Section.

4. Designation of personnel representing parties in Contract (e.g., Site Superintendent and CQC Officer).

5. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.

6. Permits and approval status.

7. Sequence of work and schedule.

8. Health and safety requirements.

9. Use of premises by the Owner and Remediation Contractor.

10. The Owner’s requirements and partial occupancy.

11. Security procedures.

12. Construction facilities and controls.

13. Temporary utilities.

14. Survey and building layout.

15. Application for payment procedures.

16. Procedures for testing.

17. Procedures for maintaining record documents.

18. Procedures regarding communications, including interactions with media, regulators, and the public.

D. The RPM will record minutes and distribute copies to participants within 5 business days after the meeting.

## 1.07 CONSTRUCTION PROGRESS REPORTING

A. The Remediation Contractor shall review the progress and quality of the Work on a daily basis and shall prepare and submit to the RPM each day a Daily Activity Report (DAR) described herein. The DAR shall be submitted to the RPM in the morning following completion of work for that day.

B. The Remediation Contractor shall meet with the RPM daily to agree upon the quantities of materials or work completed during the day. Both parties shall initial the Project Daily Quantities Report that shows there is agreement (or a lack of agreement) over the amount of work performed that day.

C. At a minimum, the DARs shall include the following information:

1. Project name.

2. Date.

3. Author of report.

4. Weather conditions including wind, precipitation, and temperature.

5. Period covered by the report and hours worked.

6. Personnel and equipment on the Site, including a listing of all Subcontractors and suppliers, as well as sign-in logs for employees, Subcontractors, and visitors, including regulatory agencies and/or testing and inspection entities.

7. Documentation of daily health and safety briefings, daily health and safety toolbox topics, and applicable Job Safety Analyses.

8. Materials and equipment delivered, used and/or stored on the Site, and demobilized.

9. Summary of daily activities.

10. Daily CQC Report as described in Section 01 45 00 – Quality Control.

11. All quantities of the work performed. Quantities requiring subsequent measurement or survey shall be estimated for the purposes of these reports.

12. Upland and marine equipment (including dredges) being operated, including the following information for each equipment:

    a) Location of operation.

    b) Hours of operating time.

    c) Name of operator.

    d) Total area dredged/excavated/backfilled.

    e) Daily production rate.

    f) Equipment performance, maintenance, and hours of downtime due to equipment breakdowns.

13. Tonnage Report Log, including weights of each full container being offloaded and the empty container weights of the corresponding container when loaded back to the barge. The Remediation Contractor shall provide the total tonnage and volume of individual material types, including hourly material barge draft readings and the total volume of material transported to the Barge Offloading Area and TSSA No. 2 by material barge or truck that day. Offloading activities from the following work day

will not be allowed to commence until the weights from the previous day are received by the RPM.

14. Description and details of the daily QC check of all dredging equipment and positioning system sensors.

15. Area backfilled each day and the estimated volume of materials placed.

    a) Daily export of XYZ files from the Hypack System (or equivalent) and processed drawings in AutoCAD Civil 3D (2014) format or compatible DTM of the survey to show the capping and backfill progress for the day.

    b) The estimated volume of materials placed.

16. Cumulative area and volume excavated/dredged and backfilled to date for the Project.

17. Cumulative and daily tonnage of stabilizing and/or drying reagent(s) used to process dredged sediment (by the RPM).

18. Cumulative and daily waste shipment log of all materials delivered to TSSA No. 2.

19. Deliveries received and manifest documents, including truckload tickets and shipping papers.

20. Monitoring, tests, and inspections performed inclusive of results. Documentation of inspections shall include, but not be limited to:

    a) Daily inspection and reporting for all materials/equipment installed to limit erosion and contaminant migration.

    b) Twice daily (minimum) inspection reporting for mobile turbidity curtain systems.

    c) Daily inspection and summary assessment of TSSA No. 2 and Barge Offloading Area.

    d) Work Zone air monitoring test results, including air monitoring locations, concentration measurements, exceedance reporting, actions taken when exceedance occurred, and Work Zone PPE level (by the RPM).

21. Any notification of non-compliance, as described in Section 01 57 19 – Temporary Environmental Controls.

22. Delays encountered and relevant details of the delay, such as the cause, resolution, and measures implemented to avoid similar delays in the future.

23. Change of conditions observed.

24. Accidents and safety reports and any emergency response actions.

D. The Remediation Contractor shall summarize the week's work in a Weekly Progress Report to be submitted to the RPM on the following Monday morning. The Weekly Progress Report shall identify the Work completed to date, anticipated work to be completed in the current week, and the latest progress survey information. The Weekly Progress Report shall include a written Environmental Protection Inspection Report, summarizing the daily inspections, condition of the environmental protection equipment and materials, TESC facilities, and repairs or modifications to environmental protection means and methods.

## 1.08 HEALTH AND SAFETY MEETINGS

A. The Remediation Contractor shall conduct daily health and safety meetings for personnel and Subcontractors as set forth in the CHASP (see Section 01 35 29 – Health, Safety, and Emergency Response Procedures).

## 1.09 WEEKLY PROGRESS MEETINGS

A. The RPM will schedule weekly (at a minimum) progress meetings to review work progress, schedules, and other matters needing discussion and resolution. The meetings will be held in the RPM's on-site trailer.

B. The Remediation Contractor shall make arrangements for meetings, prepare an agenda with copies for participants, and preside at meetings.

C. The Site Superintendent, Site Safety and Health Officer(s), Owner, and RPM are required to attend the meetings. As appropriate to agenda topics for each meeting, the Remediation Contractor's key Subcontractors and suppliers shall also attend the meetings.

D. The Remediation Contractor shall be responsible for developing the weekly meeting agenda, which, at a minimum, shall include:

1. Review minutes of previous meetings.

2. Health and safety issues.

3. Review of progress of the Work.

4. Review of monitoring results.
5. Field observations, problems, and decisions.
6. Identification of problems impeding planned progress.
7. Review of submittals schedule and status of submittals.
8. Review of off-site fabrication and delivery schedules.
9. Review of Construction Schedule in Gantt format.
10. Corrective measures to regain projected schedules.
11. Planned progress during succeeding work period.
12. Identification of potential impacts to ongoing operations during succeeding work period and the means and methods to reduce said impact.
13. Identification of noise-producing activities planned during succeeding work period and the means and methods to control and monitor related impacts.
14. Coordination of projected progress.
15. Maintenance of quality and work standards.
16. Effect of proposed changes on progress schedule and coordination.
17. Financials discussion.
18. Action items.
19. Other business relating to the Work.

E. The Remediation Contractor shall record minutes and distribute copies by the end of the following work day to all meeting participants. The RPM will review the draft and provide comments and edits to Remediation Contractor. The Remediation Contractor shall modify and distribute a final version of the meeting minutes to the Owner and RPM prior to the subsequent weekly meeting.

## 1.10 ADDITIONAL MEETINGS

A. The Remediation Contractor shall attend additional meetings requested by the RPM, regulatory agencies, and/or local officials at no additional cost to the Owner.

B. The RPM will prepare an agenda and minutes for such meetings.

## PART 2 – PRODUCTS

Not used.

## PART 3 – EXECUTION

Not used.

**END OF SECTION**

## PART 1 – GENERAL

### 1.01 SCOPE

A. This Section includes the content, procedures, and format for preparing and transmitting submittals.

B. A tabulated summary of submittals shall be generated by the Remediation Contractor in which all submittals, as required in these Specifications and the other Contract Documents, are listed (see Article 3.01).

### 1.02 RELATED SECTIONS

A. Section 01 20 00 – Price and Payment Procedures.

B. Section 01 31 00 – Project Management and Coordination.

C. Section 01 35 29 – Health, Safety, and Emergency Response Procedures.

### 1.03 TYPES OF SUBMITTALS

A. Individual submittals are required in accordance with the pertinent Sections of these Specifications. Other submittals may be required during the course of the Project and are considered part of the Work to be completed under the Contract.

B. Required submittals include, but are not limited to, the following:

1. Plans describing the conduct and control of the Work:

    a) Contractor Work Plan.

    b) Contractor CQC Plan.

    c) CHASP.

    d) EPP.

2. Administrative submittals:

    a) Schedules, progress reports, and meeting minutes as described in Section 01 31 00 – Project Management and Coordination.

    b) Project record documents.

    c) Warranties and guarantees on the Work, equipment, and facilities.

    d) Applications for Payment as described in Section 01 20 00 – Price and Payment Procedures (RESERVED)

3. Technical submittals:

   a) Manufacturer’s specifications/cut sheets and certificates of compliance.

   b) Results of QC testing/product information.

   c) Samples of materials and products to be used for the Project.

   d) Results of environmental monitoring activities.

   e) As-built data and Drawings, including Site surveys.

   f) DARs as described in Section 01 31 00 – Project Management and Coordination.

   g) Weekly Progress Reports as described in Section 01 31 00 – Project Management and Coordination.

C. Prior to mobilization, the Remediation Contractor shall submit a proposal at the Pre-construction Meeting (see Section 01 31 00 – Project Management and Coordination) for review by the RPM of the Barge Offloading Area, Nearshore Support Area, and Remediation Support Areas indicating specific use, access, restoration, and anticipated duration of use. No use of the designated support areas is permitted until the RPM provides written approval of the Remediation Contractor’s proposal.

D. The Remediation Contractor shall submit a schedule of working hours to the RPM at the Pre-construction Meeting for acceptance prior to the start of any work in the Dredge/Excavation Limits. The Remediation Contractor shall not perform any activities outside of these hours without prior approval of the RPM. Said approval shall be requested at least 48 hours prior to the proposed work outside of these hours.

E. The Remediation Contractor shall submit for approval an organizational chart describing the management structure of its on-site and office support personnel and list of major Subcontractors and suppliers at the Pre-construction Meeting in accordance with Section 01 31 00 – Project Management and Coordination.

## 1.04 SUBMITTAL QUALITY

A. Submittals shall be reproducible with every line, character, and letter clearly legible and usable for further reproduction to yield a legible hard copy.

B. Submittals shall be complete with respect to design criteria and other information specified to enable the RPM to review the information efficiently.

C. Documents submitted to the RPM that do not conform to the requirements outlined herein will not be accepted. If conforming submittals cannot be obtained, such documents shall be retraced, reissued, or photographically restored as necessary to meet such requirements. The Remediation Contractor's failure to satisfy the legibility and quality requirements will not relieve the Remediation Contractor from meeting the required schedule for submittals.

## 1.05 CONSTRUCTION WORK PLAN

A. The Remediation Contractor shall coordinate with the RPM to prepare a Construction Work Plan, which includes the specific written narrative that describes the Remediation Contractor and RPM's means and methods for completing the various parts of the Work. At a minimum, the Construction Work Plan shall include the required information included in Tables 1a and 1b.

B. The Remediation Contractor shall submit all required elements of the Construction Work Plan for the RPM review and approval **within 28 calendar days after Notice of Award**. The RPM will finalize the Construction Work Plan for review and approval by Maine DEP.

**Table 1a. Required Information for Construction Work Plan – Remediation Contractor Sections**

| **Work Plan Section** | **Required Information** |
|---|---|
| Construction Facilities and Temporary Controls | • Layout of all proposed temporary facilities, including but not limited to, on-site Remediation Contractor's office, personnel parking, materials delivery area(s), equipment/material lay-down and storage areas, fueling facility, fencing, entry and exit locations, and on- and off-site transload facility(ies).<br>• Utility connections.<br>• Methods for temporary facilities maintenance and security.<br>• A Traffic Control Plan, including methods for traffic control, where and when needed.<br>• Methods for maintaining and conducting repairs on existing and constructed access roads with the Limits of Work. |
| Surveying | • The name, address, telephone number, and qualifications of the surveyor, crew chief, Site Superintendent, and all other persons who are proposed to perform survey or survey-related duties.<br>• Procedures and equipment specifications for performing topographic and hydrographic surveys. |

| Work Plan Section | Required Information |
|---|---|
| | • Methods for establishing survey control, benchmarks, tide gage(s), and layout of the Work. |
| Dredging, Excavation, and Offloading | • Work sequence.<br>• Number, types, and capacity of equipment to be used, including names of dredge(s) and other marine vessels to be used.<br>• For each piece of equipment listed above, number and labor category of personnel expected to be on the Site and approximate man hours.<br>• Hours of operation.<br>• Methods of operation, estimated production rates, and the time required to complete each activity.<br>• Notification and procedures to be used for notifying the USCG and moving equipment to accommodate commercial and other vessel traffic using the surrounding waterway.<br>• Means and methods for dredging/excavation and haul barge transport.<br>• Means and methods for horizontal and vertical control of the Work.<br>• Methods for protection of the environment and existing facilities, including:<br>- Methods, equipment, and procedures for controlling turbidity during dredging.<br>- Procedures for preventing unfiltered release of water from the dredge material barge.<br>- Methods, procedures, and controls to protect existing facilities and utilities against damage.<br>- Methods, procedures, and controls to minimize disturbance of existing sedge grass beds in intertidal areas.<br>- Measures to prevent and capture spillage during transloading, rehandling, and transport of sediment, including the use of spill aprons and other measures necessary to fully contain dredged/excavated material.<br>- Methods, procedures, and equipment to be used to dewater dredged/excavated material (if necessary) and to treat the effluent to meet water quality criteria and permit conditions.<br>- BMPs proposed by the Remediation Contractor to minimize the potential for water quality exceedances and in response to such exceedances, if they occur. |

| **Work Plan Section** | **Required Information** |
|---|---|
| | - Procedures and equipment for collecting and handling submerged and floating debris encountered during excavation and dredging operations.<br>• Methods, procedures, and controls to be used to segregate, handle, dewater, and transport sediment and debris to TSSA No. 2.<br>• Means and methods for operating the Nearshore Support Area, including:<br>- Methods, procedures, and equipment for preventing untreated sediment and effluent release from the Nearshore Support Area into receiving waters. |
| Backfill Placement | • Work sequence.<br>• Number, types, and capacity of equipment to be used, including names of all marine vessels to be used.<br>• For each piece of equipment, number and labor category of personnel expected to be on the Site and approximate man hours.<br>• Hours of operation.<br>• Methods of operation, estimated production rates, and the time required to complete each activity.<br>• Means and methods for horizontal and vertical control of the Work.<br>• Notification and procedures to be used for moving equipment to accommodate commercial and other vessel traffic using the surrounding waterway.<br>• List of the sources (quarries) of all backfill materials, including name, location, ownership, material supplied, and contact information.<br>• List of the laboratory(ies) that will be conducting the testing of all backfill materials, including name, location, ownership, laboratory certifications, list of tests to be performed, list of analysis methods and standards, and contact information.<br>• Methods for protection of the environment and existing facilities, including:<br>- Methods, procedures, and controls to protect existing facilities and utilities against damage.<br>- BMPs proposed by the Remediation Contractor to minimize the potential for water quality exceedances and in response to such exceedances, if they occur.<br>• Methods for estimating average thickness of backfill material placed. |

| **Work Plan Section** | **Required Information** |
|---|---|
|  | • Material barge information:<br>- Certified tonnage versus displacement curve for all material barges.<br>- Name of each barge.<br>- Length, beam, and molded depth of each barge.<br>- Material capacity of each barge.<br>- Hydrostatic data certified by a naval architect for determining barge displacement in short tons, per each 1 foot of displacement between loaded and light drafts (the barge(s) shall have clear and distinct draft marks).<br>- Expected draft of each barge loaded to capacity with cap material. |
| Revegetation | • Sources for all wetland plants, including name, address, and contact information for the supplier, and furnish copies of any required permits, registrations, or certifications for the harvesting, propagation, and distribution of the plants.<br>• For plants to be field harvested, including live stakes/cuttings:<br>- Provide a map clearly depicting the proposed harvest area.<br>- Provide specific information to detail how field harvesting is conducted in compliance with applicable state or federal wetland or species protection programs.<br>- Describe the harvesting methods, including the timing and procedures for collection, staging, transport, transplant, and/or propagation as appropriate.<br>• Procedures for installing plant stock.<br>• Proposed seed mixtures to be used.<br>• For all seeds sources:<br>- Provide the name, address, and contact information of the supplier and furnish copies of any required permits, registrations, or certifications for the harvesting, propagation, and distribution of the seed.<br>- Identify the supplier’s source location for the seed.<br>• Procedures for installing seed, including detailed information regarding any proposed treatment of seeds to ensure negative buoyancy. |

| **Work Plan Section** | **Required Information** |
|---|---|
| | • Procedures for maintaining plants, including maintenance instructions and suppliers' specifications.<br>• Procedures for monitoring plants and for replacing plant(s) that do not survive until September 30 of the year of planting.<br>• Remediation Contractor's plan to access the Marine Area.<br>• Remediation Contractor's location for staging and stockpiling plants, materials, and equipment.<br>• Equipment and procedures used to transfer plants, seeds, materials, and equipment from staging areas to in-river vessels, if applicable.<br>• List of equipment to be used for the wetland work.<br>• Drawings that depict the proposed configuration of wetland planting units, identified by species, within the planting area, based on the final remedial impacts to wetland areas. |

**Table 1b. Required Information for Construction Work Plan – RPM Sections**

| **Work Plan Section** | **Required Information** |
|---|---|
| Sediment Dewatering | • Means, methods, and equipment to dewater dredged material and transport to TSSA No. 1. |
| Water Management | • Means, methods, and equipment to filter water generated from dewatering process and transport to on-site WWTP. |

## 1.06 CQC PLAN

A. Submit all elements of the CQC Plan for the RPM and Maine DEP's review and approval **within 28 calendar days after Notice of Award**.

B. At a minimum, the Remediation Contractor's CQC Plan shall include the following information:

1. Organization chart showing the various QC team members, along with their designated responsibilities and lines of authority.

2. The name, qualifications, duties, responsibilities, and authorities of each person assigned a primary QC function.

    3. Acknowledgement that the QC staff shall conduct inspections for all aspects of the Work specified and shall report to the QC Supervisor or someone of higher authority in the Remediation Contractor’s organization.

    4. Procedures for scheduling and managing submittals, including those of Subcontractors, off-site fabricators, and material suppliers.

    5. Testing methods, schedules, and procedures used to report QC information to the Owner, including samples of the various reporting forms.

C. The Remediation Contractor is encouraged to add any additional elements to the CQC Plan that are deemed necessary to adequately control all production and/or construction processes required by this Contract.

## 1.07 CHASP

A. The Remediation Contractor shall submit all elements of the CHASP for the RPM and Maine DEP’s review and information **within 28 calendar days after Notice of Award**.

B. General:

    1. The CHASP shall be prepared in full conformance with 29 CFR 1910.120 and shall establish, in detail, the protocols necessary for the recognition, evaluation, and control of all hazards associated with each task performed by the Remediation Contractor and all its Subcontractors, as well as protocols for management of change (e.g., newly identified hazards and changing field conditions) during the Work with regard to health and safety. The CHASP shall provide Site-specific and project-specific safety and health requirements and procedures based upon Site-specific and project-specific conditions. The level of detail provided in the CHASP shall be tailored to the type of work, complexity of operations to be conducted, and anticipated hazards.

    2. All topics required by OSHA standard 29 CFR Section 1910.120(b)(4) and those discussed in the subsequent parts of this Section shall be addressed in the CHASP. When the use of a specific topic is not applicable to the Project, the CHASP shall include a statement to justify its omission and establish that the topic was given adequate consideration.

    3. The RPM will review the CHASP and may transmit comments to the Remediation Contractor. It will be the responsibility of the Remediation Contractor to address comments from the RPM.

    4. The Remediation Contractor shall not be permitted to initiate the Work until all comments from the RPM on the CHASP have been addressed and resolved. Receipt of and comments by the RPM on the CHASP indicates

only that the CHASP complies with the requirements of this Section and does not imply that all procedures are suitable for the required work, nor that the CHASP complies fully with 20 CFR 1910.120. Suitability of the CHASP for the construction work is the responsibility solely of the Remediation Contractor.

5. The CHASP shall be consistent with the Orrington Remediation Site Health and Safety Plan, and the Southern Cove Health and Safety Plan (together referred to as the HASP)

C. CHASP Modification:

1. Should any unforeseen hazard(s) become evident during the performance of the Work, the Remediation Contractor's HSO shall bring such hazard(s) to the attention of the RPM, both verbally and in writing, for resolution as soon as practicable, unless those hazards present an imminent danger to life or health, in which case notice must be provided immediately and as an emergency action. In the interim, while hazards are being mitigated, the Remediation Contractor shall take all necessary temporary actions to re-establish and maintain safe working conditions in order to safeguard on-site personnel, visitors, the public, and the environment.

2. Should the Remediation Contractor seek modification of any portion or provision of the CHASP, such modification shall be requested by the HSO in writing to the RPM and, if accepted, will be authorized in writing.

3. Any disregard for the provisions of this Section and the completed CHASP shall be deemed just and sufficient cause for ordering all work to cease until the matter has been rectified to the satisfaction of the RPM.

D. At a minimum, the CHASP shall include the required information included in Table 2.

**Table 2. Required Information for CHASP**

| **CHASP Section** | **Required Information** |
|---|---|
| Site Description and Contamination Characterization | • Location and approximate size of the Site.<br>• Site topography and accessibility by road.<br>• Identification of and capabilities of emergency response teams that would provide assistance to Site personnel at the time of an emergency.<br>• List of the contaminants and their concentrations found or known to be present in Site areas to be impacted by the Work to be performed. |

| CHASP Section | Required Information |
|---|---|
| Activity Hazard/Risk Analysis | • Description of on-site tasks to be performed.<br>• Duration of planned Site activities.<br>• Chemical, physical, and biological hazards of concern for each Site task and/or operation to be performed (Activity Hazard/Risk Analysis). Certain potential hazards that may be encountered during Site work are listed below. The Contractor is solely responsible for identification of all hazards likely to be encountered during the Work.<br>• Typical construction activity hazards.<br>• Exposure to the Site's COCs, including those chemicals used as part of the construction operations, via handling contaminated sediment or surface water during Site work involving intrusive operations (e.g., dredging, earthwork, and filling operations) or material handling activities.<br>• Exposure to the Site's COCs by inhalation or dermal contact during construction operations (e.g., dust, air emissions, and sediment elutriate).<br>• Pathways for hazardous substance dispersion and human exposure:<br>- Chemical, physical, and toxicological properties of the contaminants on the select list, sources and pathways of personnel exposures, anticipated on- and off-site exposure level potentials, and regulatory (including federal, state, and local) or recommended protective exposure standards.<br>- Exposure to hazardous substances and/or chemicals brought on the Site for the purpose of executing this Contract. The Remediation Contractor shall comply with the requirements of 29 CFR Section 1910.1200, Hazard Communication.<br>• Description of how safety will be controlled with regard to non-Remediation Contractor personnel (e.g., construction observers, regulatory personnel, and visitors). |
| Staff Organization, Qualifications, and Responsibilities | • The Remediation Contractor shall develop an organizational structure that sets forth lines of authority, responsibility, and communication. The CHASP shall include a description of this organization, qualifications, and responsibilities of each of the following individuals:<br>- Qualified safety professional:<br>o Qualifications: The Remediation Contractor shall use the services of a qualified safety professional to develop and implement the CHASP. A resume of the proposed qualified safety professional shall be submitted with the bid. |

| CHASP Section | Required Information |
|---|---|
| | - HSO:<br>o Qualifications: The Remediation Contractor shall designate an individual to be the HSO. A resume of the proposed HSO shall be submitted with the bid. The HSO shall be experienced in developing and implementing health and safety programs at hazardous waste construction sites.<br>o Responsibilities: The HSO shall ensure the procedures and requirements set forth in the CHASP are implemented by Contractor personnel, conduct the Remediation Contractor Site health and safety meetings, conduct safety audits/inspections as required by the Remediation Contractor's CHASP and as otherwise needed, coordinate and oversee the Remediation Contractor's employee health and safety training, and implement a training program for the Project and maintain a current recordkeeping system for Remediation Contractor personnel.<br>• Staff training assignments such as, but not limited to, "40-hour," "24-hour," and "8-hour Supervisor" HAZWOPER certifications, as well as medical surveillance requirements. |
| PPE | • The CHASP shall address the PPE required for the Remediation Contractor's personnel for the types of work activities and attendant hazards and shall meet or exceed the minimum PPE requirements set forth in the general Site HASP. |
| Exposure Monitoring | • The CHASP shall address the required exposure monitoring that will be performed by the Remediation Contractor during various activities or tasks that comprise the Work to protect Site personnel and visitors.<br>• The level of monitoring and sampling shall meet or exceed the requirements set forth in the HASP. |
| Standard Operation Safety Procedures, Engineering Controls, Work Practices | • The CHASP shall address the engineering controls and safe work practices to be implemented. These shall include, but not be limited to, the following:<br>- Site rules and prohibitions (e.g., buddy system and eating/drinking/ smoking restrictions).<br>- Protocols for operation of heavy construction equipment in accordance with 29 CFR Section 1926. |

| CHASP Section | Required Information |
|---|---|
| | - Descriptions of safety inspection and preventative maintenance requirements for the operation of machinery or mechanized equipment, including written inspection reports.<br>- Utility markouts and clearances.<br>- Site "housekeeping."<br>- Fall protection.<br>- Safe clearance from existing infrastructure and overhead obstructions.<br>- Sanitation (in accordance with 29 CFR Section 1910.120(n)).<br>- Electrical hazards.<br>- Communication.<br>- Excavation and trenching.<br>- Dust control. |
| Site Control and Work Zones | • In order to control the potential spread of contaminants and the flow of personnel and materials into and out of Work areas, the Remediation Contractor shall establish a Site control section in the CHASP. This section shall describe the methodology to be used by the Remedial Contractor in determining the modification of Work Zone designations, procedures to limit the spread of contamination, and general limitations to be observed by Site personnel.<br>• At a minimum, the CHASP shall define the following Work Zones: EZ, CRZ, and SZ as defined in Section 01 35 29 – Health, Safety, and Emergency Response Procedures. |
| Decontamination | • The Remediation Contractor shall prepare decontamination procedures in compliance with the requirements set forth in the HASP. The decontamination procedures must include provisions for decontaminating all construction equipment, personnel, and facilities prior to demobilization from the Site. |
| Emergency Equipment and First Aid | • The CHASP shall describe the emergency and first aid equipment to be used. |
| Recordkeeping | • Documentation of appropriate employee training.<br>• Name and qualification of the person preparing the CHASP and the person designated to implement and enforce the CHASP.<br>• Signatory page for Work area personnel to acknowledge receipt, understanding, and agreement to comply with the CHASP. |

## 1.08 ENVIRONMENTAL PROTECTION PLAN

A. Submit all elements of the EPP for the RPM and Maine DEP's review and acceptance **within 28 calendar days after Notice of Award**.

B. At a minimum, the EPP shall include the required information included in Table 3.

**Table 3. Required Information for EPP**

| EPP Section | Required Information |
|---|---|
| General | • Organization chart and names of persons responsible for EPP compliance.<br>• A list of key personnel, including phone numbers (home and office), qualified to act as the Emergency Coordinator in the event of an environmental incident.<br>• Location of equipment and personnel decontamination areas.<br>• EZs, CRZs, and other zones specified in the Remediation Contractor's Site-specific CHASP.<br>• Construction wastewater collection and storage areas or treatment facilities as necessary.<br>• Identify the procedures that the Remediation Contractor shall implement if the Remediation Contractor encounters suspected hazardous waste during construction. |
| Spill Prevention, Control, and Countermeasures (SPCC) Plan | • Name of the individual who will be responsible for implementing and supervising spill containment and cleanup.<br>• The name and phone number of the Remediation Contractor's 24-hour/on-call spill response Subcontractor.<br>• Identification of potentially hazardous substances to be used on the Site. Identify intended actions to prevent introduction of such materials into air, water, or ground, and identify provisions for complying with federal, state, and local laws, ordinances, and regulations for storage and handling of these materials.<br>• Controls and supplies for preventing environmental spill.<br>• Controls and supplies for containing and cleanup of a spill should such occur.<br>• Methods to protect groundwater from contamination and methods to protect monitoring wells, as applicable.<br>• On-site upland and in-water fueling procedures. |

| EPP Section | Required Information |
|---|---|
| | • Oil spill prevention and response procedures, including the Contactor's notification procedures, to be used in the event of a spill of a regulated substance<br>• A description of the equipment and personnel to perform decontamination measures that may be required for previously uncontaminated structures, equipment, or material. |
| Stormwater Pollution Prevention Plan (SWPPP) | • Potential sources of pollution that may reasonably be expected to affect the quality of stormwater discharge from the Site.<br>• Methods to manage stormwater at the Site and Remediation Contractor's on- and off-site transload facility(ies), as well as on-site Staging and Stockpiling Area(s) to comply with all applicable laws, regulations, and permit requirements.<br>• Methods that will be used for erosion control and to reduce the pollutants in the stormwater discharge associated with dredging/excavation, and in placing clean soil at the Site.<br>• Methods to direct surface waters that have not contacted potentially contaminated materials to existing surface drainage systems (by the RPM).<br>• Methods to contain and collect water from sediment dewatering and/or stockpile areas and decontamination facilities and properly dispose of collected water (by the RPM). |
| Air Pollution and Odor Control Plan | • Describe air pollution control procedures.<br>• Describe dust minimization practices.<br>• Describe contingency actions to address odor from dredged sediment if necessary. Describe methods and materials that may be used should odor control be required. |
| Marine Water Quality Criteria Compliance Plan | • BMPs; specialized equipment (e.g., silt curtains and environmental buckets); and means, methods, and procedures used to prevent marine water quality criteria exceedances during completion of in-water activities.<br>• Contingency actions that will be taken to restore compliance with marine water quality criteria should water quality exceedances occur during any in-water activities.<br>• Methods that will be used to monitor haul barges for leakage and to repair leaky barges.<br>• Methods to control the dispersion of suspended solids from the point of dredging. |

| EPP Section | Required Information |
|---|---|
| | • Supplier, model number, and dimensions of the silt curtain, debris boom, and oil boom (containment system).<br>• Containment system layout, dimensions, and how the system will operate with the Remediation Contractor's equipment.<br>• Containment system anchoring plan.<br>• Methods and procedures for the Remediation Contractor's inspection, maintenance, and repair of the containment system during construction. |

## PART 2 – PRODUCTS

Not used.

## PART 3 – EXECUTION

### 3.01 GENERAL REQUIREMENTS

A. Submit to the applicable parties (e.g., the RPM and others), for their review and approval, an itemized table listing all submittals required by these Specifications and other Contract Documents. The table shall, at a minimum, have entries that describe (name) each submittal, the referenced document in which the submittal is required (e.g., article and specification number), the date the submittal is projected to be made, and extra columns for tracking (documenting the status of) reviews, resubmittals, and approvals. The Remediation Contractor shall then submit to the applicable parties all the submittals required by these Specifications and other Contract Documents.

B. All such items required to be submitted for review shall be furnished by and at the expense of the Remediation Contractor and any work affected by them shall not proceed until approval is provided in writing by the RPM.

C. The Remediation Contractor shall properly prepare, identify, and transmit submittals and their contents as set forth herein or as otherwise directed by the RPM. Every submittal shall bear the Remediation Contractor's signature certifying that the Remediation Contractor has completed the following:

1. Reviewed, checked, and approved the submittal.

2. Coordinated the contents with the requirements of the Work and the Contract Documents, including related work.

3. Determined and verified all quantities, field measurements, field construction criteria, materials, equipment, catalog numbers, and similar data.

4. Stated the Work covered by the submittal is recommended by the Remediation Contractor and the Remediation Contractor's guarantee will fully apply thereto.

5. Affixed the date and signature of the Remediation Contractor to the submittal in every case.

## 3.02 DEVIATIONS

A. At the time of submission, the Remediation Contractor shall give written notice in the submittal of any deviation from the requirements of these Specifications. The Remediation Contractor shall clearly indicate or describe the deviations, including all other changes required to correlate the Work. The Remediation Contractor shall state in writing all variation in costs and schedule associated with the deviations and assumptions of the effects on cost and schedule of all related changes if the deviation is approved.

B. The Remediation Contractor is encouraged to inform the RPM in advance of all deviations to minimize possible delays to the schedule that might be needed for the RPM to evaluate the acceptability of any such deviations.

## 3.03 METHOD OF SUBMITTAL

A. Deliver submittals electronically to the RPM as a Microsoft Word document (.doc, .docx) file format. Only submittals directly from the Remediation Contractor will be accepted.

B. Each submittal shall be dated, signed, and sequentially numbered as to initial or resubmittal status, fully describing the submittal contents. In each submittal, the Remediation Contractor shall state at least the following information:

1. Project number and name.

2. Name and address of the Remediation Contractor.

3. Submittal ID number, revision number, and Remediation Contractor submittal number.

4. Name and address of the Subcontractor if applicable.

5. Manufacturer, supplier, and/or distributor as applicable.

6. The Drawing and/or Specification Section(s) reference and paragraph(s) to which the submittal pertains.

C. The Remediation Contractor shall identify accompanying literature such as data sheets, catalogs, and brochures in the submittal. Where several types or models are contained in the literature, the Remediation Contractor shall delete non-applicable portions or specifically indicate which portions are intended and applicable. Submittal transmittals shall fully and clearly index all items submitted.

D. Except where the preparation of a submittal is dependent upon the approval of a prior submittal, all submittals pertaining to the same class or portion of the Work shall be submitted simultaneously.

## 3.04 REVIEW OF SUBMITTALS

A. Unless stated otherwise for a specific item herein, not less than 15 days shall be assumed for the review of submittals, not including 2 days for delivery or mailing, if necessary.

B. Extension of the Contract Time will not be granted because of the Remediation Contractor’s failure to make timely and correctly prepared and presented submittals with allowance for the checking and review periods.

C. The submittals will be returned to the Remediation Contractor under one of the following codes:

1. “REVIEWED – NO COMMENTS” is assigned when there are no notations or comments on submittal. When returned under this code, the Remediation Contractor may immediately proceed with the Work or release the equipment and/or material for manufacture.

2. “COMMENTS AS NOTED” is assigned where there are comments attached to the returned submittal, which provide additional data to aid the Remediation Contractor. In this case, the Remediation Contractor may proceed with the Work or release of equipment and/or material for manufacture, taking into account the comments. Questions or discrepancies regarding the comments should be addressed immediately with the RPM.

3. “REVISE AND RESUBMIT” is assigned when notations and comments are extensive enough to warrant resubmission of the package. The Remediation Contractor may not proceed with the particular work that is the subject of the original submittal until all notations and comments are addressed in a resubmittal. This resubmittal is to address all comments, omissions, and non-conforming items that were noted by the RPM, and as further specified in Article 3.05 of this specification. Resubmittals are to

be received by the RPM within 10 days of the date of the RPM's transmittal requiring the resubmittal, or earlier if needed to adhere to construction scheduling requirements.

4. "NOT SUBJECT TO REVIEW" is assigned when the submittal concerns items that are not subject to review by the RPM. When returned under this code, the Remediation Contractor may immediately proceed with the Work or release the equipment and/or material for manufacture.

D. The comments on submittals shall not relieve the Remediation Contractor of responsibility for any deviation from the requirements of the Contract Documents or for any revision in resubmittals unless the Remediation Contractor has given notice in writing of the deviation or revision at the time of submission (or resubmission) and written approval has been received from the RPM for approval of the specific deviation or revision. Nor shall any approval relieve the Remediation Contractor of responsibility for errors or omissions in the submittals or for the accuracy of dimensions and quantities, the adequacy of connections, and the proper and acceptable fitting, execution, and completion of the Work.

## 3.05 CORRECTIONS AND RESUBMITTALS

A. Incomplete submittals, including those not correctly transmitted, not correctly titled and identified, or not bearing the Remediation Contractor's review and approval stamp, will be returned to the Remediation Contractor without review, and any related effects on the schedule will be the sole responsibility of the Remediation Contractor.

B. The Remediation Contractor shall direct specific attention in writing to revisions other than the corrections called for on previous submittals. The Remediation Contractor shall state, in writing, all variations in costs and schedule and assumptions of the related changes. The Remediation Contractor shall identify each resubmittal with the number of the original submittal followed by consecutive letters starting with "A" for the first resubmittal, "B" for the second resubmittal, and so on.

C. The RPM reserves the right to deduct moneys from the amounts due to the Remediation Contractor to cover the cost of extra review time beyond the first resubmittal.

## 3.06 CHECK OF RETURNED SUBMITTALS

A. The Remediation Contractor shall check returned submittals for correction and ascertain if the corrections result in extra cost above that included under the Contract Documents. If, in the Remediation Contractor's opinion, extra costs result from corrections to the submittals, the Remediation Contractor shall give written notice to the RPM within 5 days after the submittal return. By failing to so notify the RPM, the Remediation Contractor shall waive all claims for extra costs resulting from required corrections.

## 3.07 CONFORMANCE

A. No work represented by required submittals shall be purchased or commenced until the applicable submittal has been reviewed and approved. Purchases made prior to submittal review and approvals are at the sole risk and expense of the Remediation Contractor.

B. The Remediation Contractor shall not proceed with any related work that may be affected by the Work covered under submittals until the applicable submittals have been approved, particularly where machinery, equipment, concrete work, grading, and the required arrangements and clearances are involved.

C. The Work shall conform to the approved submittals and all other requirements of the Contract Documents unless subsequently revised by an appropriate modification, in which case the Remediation Contractor shall prepare and submit revised submittals as may be required.

D. Whenever materials or equipment are described by using the name of a proprietary item or the name of a particular supplier, the naming of the item is intended to establish the type, function, and quality required. If the name is followed by the words “or equivalent,” indicating that a substitution is permitted, materials or equipment of other suppliers may be accepted by the Owner. Sufficient information shall be submitted by the Remediation Contractor to allow the Owner to determine that the material or equipment proposed is equivalent to that named, subject to the following requirements:

   1. The burden of proof as to the type, function, and quality of any such substitute material or equipment shall be upon the Remediation Contractor.

   2. The Owner will be the sole judge as to the type, function, and quality of any such substitute material or equipment and the Owner’s decision shall be final.

   3. The Owner may require the Remediation Contractor to furnish, at the Remediation Contractor’s expense, additional data about the proposed substitution.

   4. Acceptance by the Owner of a substitute item proposed by the Remediation Contractor shall not relieve the Remediation Contractor of the responsibility for full compliance with the Contract Documents and for adequacy of the substitute item.

## 3.08 CERTIFICATES OF COMPLIANCE

A. The Remediation Contractor shall furnish the RPM with notarized certification for items specified elsewhere in the Contract Documents. All material or equipment manufacturers or installers shall certify in writing that the material supplied or Site conditions are in compliance with the requirements stipulated in the Contract Documents and these Specifications.

**END OF SECTION**

## PART 1 – GENERAL

### 1.01 SCOPE

A. The Remediation Contractor shall develop and implement the CHASP that addresses the health and safety of all Remediation Contractor personnel and its Subcontractor personnel involved with the construction work. The Remediation Contractor shall also provide a description of how safety will be controlled with regard to non-Remediation Contractor personnel (e.g., construction observers, regulatory personnel, and visitors). The CHASP shall be submitted to the RPM for review and comment prior to the start of the Work as described in this Section.

B. The CHASP, at a minimum, shall be compliant with the requirements set forth in this Section and in accordance with the Health and Safety Plan (CDM Smith 2014; HASP).

C. Work performed shall be consistent with the guidelines and references and in compliance with all applicable regulations and standards including, but not limited to, those listed below. In the case that these requirements are conflicting, the one which offers the greatest protection shall be followed. It is the responsibility solely of the Contractor to identify any and all safety and health standards, regulations, and guidance applicable to the Work.

### 1.02 RELATED SECTIONS

A. Section 01 10 00 – Summary of Work.

B. Section 01 31 00 – Project Management and Coordination.

C. Section 01 33 00 – Submittal Procedures.

### 1.03 REFERENCES

A. Reference Standards:

1. OSHA Publications:

   a) 29 CFR Section 1910, Occupational Safety and Health Standards for General Industry, and specifically, but not exclusively, the following sections:

      1) 29 CFR Section 1910.120 – Hazardous Waste Operations and Emergency Response.

      2) 29 CFR Section 1910.1200 – Hazard Communication.

      3) 29 CFR Section 1915.1000 – Air Contaminants.

b) Air Contaminants – Permissible Exposure Limits, OSHA 3112, 1989.

c) 1904 Record Keeping and Reporting Occupational Injuries and Illnesses.

d) 1990 Identification, Classification and Regulation of Potential Occupational Carcinogens.

e) 29 CFR Section 1926 Safety and Health Regulations for Construction.

2. NIOSH Publication:

a) NIOSH 85-115 Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities

3. American Conference of Governmental Industrial Hygienists Publication:

a) Threshold Limit Values and Biological Exposure Indices for (current revision).

4. ANSI:

a) ANSI Z88.2-1992 Practices for Respiratory Protection

b) ANSI Z78.1-2012 Occupational and Educational Eye and Face Protection Devices

c) ANSI Z89.1-2009 Safety Requirements for Industrial Head Protection

d) ANSI Z41.1-1999 Personal Protection-Protective Footwear

5. State of Maine Regulations:

a) 12 CMR 179 Board of Occupational Safety and Health.

B. Other Documents:

1. CDM Smith, Inc., 2014. Health and Safety Plan (HASP; current revision)

2. CDM Smith. Perimeter Air Monitoring Plan (July 22, 2015).

## 1.04 SUBMITTALS

A. The Remediation Contractor shall prepare and submit a detailed, written CHASP as part of the Contractor Work Plan in accordance with Section 01 33 00 – Submittal Procedures.

## 1.05 WORK ZONES

A. The Remediation Contractor shall clearly delineate, mark, label, and identify the Work Zones in the field and shall limit equipment, operations, and personnel in the zones as required by the Contract Documents and described in the CHASP, consistent with 29 CFR Section 1910.120.

B. Exclusion Zone (EZ): The EZ boundary shall be set by the Remediation Contractor so that it encompasses areas around individual intrusive construction activities being performed. The Remediation Contractor shall control entry into this area, and exit may only be made through the CRZ.

C. Contaminant Reduction Zone (CRZ): The CRZ shall be located outside of the designated EZ and will be where PPE is donned/doffed and decontamination activities occur; PPE and contaminated water or soil shall be containerized for disposal.

D. Support Zone (SZ): The SZ shall be established on site and is defined as the area outside the CRZ and EZ. The SZ shall be clearly delineated and shall be secured against active or passive contamination from the Site. No equipment or personnel may go from the EZ to the SZ without passing through the CRZ and being decontaminated in accordance with the CHASP.

## 1.06 TRAINING

A. For all personnel working in or around or having the potential to work in any EZ or CRZ, the minimum training content must include basic information relevant to hazardous waste operations required by 29 CFR Section 1910.120, including confined space entry awareness and hands-on training with air purifying and supplied-air respiratory protective equipment. The HAZWOPER 40-, 24-, and 8-hour Supervisor OSHA training, as well as applicable current refreshers, must have been completed as required by 29 CFR Section 1910.120 prior to arriving on Site, and proof of completion shall be provided to the RPM prior to mobilization and prior to assignment of any relief staff during the Project.

B. In addition, employees involved with construction activities (e.g., excavation and regrading/restoration) shall have successfully completed the OSHA Construction 10-hour training course. Proof of completion shall be provided to the RPM prior to mobilization.

C. Prior to working on site, Remediation Contractor personnel working on the Site shall participate in the Site orientation provided by the RPM.

### 1.07 MEDICAL SURVEILLANCE

A. The CHASP shall describe the Medical Monitoring Program, including scheduling of examinations, certification of fitness, compliance with OSHA requirements, and information provided to the occupational physician. The Remediation Contractor shall ensure the occupation physician performs the medical examination prescribed in 29 CFR Section 1910.120(f) for personnel performing work in areas other than the SZ.

### 1.08 SITE CONDITIONS

A. Refer to Section 01 10 00 – Summary of Work.

## PART 2 – PRODUCTS

### 2.01 MEDICAL, FIRST AID, AND MONITORING EQUIPMENT

A. The Remediation Contractor shall provide all medical, first aid, and environmental monitoring equipment to be used at the Site, consistent with its CHASP.

### 2.02 PERSONAL PROTECTIVE EQUIPMENT

A. The Remediation Contractor shall supply all PPE necessary to be in compliance with the CHASP for all Site personnel. The Remediation Contractor shall make available PPE for use by any Site visitors.

## PART 3 – EXECUTION

### 3.01 IMPLEMENTATION OF THE CHASP

A. It shall be the responsibility solely of the Remediation Contractor to ensure all health and safety requirements are implemented in accordance with the Remediation Contractor’s CHASP and applicable regulations.

B. If the RPM finds that the Remediation Contractor’s HSO is not providing adequate health and safety controls, the Remediation Contractor may provide alternate personnel subject to the approval and/or acceptance of the Owner to serve as HSO. All on-site personnel shall have the right to stop work at any time for any health and safety concerns.

C. The RPM may require the Remediation Contractor to conduct, or it may conduct itself, safety audits and/or inspections if the CHASP requirements are not met or appear inadequate.

## 3.02 LOGS, REPORTS, AND RECORDKEEPING

A. The Remediation Contractor shall maintain CHASP logs covering the implementation of the CHASP and other requirements of this Section. The Remediation Contractor shall develop the formats and submit as part of the CHASP.

B. The Remediation Contractor shall keep logs, reports, and other records on site in accordance with requirements for on-site documents in Section 01 31 00 – Project Management and Coordination.

**END OF SECTION**

## PART 1 – GENERAL

### 1.01 SCOPE

A. This Section describes the Remediation Contractor's CQC requirements, duties, and responsibilities during execution of the Work. The intent of this Section is to require the Remediation Contractor to establish the necessary level of control that will provide sufficient information to ensure the Remediation Contractor and RPM that these Specification requirements are being and have been met.

B. The Remediation Contractor shall establish, provide, and maintain the CQC Plan as specified herein and in Section 01 33 00 – Submittal Procedures, detailing the methods and procedures that will be taken to ensure all materials and completed construction elements conform to the Drawings, these Specifications, and other requirements. Although guidelines are established and certain minimum requirements are specified herein and elsewhere in these Specifications, it is the responsibility of the Remediation Contractor to ensure construction and CQC are accomplished in accordance with the stated purpose and these Specifications as described herein.

C. The Remediation Contractor shall be prepared to discuss and present the Remediation Contractor's understanding of the CQC requirements at the Pre-construction Meeting, as discussed in Section 01 31 00 – Project Management and Coordination. No construction shall begin until the CQC Plan has been reviewed and approved by the RPM.

### 1.02 RELATED SECTIONS

A. Section 01 31 00 – Project Management and Coordination.

B. Section 01 33 00 – Submittal Procedures.

### 1.03 SUBMITTALS

A. The Remediation Contractor shall submit the qualifications of the personnel identified in Article 1.05.

B. The Remediation Contractor shall submit the CQC Plan in accordance with Section 01 33 00 – Submittal Procedures.

C. The Remediation Contractor shall submit a Daily CQC Report as part of the DAR in accordance with Section 01 31 00 – Project Management and Coordination and Section 01 33 00 – Submittal Procedures.

D. The Remediation Contractor shall submit test and inspection reports in accordance with Section 01 31 00 – Project Management and Coordination and Section 01 33 00 – Submittal Procedures.

E. The Remediation Contractor shall submit manufacturer certifications and warrantees in accordance with Section 01 33 00 – Submittal Procedures.

## 1.04 QUALITY ASSURANCE – CONTROL OF INSTALLATION

A. The Remediation Contractor shall monitor QC over suppliers, manufacturers, products, services, Site conditions, and workmanship to produce work of specified quality.

B. The Remediation Contractor shall comply with manufacturers' instructions, including following each step in a sequence.

C. Should manufacturers' instructions conflict with the Contract Documents, the Remediation Contractor shall request clarification from the RPM before proceeding.

D. The Remediation Contractor shall comply with specified standards as minimum quality for the Work, except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. The Remediation Contractor shall ensure the Work is performed by persons qualified to produce the required and specified quality.

F. The Remediation Contractor shall verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. The Remediation Contractor shall secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

H. Familiarity with Pertinent Codes and Standards: In procuring all items used for the Work, it is the Remediation Contractor's responsibility to verify the detailed requirements of the specifically named codes and standards and verify that the items procured for use in the Work meet or exceed the specified requirements.

I. Rejection of Non-Complying Items: The RPM reserves the right to reject items incorporated into the Work that fail to meet the specified minimum requirements. The RPM further reserves the right, and without prejudice to other recourse, to accept non-complying items subject to an adjustment in the Bid Price as approved by the RPM.

## 1.05 REFERENCES AND STANDARDS

A. CQA Plan submitted as Appendix G of the Southern Cove Corrective Measures Implementation Plan dated June 2016.

B. Products or workmanship specified by association, trade, or other consensus standards shall comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes or the Contract Documents.

C. Conform to reference standard by date of issue current on the date of Contract Documents, except where a specific date is established by code.

D. Obtain copies of standards where required by product Specification Sections.

E. Neither the contractual relationships, duties, nor responsibilities of the parties in the Contract, nor those of the Owner, shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

F. All pertinent laws, ordinances, rules, regulations, and codes shall govern construction activities at the Site.

G. Construction that is not governed by governmental regulations or the Contract Documents will be governed by the more stringent provisions of the latest published edition or statute adopted edition, at the time of Contract signing, following these applicable codes and standards:

  1. Uniform Building Code.

  2. National Electrical Code.

  3. Uniform Plumbing Code.

  4. Uniform Fire Code.

## 1.06 REMEDIATION CONTRACTOR PERSONNEL REQUIREMENTS

A. All Remediation Contractor personnel shall be trained, experienced, and qualified to perform the tasks assigned to them.

B. The Remediation Contractor shall submit the qualifications of the proposed CQC Officer to the RPM for review and approval.  The proposed CQC Officer shall have a minimum of 5 years of experience as a CQC Officer, in addition to having been the CQC Officer on three projects of similar type and size, described using the form below.

### Remediation Contractor Personnel

**CQC Officer:** The CQC Officer must have successfully completed three projects of similar type and size (describe below).

Name: ______________________________
Address: ______________________________
Phone: ______________________________
Name of Remediation Contractor Employed By: ______________________________

1. Project Name: ______________________________
   Owner: ______________ Contact Person: ______________
   Name of Remediation Contractor Employed By: ______________________________
   Completion Date: ______________________________

2. Project Name: ______________________________
   Owner: ______________ Contact Person: ______________
   Name of Remediation Contractor Employed By: ______________________________
   Completion Date: ______________________________

3. Project Name: ______________________________
   Owner: ______________ Contact Person: ______________
   Name of Remediation Contractor Employed By: ______________________________
   Completion Date: ______________________________

## PART 2 – PRODUCTS

Not used.

## PART 3 – EXECUTION

### 3.01 CQC PLAN

A. The Remediation Contractor shall submit a CQC Plan to the RPM in accordance with Section 01 33 00 – Submittal Procedures. The CQC Plan will be reviewed by the Owner and must be approved before any work can start. The CQC Plan will be used to document inspections, monitoring, surveys, and other actions to be taken by the Remediation Contractor to ensure the Work complies with all Contract requirements.

B. The CQC Plan shall indicate the appropriate action to be taken when a process is deemed or believed to be out of control (out of tolerance) and detail what action will be taken to bring the process into control.

## 3.02 CQC OFFICER

A. The Remediation Contractor shall identify an individual within its organization as a CQC Officer. The individual shall be located at the Site full-time and shall be responsible for overall QC management, having the authority to act in all QC matters for the Remediation Contractor.

## 3.03 TESTING SERVICES

A. Necessary materials testing shall be performed by an independent testing laboratory during the execution of the Work. The Remediation Contractor shall provide access to the area necessary to perform the testing and/or to secure the material for testing.

B. Testing does not relieve the Remediation Contractor’s obligation to perform the Work to Contract requirements.

C. Retesting required because of non-conformance to specified requirements shall be performed by the same independent firm. Payment for retesting will be charged to the Remediation Contractor by deducting testing charges from payments due to the Remediation Contractor.

D. Material testing for initial material approval shall be performed by an independent, certified laboratory and paid for by the Remediation Contractor. These tests must be dated within 6 months of the submittal date.

## 3.04 DOCUMENTATION

A. The Remediation Contractor shall develop and maintain a database (physical or electronic) of QC Records necessary to document the conduct and QC of the Work. QC Records are those documents that have been reviewed and accepted by the Remediation Contractor as complete, correct, and legible. QC Records shall include documents such as:

1. Drawings, Specifications, procedures used for construction, procurement documents, inspections, and test records.
2. Submittals.
3. Personnel and procedure qualification records.
4. Material, chemical, and physical property test results; certificates of Compliance and shipment releases.
5. Non-compliance reports and corrective action.

B. The Remediation Contractor shall identify all QC Records in the CQC Plan and maintain them in the Remediation Contractor's Site files. The RPM shall be provided access to these files when requested. Upon completion and acceptance of the Work by the Owner, these files shall be turned over to the RPM.

C. The Remediation Contractor shall prepare and maintain a Daily CQC Report of operations. The Daily CQC Report shall be attached to the Remediation Contractor's DAR and submitted in accordance with Section 01 33 00 – Submittal Procedures. The Daily CQC Report shall include the results of all inspections, surveys, and monitoring activities and shall be signed by the Remediation Contractor's Field Superintendent or CQC Officer.

D. The Remediation Contractor's CQC Plan shall include procedures for access and distribution control of the QC records. The following types of documents shall be on controlled distribution to ensure changes to them are accurately transmitted and received when applicable:

1. Manuals.
2. Instructions.
3. Procedures.
4. Specifications.
5. Drawings.
6. Inspection and test plans.
7. Field change requests.

## 3.05 OVERSIGHT BY THE RPM

A. All items of material and equipment shall be subject to oversight by the RPM at the point of production, manufacture, or shipment to evaluate whether the Remediation Contractor, producer, manufacturer, or shipper maintains an adequate QC system in conformance with the requirements detailed herein and the applicable Specification Sections and Drawings. In addition, all items of materials, equipment, and work in place shall be subject to surveillance by the RPM at the Site for the same purpose.

B. To facilitate oversight by the RPM, the Remediation Contractor shall allow the RPM access to the dredge barge and other floating equipment at the request of the RPM and while the Work is being performed.

C. Oversight by the RPM does not relieve the Remediation Contractor of performing QC inspections of either on- or off-site Remediation Contractor's or Subcontractors' work.

## 3.06 NON-COMPLIANCE

A. The RPM will notify the Remediation Contractor of any non-compliance with any of the foregoing requirements. The Remediation Contractor shall, after receipt of such notice, immediately take corrective action. Any notice, when delivered by the RPM or his/her authorized representative to the Remediation Contractor or his/her authorized representative at the Site of the Work, shall be considered sufficient notice.

**END OF SECTION**

## PART 1 – GENERAL

### 1.01 SCOPE

A. This Section covers requirements for provision, maintenance, and removal of temporary on-site facilities necessary to properly conduct the Work, the installation of temporary perimeter controls, and off-site traffic controls.

B. The Remediation Contractor shall furnish and maintain temporary facilities including, but not limited to, the Remediation Contractor's field office, access roads, decontamination facilities, telephone service, sanitary facilities, and the Remediation Contractor's material storage facility.

### 1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittal Procedures.

B. Section 35 20 26 – Backfill and Material Placement.

### 1.03 REFERENCES

A. OSHA Publications:

1. 29 CFR Section 1910 Occupational Safety and Health Standards.
2. 29 CFR Section 1910 Occupational Safety and Health Standards.
3. .331-.335 National Electric Code (NFPA 70)
4. 29 CFR Section 1915.1000 Air Contaminants.
5. 29 CFR Section 1926 Safety and Health Regulations for Construction.

B. Maine DOT Standard Specifications.

### 1.04 SUBMITTALS

A. The Remediation Contractor shall submit a Construction Facilities and Temporary Controls Plan as part of the Construction Work Plan in accordance with Section 01 33 00 – Submittal Procedures.

### 1.05 FIELD OFFICES

A. The Remediation Contractor shall provide and maintain a field office for use by the Remediation Contractor's personnel. The field office shall be located in the area designated on the Drawings.

## 1.06 TEMPORARY UTILITIES

A. The Remediation Contractor shall avoid excavation for temporary utility installation within the Site boundaries. Temporary utilities shall be run at grade or overhead.

B. Electric Power: The Remediation Contractor shall make arrangements for obtaining temporary electric power service and metering equipment for all field offices. The temporary electric power installations shall meet construction safety requirements of OSHA, state, local, National Electric Code (NFPA 70), and other governing agencies.

C. Water: The Remediation Contractor shall supply potable water to the field office with convenient access for the Remediation Contractor's personnel.

D. Sewage: The Remediation Contractor shall provide and maintain sanitary facilities that comply with regulations of local and state health departments. Chemical toilets shall be maintained in a sanitary condition at all times, conforming to code requirements and acceptable to the health authorities. They shall be of watertight construction so that no contamination of the area can result from their use. The Remediation Contractor shall make arrangements for frequent emptying and maintenance of toilets. Upon completion of the Work, the Remediation Contractor shall remove toilets and restore the area to original conditions.

Toilets will not be allowed at the Nearshore Staging Area.

E. Internet Access: The Remediation Contractor shall provide on-site high speed Internet access for Project use during construction.

## 1.07 DECONTAMINATION FACILITY

A. The Remediation Contractor shall provide personnel decontamination facilities as needed to comply with its CHASP and all environmental protection requirements.

B. The Remediation Contractor shall provide wheel cleaning by hand or other mechanical means for vehicles leaving the Nearshore Support Area.

C. The RPM will construct and maintain existing or new temporary decontamination pads and wheel washes, as necessary, to decontaminate upland-based equipment as shown on the Drawings.

## 1.08 TRAFFIC CONTROL

A. It is the sole responsibility of the Remediation Contractor to be completely familiar with and follow local, state, and federal regulations pertaining to traffic control.

B. The Remediation Contractor shall submit a Traffic Control Plan to the RPM with the Construction Facilities and Temporary Controls Plan in accordance with Section 01 33 00 – Submittal Procedures. The Remediation Contractor shall perform traffic control in accordance with the approved Traffic Control Plan.

C. At a minimum, the Traffic Control Plan shall include a description of on-site hauling routes, anticipated traffic, regulatory compliances, use of flagmen (including qualifications of flagmen), communication methodology between flagmen and heavy equipment operators (e.g., radio communication), and other details related to traffic control. The Traffic Control Plan shall describe the plans for coordinating the Remediation Contractor's traffic with that from other Site activities, including the RPM and other contractors working at the Site.

D. The Remediation Contractor shall provide a flagman (or flagmen) at the entrance of the Site, along hauling routes, and/or Work areas when local traffic flow may be impacted by the Work.

E. Access Roads:

1. Access to the Nearshore Support Area will be constructed by the RPM.

2. The Remediation Contractor shall be responsible for maintaining the existing access road from the Remediation Support Area to the Nearshore Support Area, including:

a) Provide necessary lighting, signs, barricades, and distinctive markings for the safe movement of traffic. Lighting must be adequate to ensure full and clear visibility for full width of the haul road and Work areas during any night work operations.

b) Install, maintain, and operate the necessary dust controls needed for the safe and proper completion of the Work at all times.

F. Barricades:

1. The Remediation Contractor shall erect and maintain temporary barricades to limit public access to hazardous areas.

2. The Remediation Contractor shall securely place barricades clearly visible with adequate illumination to provide sufficient visual warning of the hazard during both day and night.

## PART 2 – PRODUCTS

### 2.01 FACILITIES, TRAILERS, AND FURNISHINGS

A. The facilities, trailers, and furnishings may be new or used but shall be serviceable and adequate for the required purpose. The facilities, trailers, and furnishings shall meet applicable codes and regulations and shall not create unsafe or unsightly conditions.

### 2.02 MATERIAL FOR ACCESS ROAD MAINTENANCE

A. 1.5-inch Crushed Stone:

1. 1.5-inch crushed stone material shall consist of durable natural rock consisting of angular fragments and be free from clay, loam, or other deleterious material.

2. 1.5-inch crushed stone shall meet the following gradation requirements:

| Sieve Size | Percent Passing (by weight) |
|---|---|
| 2 inches | 100% |
| 1 1/2 inch | 95% to 100% |
| 1 inch | 35% to 75% |
| ¾ inch | 0% to 25% |

3. 1.5-inch stone shall have no more than 5% carbonate content when tested in accordance with ASTM D4373.

4. 1.5-inch crushed stone material for the temporary roads and surfaces shall meet the gradation requirements in Maine DOT Specification 703.10 Type A Aggregate for Untreated Surface Course and Leveling Course.

5. The Remediation Contractor shall perform and submit to the RPM a minimum of one round of quality control tests per borrow source as described below, prior to material being delivered to the Site. In addition, the Remediation Contractor shall perform the following tests at the frequency specified below:

   a) Grain size (ASTM D422) at 1 test per 1,000 cy.

   b) Carbonate content (ASTM D4373) at 1 test per source.

   c) Certification and test results certifying that the material meets the requirements for clean fill in Section 35 20 26 – Backfill and Material Placement at 1 test per source.

6. Control tests shall be repeated if visual or textural change in source material is detected by the Remediation Contractor or RPM.

B. Geotextile:

1. Unless otherwise noted on the Drawings, the manufacturer(s) shall furnish materials of which MARVs meet or exceed the criteria specified in the following table:

| Property | Specified Value | Units | Test Method |
|---|---|---|---|
| **Non-woven Geotextile for Separation/Filter Applications** | | | |
| Mass per unit area | ≥ 7.5 (8 nominal) | oz/yd$^2$ | ASTM D 5261 |
| Grab tensile | ≥ 180 (MD and CD) | pounds | ASTM D4632 |
| Trapezoidal tear strength | ≥ 75 (MD and CD) | pounds | ASTM D4533 |
| Puncture strength (CBR) | ≥ 380 | pounds | ASTM D6241 |
| Permittivity | ≥ 1.4 | sec$^{-1}$ | ASTM D4491 |
| Apparent opening size | ≤ 80 maximum<br>≤ 0.18 | U.S. Sieve<br>millimeters | ASTM D4751 |
| Ultraviolet resistance at 500 hours | ≥ 70 | % retained | ASTM D4355 |
| **Non-woven Geotextile for Cushion Application** | | | |
| Mass per unit area | ≥ 24 | oz/yd$^2$ | ASTM D5261 |
| Grab tensile | ≥ 500 (MD and CD) | pounds | ASTM D4632 |
| Trapezoid tear strength | ≥ 200 (MD and CD) | pounds | ASTM D4533 |
| Puncture strength (CBR) | ≥ 1,720 | pounds | ASTM D6241 |
| Ultraviolet resistance at 500 hours | ≥ 70 | % retained | ASTM D4355 |
| **Non-woven Geotextile for Cushion (Geomembrane Protection)** | | | |
| Mass per unit area | ≥ 32 | oz/yd$^2$ | ASTM D5261 |
| Grab tensile | ≥ 600 (MD and CD) | pounds | ASTM D4632 |
| Trapezoid tear strength | ≥ 270 (MD and CD) | pounds | ASTM D4533 |
| Puncture strength (CBR) | ≥ 2,280 | pounds | ASTM D6241 |
| Ultraviolet resistance at 500 hours | ≥ 70 | % retained | ASTM D4355 |

Notes:
CD = Cross-machine Direction
MD = Machine Direction
oz/yd$^2$ = ounces per square yard

## PART 3 – EXECUTION

### 3.01 PREPARATION

A. The Remediation Contractor shall grade the locations of the temporary facilities to promote drainage.

## 3.02 PROTECTION OF WORK

A. The Remediation Contractor shall use all means necessary to protect all prior work, including all materials and completed work of other Sections.

B. The Remediation Contractor shall maintain the access roads throughout construction where ruts or undulations appear. Access roads with ruts or undulations deeper than 3 inches shall be repaired by regrading, resurfacing, and recompacting, or other means approved by the RPM.

C. In the event of damage to the Work of this Section or any other Sections of these Specifications, the Remediation Contractor shall immediately make all repairs and replacements necessary at a cost borne solely by the Remediation Contractor.

## 3.03 ACCESS ROAD MAINTENANCE

A. Placement of 1.5-inch crushed stone:

1. 1.5-inch crushed stone shall be placed and compacted to thicknesses shown on the Drawings in completed lifts up to 12 inches thick. The road base shall be spread, shaped, and compacted the same day it is placed.

2. Unstable areas and areas requiring additional compaction, as identified by and at the sole discretion of the RPM, shall be corrected by the Remediation Contractor at a cost borne solely by the Remediation Contractor.

B. Geotextile Repair:

1. Any holes or tears in the geotextile shall be repaired using a patch made from the same geotextile, with a minimum of 3 feet overlap in all directions. Geotextile patches will be sewn into place no closer than 1 inch from any panel edge. Should any tear exceed 50% of the width of the roll, that roll shall be removed and replaced. Heat bonding of geotextiles shall be performed on patches only upon specific approval of the RPM.

   a) Any adjacent fabrics shall be overlapped a minimum of 6 inches.

   b) Seams shall be sewn in underdrain and toe drain applications.

   c) If sewn, the sewing thread and method shall be such that the tensile strength of sewn seams exceeds the specified grab tensile strength for the parent material presented in this Section.

## 3.04 INSTALLATION OF FACILITIES, TRAILERS, AND FURNISHINGS

A. The Remediation Contractor shall construct the field offices, personnel decontamination facilities, personnel shelter, and storage shelter to comply with their CHASP. The facilities shall be constructed on structurally suitable foundations. Trailer units shall be jacked off the wheels, supported on a temporary foundation, and grounded. Steps and landings shall be provided at all doors.

B. The Remediation Contractor shall install furnishings and equipment and provide utility service for field offices for which it supplies.

## 3.05 REMOVAL

A. The facilities described in this Section, except for access roads, shall remain the property of the Remediation Contractor.

B. The facilities described in this Section shall be removed from the Site within 30 days of receipt of notice to remove, or as otherwise required by the RPM.

C. Facilities shall be decontaminated prior to their removal from the Site as appropriate and in accordance with the manufacturer's recommendations and the requirements for equipment decontamination as described in the CHASP.

**END OF SECTION**

## PART 1 – GENERAL

### 1.01 SCOPE

A. This Section covers preventing environmental pollution during, and as a result of, construction operations. Other Specification Sections may also contain specific requirements for environmental protection. Those specific requirements are in addition to the requirements in this Section; see Section 01 11 00 – Summary of Work for Order of Precedence. The control of environmental pollution requires consideration of noise levels, air, water, and land.

B. The Remediation Contractor is responsible for environmental protection and compliance with environmental permit conditions during all construction activities at all locations it performs work as part of this Contract. Environmental degradation arising from construction activities shall be prevented, abated, controlled, and minimized by complying with all applicable federal, state, and local laws and regulations concerning environmental pollution control and abatement, as well as the specific requirements in the Project Permits.

C. The Work includes compliance with all controls or local, state, and federal ordinances with respect to safety, noise, odor, dust, fire and police action, civil disobedience, security, or traffic.

D. No separate payment will be made for effort associated with the Work described in this Specification Section. Work required to comply with this Specification Section is considered to be incidental to all other activities described in the Contract Documents.

E. The Remediation Contractor shall furnish and/or provide all supervision, labor, tools, materials, equipment, services, and appurtenances necessary for the construction, implementation, and maintenance of the Mobile Turbidity Curtain System presented in this Section and shown on the Drawings for the duration of the dredging work. The Mobile Turbidity Curtain System will be part of the Contractor's base bid and shall include a rigid frame supporting a turbidity barrier on all sides, such as a series of modular barges arranged and secured in a configuration such that a moon pool is created for the access of the offshore dredging equipment. This mobile system includes an integral turbidity barrier and absorbent booms as shown on the Drawings.

F. The Remediation Contractor shall provide all temporary control measures shown on the Drawings or as directed by the Owner or the RPM, for the duration of the Contract. Erosion and sedimentation control drawings are intended to be a guide to address the stages of work shown. Additional measures not specified on the Drawings may be necessary and shall be implemented to address intermediary stages of work and any conditions that may develop during construction at no cost to the Owner.

G. Soil erosion and sediment control measures shall at all times be satisfactory to the RPM. The RPM will inform the Remediation Contractor of unsatisfactory construction procedures and operations if observed. If the unsatisfactory construction procedures and operations are not responded to and corrected within 24 hours, the RPM may suspend the performance of any or all other construction until the unsatisfactory condition has been corrected. Such suspension shall not be the basis of any claim by the Remediation Contractor for additional compensation nor for an extension of time to complete the Work. Any complaints, fines, etc. relating to ineffective erosion control shall be the sole responsibility of the Remediation Contractor.

H. The Remediation Contractor shall inspect all soil erosion and sediment control measures at least at the beginning and end of each day to ascertain that all devices are functioning properly during construction. Maintenance of all soil erosion and sediment control measures on the Limits of Work shall be the responsibility of the Remediation Contractor until final stabilization is complete and until the permanent soil erosion controls are established and in proper working condition.

I. The Remediation Contractor shall protect adjacent properties and watercourses from soil erosion and sediment damage throughout construction.

## 1.02 RELATED SECTIONS

A. Section 01 11 00 – Summary of Work.

B. Section 01 31 00 – Project Management and Coordination.

C. Section 01 33 00 – Submittal Procedures.

D. Section 01 70 00 – Project Record Documents and Project Closeout.

E. Section 46 01 00 – Construction Water Management.

## 1.03 REFERENCES

A. Project Permits (Appendix A).

B. Perimeter Air Monitoring Plan (CDM Smith, July 22, 2015).

C. U.S. Department of Labor – OSHA 29 CFR Part 1926 – Safety and Health Regulations for Construction.

D. “Risk Assessment Guidance for Superfund” Volume 1 – Human Health Evaluation Manual Supplement (Part A). Office of Emergency and Remedial Response (USEPA, 1989).

E. Maine Erosion and Sediment Control BMPs.

F. CQA Plan submitted as Appendix G of the CMI Plan dated June, 2016

G. Latest version of ASTM International standards:

| | | |
|---|---|---|
| 1. | ASTM D 3776 | Standard Test Methods for Mass Per Unit Area (Weight) of Fabric |
| 2. | ASTM D 4491 | Standard Test Methods for Water Permeability of Geotextiles by Permittivity |
| 3. | ASTM D 4533 | Standard Test Method for Trapezoid Tearing Strength of Geotextiles |
| 4. | ASTM D 4632 | Standard Test Method for Breaking Load and Elongation of Geotextiles (Grab Method) |
| 5. | ASTM D 4751 | Standard Test Method for Determining Apparent Opening Size of a Geotextile |
| 6. | ASTM D 4833 | Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products |

## 1.04 SUBMITTALS

A. The Remediation Contractor shall prepare and submit an EPP that includes the following elements: TESC Plan; SPCC Plan; SWPPP; Air Pollution and Odor Control Plan; and Marine Water Quality Criteria Compliance Plan in accordance with Section 01 33 00 – Submittal Procedures.

B. At least 15 days prior to the start of the Work, the Remediation Contractor shall submit manufacturers' material specification sheets and material supplier product data for products and components to be installed by the Remediation Contractor as part of the Work described in the Contract Documents and shown on the Drawings.

## 1.05 ENVIRONMENTAL RESPONSIBILITY

A. The Remediation Contractor shall immediately notify the RPM of any environmental problems that develop at the Site and take all reasonable and necessary measures in the performance of the Work to avoid causing negative impacts to the environment. Where negative impacts occur, the Remediation Contractor must immediately advise the RPM and shall be solely liable to undertake all reasonable and necessary measures to address such negative impacts.

B. The Remediation Contractor shall sequence the Work to prevent or minimize, to the extent practicable, the potential for recontamination of the Site or adjacent non-contaminated areas.

C. The Remediation Contractor shall maintain key pollution control systems in working condition throughout the Project and undertake all works such that there are no unauthorized discharges of liquids or solids to the marine environment, or of gas to the atmosphere.

D. The Remediation Contractor shall maintain a neat Work area free of unnecessary debris, tools, equipment, or materials; dispose of sewage, refuse, and chemical wastes in compliance with the applicable regulations and permit requirements for this work; and remove all tools, equipment, supplies, and wastes from the Site upon completion of the Work.

E. The Remediation Contractor shall maintain all equipment and machinery in good working order and free of leaks or excess oil, grease, and debris. The Remediation Contractor shall verify that appropriately equipped spill kits are available on all equipment at the Site and Remediation Contractor Facilities, and that personnel are knowledgeable with the provisions of the EPP and are adequately trained to implement the measures contained therein.

### 1.06 FIRES

A. Fires and burning of rubbish at the Site are not permitted.

## PART 2 – PRODUCTS

### 2.01 MOBILE TURBIDITY CURTAIN SYSTEM

A. The Mobile Turbidity Curtain System shall consist of a turbidity barrier(s) and rigid frame to allow the system to be efficiently repositioned with the dredge equipment. The final design of the Mobile Turbidity Curtain System is the responsibility of the Remediation Contractor.

B. The turbidity barrier shall consist of rope or cable with floats, anchors (chain or weight), and pre-manufactured impermeable turbidity barrier on the inside and a permeable turbidity barrier on the outside as shown on the Drawings.

C. Rigid Frame:

1. Modular Barges:

    a) Modular barges shall be portable interlocking modular barges designed for use in marine and heavy construction applications such as Flexifloat® or Poseidon® modular barge systems or an equivalent as approved by the RPM.

b) Modular barges shall have deck cleats or an equivalent to secure billow control chains to the barges. Deck cleats or an equivalent shall be spaced 5 feet on center or as required for the length of the barge.

c) The Remediation Contractor shall weld 2-inch galvanized pipe flanges onto the side of the barge using a 2-inch galvanized pipe connected with the appropriate galvanized fittings spaced accordingly to secure the turbidity barrier to the barge.

2. Alternate Rigid Frame:

a) The Remediation Contractor may propose an alternate rigid mobile turbidity curtain frame that allows the system to move with the dredge platform, secures the turbidity barrier, and allows for reefing the turbidity barrier to adjust barrier billowing and length of the barrier.

D. Billow Control Chains:

1. The Mobile Turbidity Curtain System shall include reefing lines to extend between the top of the barrier and bottom ballast chain for infield depth adjustments and feeling of the barriers for redeployment, if applicable.

a) Billow control chains shall be 1-inch galvanized mooring bottom chain or an equivalent as approved by the RPM. The chain length shall be adjustable so it does not drag on the sediment surface. Billow control chains shall be alternately placed in front of and behind the turbidity barrier to control billowing of the barrier. Chains shall extend along the full perimeter of the modular barge system and shall be secured to the deck cleats spaced 5 feet on center.

## 2.02 CONTAINMENT BOOM

A. The Remediation Contractor shall maintain a floating containment boom to deploy as needed to contain floating debris outside of the Mobile Turbidity Curtain System. The containment boom shall be capable of fully containing all floating debris generated during dredging. The Remediation Contractor shall inspect the floating containment boom on a daily basis and maintain the condition of the containment boom throughout the duration of the Work.

## 2.03 SORBENT BOOM

A. Floating sorbent boom shall be deployed within the Mobile Turbidity Curtain System at all times when the Remediation Contractor is completing dredging and backfill activities. The Remediation Contractor shall inspect the sorbent boom on a daily basis, maintain the condition of the sorbent boom throughout the duration of the Work, and replace the sorbent boom once it becomes ineffective at absorbing sheen. The Remediation Contractor shall maintain additional sorbent materials and pads to deploy as needed to remove surface sheens.

## 2.04 SILT FENCE

A. Filter fabric fence shall conform to the following requirements:

| **Test Type** | **Test Method** | **Unit** | **Minimum Average Roll Value (Machine Direction)** |
|---|---|---|---|
| Unit weight | ASTM D3776 | oz/yd$^2$ | 3.9 min. |
| Grab tensile strength | ASTM D4632 | Pounds | 200 min. |
| Grab tensile elongation | ASTM D4632 | % | 15-60 |
| Puncture resistance | ASTM D4833 | Pounds | 60 min. |
| Trapezoid tear strength | ASTM D4533 | Pounds | 50 min. |
| Apparent opening size | ASTM D4751 | U.S. Standard Sieve | 40 min. |
| Flow rate | ASTM D4491 | gal/min/ft$^2$ | 18-60 |

Notes:
gal/min/ft$^2$ = gallons per minute per square foot
oz/yd$^2$ = ounces per square yard

B. Filter fabric fence shall be woven fabric.

C. Filter fabric shall be a minimum of 36 inches in width.

D. Stakes for fencing shall be in accordance with the manufacturer's recommendations.

## 2.05 EROSION CONTROL BLANKET

A. The erosion control blanket shall be double net straw blankets for slopes and double net coconut fiber for ditches/swales or similar, approved by the RPM.

B. The erosion control blanket shall be photodegradable and decompose into natural mulch. The mats shall be such that they retain moisture to control runoff and promote the germination of seeds.

C. The erosion control blanket shall consist of a 24-month biodegradable fiber double net blanket specified for 2H:1V slopes or greater (e.g., North American green C125BN or equivalent).

## 2.06 FIBER ROLL

A. The fiber roll shall consist of a 9-inch diameter biodegradable straw wattle with a UV degradable polyethylene netting or approved equal.

B. Hardwood stakes used for the fiber roll installation shall consist of a minimum of 1-inch by 1-inch square cross-sections that are 24 to 36 inches long.

## 2.07 STRAW BALES

A. Straw bales shall be placed in a row with the ends tightly adjoining.

B. Straw bales placed on pavement or concrete shall have burlap placed between the bale and the pavement or concrete.

C. Stakes are not required if bales are installed on asphalt or pavement surfaces. Straw bales placed on soil shall be anchored in place by at least two stakes driven through the bale. The stakes shall be driven at least 18 inches into the ground.

## 2.08 STOCKPILE COVERS

A. Stockpile covers shall be made of minimum 10-mil polyethylene sheeting and shall be strong, durable, flexible polyethylene sheeting as manufactured by Poly-America L.P., of Grand Prairie, Texas, or an RPM-approved equivalent. It shall be capable of resisting tears or punctures. The sheeting shall have a minimum impact strength of 475 grams per ASTM D1709.

B. Weights used to secure the stockpile covers shall be 50-pound bags of sand (or an approved equal).

C. Lines to secure the sand bags and stockpile covers shall be a minimum 3/8-inch polypropylene or manila braided rope.

## 2.09 AIR POLLUTION PREVENTION

A. The Remediation Contractor shall provide materials including, but not limited to, tarps, plastic, non-contact water, sand bags, HgX manufactured by Acton Technologies, Inc., or other approved materials necessary to control air quality at the Site.

# PART 3 – EXECUTION

## 3.01 GENERAL

A. The Remediation Contractor shall maintain a copy of the EPP at the Site in accordance with maintenance Project Record Documents described in Section 01 70 00 – Project Record Documents and Project Closeout.

B. In the event of a conflict between these requirements and environmental and pollution control laws, rules, or regulations of other federal, state, or local agencies, the more restrictive laws, rules, or regulations shall apply as determined by the RPM.

C. All overlying barge water shall be filtered prior to decanting or pumping to the Penobscot River. Filtered water shall meet the TSS or turbidity limits established in the Section 401 Water Quality Certificate.

D. No discharge of water from the Nearshore Support Area, the Remediation Support Area, or any other upland Work area to the Penobscot River shall be allowed that exceeds the regulated pollutant levels in the MEPDES Permit.

E. The Remediation Contractor shall be solely responsible for any damages and fines incurred because of Remediation Contractor, Subcontractor, or supplier actions in implementing the requirements of this Section.

F. The Remediation Contractor shall be solely responsible for schedule impacts incurred because of Remediation Contractor, Subcontractor, or supplier actions in implementing the requirements of this Section.

G. Supervision:

1. During the Work, the Remediation Contractor shall supervise all activities, including those of Subcontractors, to ensure compliance with the intent and details of the EPP. The Remediation Contractor shall conduct weekly environmental compliance meetings to ensure that its Subcontractors and all personnel working at the Site are familiar with the environmental protection provisions. Inspect all equipment and materials for environmental protection regularly to ensure they are in proper order, are being applied correctly, and have not deteriorated.

H. Daily Inspection and Weekly Reporting:

1. The Remediation Contractor shall conduct daily inspection of its environmental protection measures to ensure all are working properly and are adequately maintained during the duration of construction.

2. The Remediation Contractor shall submit written Weekly Environmental Protection Inspection Reports to the RPM as part of the Remediation Contractor’s Weekly Construction Report in accordance with Section 01 31 00 – Project Management and Coordination.

## 3.02 NOTIFICATION OF NON-COMPLIANCE

A. The RPM will notify the Remediation Contractor, in writing, of observed non-compliance with federal, state, or local environmental statutes, ordinances or regulations, permits, and other elements of the Remediation Contractor's EPP. Notwithstanding this notification process, the Remediation Contractor shall be responsible for conducting all construction activities in a manner compliant with these regulations.

B. The Remediation Contractor shall inform the RPM of proposed corrective action after receipt of such notice and take such action for approval by the RPM.

C. The RPM may issue a stop work order until satisfactory corrective action has been taken.

D. No time extensions shall be granted or equitable adjustments allowed to the Remediation Contractor for such suspensions.

E. The Remediation Contractor is required to comply with all environmental requirements whether or not notified by the Owner of non-compliance.

## 3.03 SUBCONTRACTORS

A. Compliance with this Section by Subcontractors will be the responsibility of the Remediation Contractor.

## 3.04 SITE MAINTENANCE

A. The Remediation Contractor shall keep all work areas clean and free from rubbish and debris. The Remediation Contractor shall remove materials and equipment from the Site when they are no longer necessary. Upon completion of the Work, and before final acceptance, the Remediation Contractor shall clear the Site of equipment, unused materials, and rubbish to present a clean and neat appearance in conformance with the present condition of the Site.

B. Cleanup:

1. The Remediation Contractor shall maintain work in tidy condition, free from accumulation of waste products and debris.

2. The Remediation Contractor shall dispose of waste materials and debris in accordance with these Specifications.

3. Waste material of any kind shall not be permitted to remain on the Site of the Work or on adjacent streets. Immediately upon such materials becoming unfit for use in the Work, they shall be collected, carried off site, and properly disposed of by the Remediation Contractor.

4. The Remediation Contractor shall keep all buildings occupied by the Remediation Contractor clear of all refuse, rubbish, and debris that may

accumulate from any source, and keep them in a neat condition to the satisfaction of the RPM.

5. The Remediation Contractor shall handle paints, solvents, petroleum products, hazardous substances, bulk cement, concrete cure washings, crushed concrete, waste streams generated during construction, and other construction materials with care to prevent entry of contaminants into storm drains, surface waters, or soils. The Remediation Contractor shall dispose of excess materials off site in accordance with applicable local, state, and federal regulations.

6. In the event that waste material, refuse, debris, and/or rubbish are not removed from the Work by the Remediation Contractor, the Owner reserves the right to have the waste material, refuse, debris, and/or rubbish removed, and the expense of the removal and disposal shall be deducted from payment owed to the Remediation Contractor.

## 3.05 PROTECTION OF AQUATIC VEGETATION

A. The Remediation Contractor shall operate barge movements to minimize impacts to aquatic vegetation.

   1. The Remediation Contractor shall set and retrieve anchors vertically, and maintain anchor tension such that anchor cables do not drag.

   2. The Remediation Contractor shall use minimal propulsion power when maneuvering barges between the MHHW water line and elevation -20 feet MLLW, for the protection of benthic and intertidal habitat, as well as sediment and backfill within the remediation areas.

## 3.06 AIR POLLUTION AND ODOR CONTROL

A. General:

   1. The RPM is responsible for conducting air monitoring in accordance with the PAMP. The Remediation Contractor is responsible for conducting Work in a manner that does not cause non-compliances with the PAMP.

   2. The Remediation Contractor shall furnish all materials, equipment, and personnel necessary to complete the scope of work required in the Drawings and these Specifications while maintaining perimeter air quality levels below action levels established in the PAMP.

   3. The Remediation Contractor is responsible for completing all Site construction activities and implementing mitigation measures in accordance with the PAMP. The RPM will furnish equipment and personnel necessary to perform the perimeter air monitoring. The

Remediation Contractor will not be allowed to perform intrusive work when the perimeter air monitoring stations are not operating.

4. The Remediation Contractor may have to reduce work hours and modify the location of the Work if perimeter air quality exceeds the values set forth in the PAMP.

5. The Remediation Contractor will be responsible for repairing or replacing any of the RPM's perimeter air monitoring equipment or enclosures if they are damaged or destroyed during the Remediation Contractor's construction activities. Remediation Contractor's work activities will not be allowed to proceed until the repaired or replaced equipment is in full operation and in compliance with the PAMP.

B. Air Pollution Prevention Measures:

1. The Remediation Contractor shall not discharge smoke, dust, odor, or other contaminants into the atmosphere that violate the regulations of any legally constituted authority. The Remediation Contractor shall not allow internal combustion engines to idle for prolonged periods of time. The Remediation Contractor shall maintain construction vehicles and equipment in good repair. The Remediation Contractor shall repair or replace exhaust emissions that are determined to be excessive by the RPM.

2. The Remediation Contractor shall minimize dust nuisance by cleaning, sweeping, vacuum sweeping, sprinkling with water, or other means. The use of water, in amounts that result in mud on public streets, is not acceptable as a substitute for sweeping or other methods. The Remediation Contractor shall keep equipment for this operation on the Site or available at all times.

    a) The Remediation Contractor shall execute the Work by methods that minimize raising dust from construction operations.

    b) The Remediation Contractor shall apply water as required for dust control and when advised by the RPM. The Remediation Contractor shall choose dust control methods such that a minimal amount of water is required.

    c) The Remediation Contractor shall apply water with distributors equipped with a spray system to ensure uniform application and with means of shut off.

    d) The Remediation Contractor shall not allow runoff from water used for dust control to enter storm drains.

e) Water for dust control or other uses shall not be taken from the Site or the Penobscot River without prior approval from the RPM.

3. Consistent with all local, state, and federal regulations, the Remediation Contractor shall conduct all operations and maintain the Site to minimize and suppress objectionable odors and the potential for organic vapors associated with the Work.

a) The Remediation Contractor shall monitor odor as necessary to comply with any applicable health and safety regulations and implement procedures to reduce or eliminate odor from sediment stockpiles if necessary.

b) The Remediation Contractor shall implement measures to suppress organic vapor concentrations and/or odors at no additional cost to the Owner. Acceptable measures include backfilling open excavations and/or application of an odor or organic vapor suppression foam.

c) The Owner reserves the right to suspend the Work at any time in the event that the Remediation Contractor's operations result in organic vapors or objectionable odors that are deemed to cause a potential safety and/or air quality issue.

C. Air Quality Levels:

1. The RPM will characterize the Site's air quality level into one of three categories based on the perimeter air monitoring readings. The air quality level will determine which construction activities can be performed and what mitigation measure may need to be implemented. On a daily basis, the RPM will notify the Remediation Contractor of the level or if it changes in the course of a day. The air quality levels are as follows:

a) Level GREEN: Construction activities may proceed, and no specific mitigation measures are necessary.

b) Level YELLOW: Construction activities may proceed with caution, mitigation measures shall be deployed, and a shortened work schedule may be necessary.

c) Level RED: Work stopped until levels are down to level YELLOW or GREEN.

D. The criteria used to establish the air quality level are presented in the PAMP. The mitigation measures and actions are as follows:

1. Level GREEN: The Remediation Contractor shall institute engineering controls only as necessary to control dust where the potential exists for airborne particulate generation or odor as a result of all construction activities. The Remediation Contractor shall include controls such as alternate means of work execution, water, wind breaks, and cover materials.

2. Level YELLOW: Where the Remediation Contractor has been notified of a Level YELLOW condition when the GREEN threshold level is exceeded, the Remediation Contractor shall implement mitigation measures. Mitigation measures will be performed until either the activity is deemed by the RPM to no longer require measures to be performed, based on determination that the activity is not the source of the exceedance, or the levels abate to level GREEN.

3. Level RED: Where the Remediation Contractor has been notified of a level RED condition, the Work shall be stopped. Mitigation measures shall be performed until either the activity is deemed by the RPM to no longer require measures to be performed, based on determination that the activity is not the source of the exceedance, or the levels abate to threshold level YELLOW OR GREEN.

E. Process Controls:

1. Process controls, including, but not limited to, delaying or temporary suspension of the Work may be instituted at the direction of the RPM where conditions (e.g., excessive wind or temperature) may prohibit the proper implementation and effectiveness of engineering controls.

F. Work Stoppage:

1. Where engineered or process controls may fail to suppress dust or vapors to established acceptable levels (below Level RED exceedances; i.e., Level YELLOW or GREEN) or control odors on the Site, the Work shall stop until effective measures are identified to control the condition contributing to the exceedance.

## 3.07 NOISE AND LIGHTING CONTROL

A. The Remediation Contractor shall ensure construction involving noisy operations, including starting and warming up of equipment, is in compliance with local noise ordinances. The Remediation Contractor shall schedule noisy operations to minimize the duration.

B. The Remediation Contractor shall comply with all local controls and noise level rules, regulations, and ordinances that apply to the Work.

C. The Remediation Contractor shall enclose each internal combustion engine used for any purpose on the job or related to the job and equip with a muffler and spark arrester of a type recommended by the manufacturer. The Remediation Contractor shall not operate any internal combustion engine on the Project without said muffler and enclosure. The Remediation Contractor shall ensure noise-control devices on construction equipment are properly maintained. The Remediation Contractor shall operate all construction equipment with exhaust systems in good repair to minimize noise.

D. The Remediation Contractor shall implement the use of lighting shrouds for the Work to be completed during nighttime hours to minimize lighting disruptions to local residents.

## 3.08 SPILL PREVENTION AND CONTROL

A. The Remediation Contractor shall be responsible for prevention, containment, and cleanup of spilling of oil, fuel, and other petroleum products used in the Remediation Contractor’s operations. All such prevention, containment, and cleanup costs shall be borne by the Remediation Contractor.

B. The Remediation Contractor is advised that discharge of oil from equipment or facilities into State waters or onto adjacent land is not permitted.

C. The Remediation Contractors shall take the following measures, at a minimum, regarding oil spill prevention, containment, and cleanup:

1. The Remediation Contractor shall inspect fuel hoses, lubrication equipment, hydraulically operated equipment, oil drums, and other equipment and facilities regularly for drips, leaks, or signs of damage, and maintain and store properly to prevent spills. The Remediation Contractor shall maintain proper security to discourage vandalism.

2. The Remediation Contractor shall dike or locate all land-based oil and products storage tanks to prevent spills from escaping to the water. The Remediation Contractor shall line diking and sub-soils with impervious material to prevent oil from seeping through the ground and dikes.

3. The Remediation Contractor shall immediately contain all visible floating oils with booms, dikes, oil-absorbent pads, or other appropriate means and remove from the water prior to discharge into State waters. The Remediation Contractor shall immediately contain all visible oils on land using dikes, straw bales, or other appropriate means and remove using sand, ground clay, sawdust, or other absorbent material, and properly dispose. The Remediation Contractor shall temporarily store waste materials in drums or other leak-proof containers after cleanup and during

transport to disposal. The Remediation Contractor shall dispose waste materials off property at an approved and permitted disposal facility.

4. The Remediation Contractor shall use environmentally sensitive hydraulic fluids that are non-toxic to aquatic life and readily or inherently biodegradable.

5. In the event of any oil or product discharges into public waters, or onto land with a potential for entry into public waters, the Remediation Contractor shall immediately notify the RPM. The RPM will notify required reporting agencies at their listed 24-hour response numbers, including, but not limited to:

   a) National Response Center: (800) 424-8802.

   b) Maine DEP: (800) 482-0777.

6. The Remediation Contractor shall maintain the following equipment and materials on the Site in sufficient quantities to address potential spills from the Remediation Contractor’s floating and land-based equipment:

   a) Oil-absorbent booms.

   b) Oil-absorbent pads or bulk material.

   c) Oil-skimming system.

   d) Straw bales.

   e) Oil dry-all, gloves, and plastic bags.

   f) Remediation Contractor PPE for emergency spill response.

   g) Concentrated odor neutralizer.

D. The Remediation Contractor shall perform construction activities by methods that will prevent entrance or accidental spillage of solid matter, contaminants, debris, or other pollutants or wastes into saltwater bodies, streams, flowing or dry watercourses, lakes, wetlands, reservoirs, or underground water sources. Such pollutants and wastes include, but are not restricted to, refuse, garbage, cement, sanitary waste, industrial waste, hazardous materials, radioactive substances, oil and other petroleum products, aggregate processing tailings, mineral salts, and thermal pollution.

## 3.09 MOBILE TURBIDITY CURTAIN SYSTEM

A. The Remediation Contractor shall design and construct a Mobile Turbidity Curtain System for use during all dredging and backfill placement work in the Marine Area as shown on the Drawings and in strict accordance with the manufacturers' recommended procedures.

B. The Mobile Turbidity Curtain System shall consist of a series of modular barges or equivalent rigid frame system, approved by the RPM, arranged and secured in a configuration such that a "moon pool" is created for work access within the modular barges or rigid frame system as shown on the Drawings. Submerged in-water dredging shall be conducted within the moon pool at all times, unless directed otherwise by the RPM.

C. At a minimum, a full-length impermeable turbidity barrier shall be fitted to the inner edges of the modular barge/rigid frame system and secured to a 2-inch galvanized pipe, or an equivalent, and welded to the barge. This is the primary turbidity barrier in the Mobile Turbidity Curtain System.

D. Chains or equivalent weighted materials shall be draped down the turbidity barrier to prevent the turbidity barrier from billowing under the barge as shown on the Drawings. Chains shall be placed in an alternating manner on the inside and outside edge of the turbidity barrier. It is the Remediation Contractor's responsibility to design the Mobile Turbidity Curtain System with sufficient ballast and rigidity.

E. An impermeable or permeable turbidity barrier (full- or partial-length) may be fitted outside of the main turbidity barrier to reduce hydrodynamic loads on the primary turbidity barrier.

F. The Remediation Contractor shall secure absorbent booms to the inside edge of the modular barge/rigid frame system to control sheen during dredging activities, if any sheen is observed. A second exterior perimeter absorbent boom, installed outside of the turbidity barrier, may be required to control sheen and shall be installed at the request of the RPM. Absorbent booms and sorbent pads shall be used in conjunction with the turbidity barrier to control sheens that may be encountered during in-water activities and prevent downstream transport of resuspended materials and sheens.

G. Before moving the mobile system, the Remediation Contractor shall verify that all surface debris is removed and turbidity within the curtained off area has visibly reduced, as verified by the RPM.

## 3.10 TEMPORARY EROSION AND SEDIMENT CONTROL

A. The Remediation Contractor shall develop and implement the construction SWPPP as described in Section 01 33 00 – Submittal Procedures, including TESC

BMPs. The Remediation Contractor shall address the following issues as part of developing and implementing the TESC BMPs:

1. The TESC notes and details shown on the Drawings and the information in this Section of these Specifications are minimum requirements for the anticipated Site conditions during the construction period. During the construction period, upgrade the TESC facilities as needed for unexpected storm events and modify these facilities for changing Site conditions (such as relocation of ditches and silt fences, etc.) at no additional cost to the Owner.

2. Inspect the TESC facilities daily and maintain these facilities to ensure continued proper functioning during the construction period. Submit written records of these inspections to the RPM as part of the Remediation Contractor’s DARs and Weekly Construction Report in accordance with Section 01 33 00 – Submittal Procedures.

3. Employ appropriate erosion control measures, including silt fences, filter fabric, plastic sheeting, and placement of straw bales along the peripheries of construction sites, and ensure measures are in place prior to any clearing or grading activity.

B. If monitoring or inspection shows that the erosion controls are ineffective, the Remediation Contractor shall immediately mobilize work crews to make repairs, install replacements, or install additional controls as necessary.

C. General Erosion Control Requirements:

1. The RPM has the authority to control the surface area of each material exposed by the construction operations and to direct the Remediation Contractor to immediately provide permanent or temporary stormwater control measures to prevent impacts to adjacent water courses or other areas of water impoundment. Every effort shall be made by the Remediation Contractor to prevent erosion on the Site abutting properties.

2. The Remediation Contractor shall limit the surface area of earth material exposed to the maximum extent practicable.

3. The Remediation Contractor shall install and maintain the erosion control measures. The Remediation Contractor shall remove such installations at the request of the RPM.

4. The Remediation Contractor shall operate all equipment and perform all construction operations to minimize pollution. The Remediation Contractor shall cease any operations that will increase pollution during rainstorms.

D. Silt Fencing:

1. The Remediation Contractor shall install silt fencing as shown on the Drawings and according to the manufacturer’s recommendations.

2. The Remediation Contractor shall inspect, maintain, and/or replace silt fence throughout the Contract period and remove all such temporary features when directed by the RPM.

E. Erosion Control Blanket:

1. If needed, The Remediation Contractor shall install, according to the manufacturer’s recommendations, the erosion control blanket in temporary diversion berms and on slopes.

F. Fiber Roll:

1. Fiber rolls may be used to control runoff from small disturbed areas, provided that runoff is in the form of sheet flow.

2. Fiber rolls shall be installed along the inner and outer contours of cut slopes.

3. Fiber rolls can also be used as check dams in areas of concentrated flow on a temporary basis.

4. Fiber rolls shall be installed according the manufacturer’s specifications.

G. Stockpile Covers:

1. Stockpile covers shall be installed as shown on the Drawings. The edges of polyethylene sheeting shall be overlapped by a minimum of 12 inches and secured with sand bags (or approved equal) and rope so that a grid (horizontal and vertical) spacing for the ropes shall not exceed 10 feet on center.

2. Stockpiles shall have berms (straw bales) as shown on the Drawings. Stockpile berms are not required if the stockpile is within a larger containment cell such as the TSSA No. 2.

H. Inspection and Maintenance:

1. The Remediation Contractor shall maintain and document the sediment and erosion control features at all times throughout the Project’s duration and until the completion certification and approval has been issued. This may include, but not be limited to, stabilizing unvegetated slopes before and throughout the winter, frequently inspecting and maintaining erosion

and sediment controls throughout the winter, and repairing or replacing erosion and sediment controls. In no case shall the winter conditions preclude maintenance of erosion and sediment controls nor establishment of final vegetation.

2. The Remediation Contractor shall conduct regular sediment and erosion control system inspections throughout the Project's duration. At a minimum, the Remediation Contractor shall conduct weekly inspections. The Remediation Contractor shall document these inspections and maintenance/repair activities in the DARs as outlined in Section 01 33 00 – Project Management and Coordination. The Remediation Contractor shall report the results of the inspection and the recommended maintenance and/or repair procedures to the RPM for approval.

3. Additional inspections are required immediately following a major storm event (i.e., rainfall amounts more than 0.5 inch).

4. At a minimum, maintenance shall include, but not be limited to, the following:

   a) Sediment buildup shall be removed from silt fences before it exceeds 6 inches in depth.

   b) Any floating construction or natural debris shall be immediately removed.

   c) Repair and/or replacement of silt fences that are not properly secured, embedded, aligned, or are otherwise no longer providing the intended functions to the satisfaction of the RPM.

5. The construction entrances, exits, and traffic areas within the Limits of the Work shall be maintained in a condition that shall prevent tracking or flowing of impacted media (soil, sediment, and liquid). Tracking or flowing of impacted media (soil, sediment, and liquid) onto public rights-of-way is not permitted. The Remediation Contractor shall maintain construction entrances, exits, and traffic areas as required with periodic top dressing with additional stone as conditions demand; repair or clean out any measures used to trap such media; or clean other devices or surfaces. Impacted media spilled, dropped, washed, or tracked onto public rights-of-way must be removed immediately, at no additional cost to Owner, and properly handled and properly disposed of by the Remediation Contractor to the RPM's satisfaction.

I. Removal and Cleanup:

1. The Remediation Contractor shall remove and dispose of all sediment and erosion control features upon receiving Project completion approval from

the RPM. The removal and cleanup shall be performed to the satisfaction of the RPM.

## 3.11 WASTEWATER MANAGEMENT AND DISPOSAL

A. The Remediation Contractor shall comply with applicable discharge limitations and requirements as described in Section 46 01 00 – Construction Water Management. The Remediation Contractor shall not discharge wastewaters to the Site's sewer systems that do not conform to, or are in violation of, such limitations or requirements.

B. The Remediation Contractor shall not discharge wastewater from personnel hygiene, decontamination, or toilet facilities on the Site.

## 3.12 DISPOSAL OF NON-SEDIMENT WASTES

A. The Remediation Contractor is responsible for storing, separating, handling, and transporting all waste materials in accordance with applicable regulations and requirements.

B. Disposal or recycling of other waste generated during the Project shall be done in compliance with applicable regulations, and the facilities used will need to be reviewed by the RPM.

## 3.13 CONTACT WATER MANAGEMENT CONTROLS

A. Stockpile Contact Water Control Measures:

   1. The Remediation Contractor shall transport all dredged/excavated sediment to the TSSA No. 2 truck offload ramp within the Remediation Support Area in accordance with Section 35 20 23 – Dredging and Excavation. Stockpiling dredged/excavated sediment within the Barge Offloading Area, Nearshore Support Area, or other locations is not allowed unless otherwise directed by the RPM.

   2. The RPM will be responsible for managing contact water within the Remediation Support Area for stockpiles managed by the RPM.

   3. The Remediation Contractor shall suspend the Work in the rain if such work cannot be performed without causing turbid runoff.

   4. Discharge of hazardous substances will not be permitted under any circumstances.

## 3.14 STORMWATER MANAGEMENT CONTROLS

A. Drainage and Surface Water Management:

1. The Remediation Contractor shall divert stormwater runoff from upslope areas away from stockpile and/or excavation areas. The Remediation Contractor shall implement practices to divert flows from exposed soils, or otherwise limit runoff and the discharge of pollutants from exposed areas of the Site.

2. The Remediation Contractor shall use methods of dewatering, excavating, or stockpiling sediment, soil, and debris materials that include prevention measures to control silting and erosion, and will intercept and settle any runoff of soil- or sediment-laden wastewaters.

3. Before construction begins, the Remediation Contractor shall establish appropriate perimeter barriers to prevent excess surface water flows from causing erosion. The Remediation Contractor shall keep Work areas free of surface water run-on from adjacent upland areas and as free from immersion as possible. Unless otherwise specified, the Remediation Contractor shall remove all temporary facilities, equipment, and structures for care and diversion of water upon completion of the Work, except the permanent drainage features of the Project.

4. To avoid solids or turbid runoff from entering surface waters, the Remediation Contractor shall secure and/or berm excavated areas and stockpiles and employ other methods as necessary such as straw bale around storm drains or excavated areas, or use sedimentation basins.

5. The Remediation Contractor shall prevent construction site runoff from directly entering any storm drain or the waterway and use straw bales or other filtration method suitable to the RPM.

## 3.15 FUEL STORAGE TANKS MANAGEMENT

A. Storage Tank Placement. The Remediation Contractor shall place fuel or other petroleum product (hereinafter referred to collectively as fuel) storage tanks or containers at least 20 feet from waterbodies, streams, flowing or dry watercourses, wetlands, reservoirs, and any other water source in a discharge area.

B. Storage Area Dikes. The Remediation Contractor shall construct storage area dikes at least 12 inches high or graded and sloped to permit safe containment of leaks and spills equal to the capacity located in each area plus a sufficient amount of freeboard to contain the 25-year rainstorm.

C. Diked Area Barriers. The Remediation Contractor shall provide diked areas with an impermeable barrier at least 50 millimeters thick. Areas used for refueling operations shall be underlined with an impermeable liner at least 50 millimeters thick buried under 2 to 4 inches of soil.

D. Underground Tank Prohibitions. Do not use underground storage tanks.

## 3.16 PROTECTION OF WATER RESOURCES

A. General:

1. The Remediation Contractor shall comply with state water quality standards and conditions of any permits and clearances obtained for the Work. No uncontrolled effluent will be permitted that results from the Remediation Contractor's activities.

B. Disposal:

1. Except as provided in the Contract, disposal of any wastes, effluents, trash, grease, chemicals, or other contaminants in waterbodies shall not be allowed. If any waste material is dumped in unauthorized areas, the material shall be removed by the Remediation Contractor and the area shall be restored to a condition approximating the adjacent undisturbed area, at no additional expense to the Owner.

## 3.17 MARINE WATER QUALITY CRITERIA COMPLIANCE

A. The Owner is responsible for preparing a WQMP per the requirements of the Section 401 Water Quality Certificate.

B. The Remediation Contractor is responsible for conducting the Work in a manner that does not cause non-compliances with the Section 401 Water Quality Certification issued for the Project and other applicable local, state, and federal standards.

C. The Owner will conduct its own marine water quality monitoring during the Project to assess the Remediation Contractor's compliance, but this does not alleviate the responsibility of the Remediation Contractor to comply with the water quality criteria. In the event of a water quality exceedance, the Remediation Contractor will be required to modify its procedures, methods, or equipment appropriately to remedy the exceedances, at no additional expense to the Owner. The purpose of the specified water quality monitoring is to provide ongoing assessment of water quality impacts during dredging, backfilling, and other in-water construction activities as specified in the WQMP. The Remediation Contractor shall have in place BMPs to respond to water quality exceedances from in-water construction activities.

D. The Remediation Contractor shall review and comply with conditions in the Maine DEP-approved WQMP. The WQMP is available as a reference document to the Contract Documents as Appendix E to these Specifications.

E. In the event that water quality criteria are exceeded during the Work:

1. Modification of Operations. If water quality criteria are exceeded, the Remediation Contractor shall take immediate steps to correct the exceedance and improve water quality conditions. Such steps may include modified operational practices, engineering controls, and other measures as appropriate. The Remediation Contractor shall communicate all modifications proposed to the RPM prior to implementing them. If corrective actions do not result in water quality criteria being met, the Remediation Contractor shall be prepared to temporarily suspend operations until water quality comes back into compliance with the criteria.

2. Cessation of Operations. The Remediation Contractor shall cease construction activities at the first indication of a regulated substance spill (e.g., oil) within the Work area, or at the first indication of distressed or dying fish in the vicinity of construction. When such conditions occur, the Remediation Contractor shall cease all operations and take all necessary steps to correct the problem. Immediately notify the RPM of the problem. Operations may resume upon approval of the RPM after the problem has been corrected.

3. USACE and Maine DEP will be notified by the RPM.

### 3.18 EQUIPMENT DECONTAMINATION

A. The Remediation Contractor shall decontaminate equipment after working in potentially contaminated Work areas such as the Nearshore Support Area and prior to subsequent work or travel to the Plant Area and Remediation Support Area.

B. The Remediation Contractor shall perform equipment decontamination on a Remediation Contractor-constructed equipment decontamination pad or in watertight barges to prevent cross-contaminating unimpacted areas.

C. Each piece of equipment may be inspected by the RPM after decontamination and prior to removal from the Site or travel on clean areas. The RPM will have the right to require that additional decontamination be completed if deemed necessary, at no additional cost to the Owner.

D. The Remediation Contractor shall collect decontamination wastewaters and sediments that accumulate on the equipment decontamination pad, properly dispose of solid waste materials, and transfer waters to the on-site GWTP.

E. The Remediation Contractor shall furnish and equip personnel engaged in equipment decontamination with PPE, including suitable disposable clothing, respiratory protection, and face shields.

**END OF SECTION**

## PART 1 – GENERAL

### 1.01 SCOPE

A. This Section covers the requirements for maintenance and submittal of Project Record Documents and other project closeout procedures.

### 1.02 RELATED SECTION

A. Section 32 91 00 – Revegetation

### 1.03 SUBMITTALS

A. The Remediation Contractor shall submit written certification for Project closeout, as required as part of the closeout procedures described in this Specification, to the RPM within 20 calendar days of completion of the Work.

B. The Remediation Contractor shall submit all Project Record Documents, as described in this Section, to the RPM within 30 calendar days of completion of work.

C. The Remediation Contractor shall submit the final Application for Payment, as described in this Section, to the RPM within 20 calendar days of completion of the Work.

### 1.04 ON-SITE DOCUMENTS

A. The Remediation Contractor shall maintain at the Site, in good order for ready reference by the Owner, one complete record copy of the Contract Documents, including the Addenda, Change Orders, and Project Permits; all working drawings; Progress Schedule; QC Records; CHASP logs; and other approved submittals. The Remediation Contractor shall generate and keep on Site all documents and reports required by applicable permit conditions.

B. The Remediation Contractor shall mark the Record Drawings to record all changes made during construction. The location of all existing or new underground piping, valves and utilities, and obstructions, as located during the Work, shall be appropriately marked on the ground until the Remediation Contractor incorporates the actual field location dimensions and coordinates into the Record Drawings for the Site. The Remediation Contractor shall update the Project's Record Drawings on a weekly basis and before elements of the Work are covered or hidden from view. After the completion of the Work, or portions of the Work, and before requesting final inspection, the Remediation Contractor shall give the Record Drawings to the Owner. The Owner reserves the right to withhold progress payments until such time as the Record Drawings are brought current.

## 1.05 MAINTENANCE OF PROJECT RECORD DOCUMENTS

A. Throughout the Work, the Remediation Contractor shall maintain one record copy of the Project Record Documents in a safe place at the Site including, but not limited to:

1. Permits, regulatory approvals, and other government directives that relate to the Work.
2. Drawings.
3. Specifications.
4. Written plans.
5. Subcontracts.
6. Change orders, field orders, and other modifications to the Contract.
7. All submittals required by the Contract Documents and approved by the RPM.
8. DARs, Daily CQC Reports, and Weekly Progress Reports.
9. Weekly meeting minutes.
10. Construction photographs.
11. Approved submittals/shop drawings.
12. Product data and samples.
13. As-built Drawings and other as-built documentation.
14. Other documents related to performance of the Work, including inspections.

B. Updates:

1. The Remediation Contractor shall update the Project Record Documents on a frequent basis such that the information in the documents is current and can be clearly discussed during every weekly progress meeting.
2. The Remediation Contractor shall legibly mark the following items on the Project Record Documents and shop drawings to record actual construction:
    - a) Approved field changes of locations, dimensions, and details.

b) Significant detail(s) not shown in the original Contract Documents.

3. The Project Record Documents shall be kept on the Site, amended as changes occur, and returned to the RPM with the Remediation Contractor's claim for final Application for Payment.

C. Copies of Project Record Documents shall be retained by the Remediation Contractor at an off-site location as a redundancy in case of damage or loss on the Site.

## 1.06 PROJECT CLOSEOUT PROCEDURES

A. The Remediation Contractor shall submit written certification to the RPM. The written certification shall indicate that:

1. Contract Documents have been reviewed.

2. Work has been tested and inspected during construction.

3. Work is complete in accordance with Contract Documents and ready for the RPM's final inspection.

B. Once the written certification is received, the RPM will perform the final inspection with the Remediation Contractor in attendance. If necessary, a punch list of outstanding work items will be generated, which the Remediation Contractor shall address prior to final payment.

C. At the completion of field operations, the Remediation Contractor shall deliver all Project Record Documents to the RPM. Delivery shall be accompanied with a transmittal letter, indicating the date, project title and number, RPM's name and address, and the title of each Project Record Document.

D. The Remediation Contractor shall submit the final Application for Payment, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

## 1.07 FINAL CLEANING

A. Upon completion of the Work and prior to final inspection, the Remediation Contractor shall decontaminate and remove all of its equipment, signs, facilities, construction materials, and trash from the Site and perform any other reasonable clean-up activities requested by the RPM. All disturbed areas shall be revegetated or otherwise put into a condition satisfactory to the RPM. Revegetation shall be carried out in accordance with Section 32 91 00 – Revegetation and as shown on the Drawings.

## PART 2 – PRODUCTS

Not used.

## PART 3 – EXECUTION

Not used.

**END OF SECTION**

## PART 1 – GENERAL

### 1.01 SCOPE

A. The Remediation Contractor shall provide all materials, labor, equipment, and incidentals necessary to conduct the proper surveys required to determine seafloor and shore elevations within the area of the Work.

B. The Remediation Contractor shall perform hydrographic and topographic surveys for layout of the Work; verify dredge and excavation depths; verify backfill material placement elevation; obtain final quantities for dredging, excavation, and backfilling; and verify the grades of final as-built construction for acceptance of completed work as stipulated in this Section.

### 1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittal Procedures.

B. Section 01 31 00 – Project Management and Coordination.

C. Section 01 45 00 – Quality Control.

D. Section 01 70 00 – Project Record Documents and Project Closeout.

E. Section 35 20 23 – Dredging and Excavation.

### 1.03 REFERENCE STANDARDS

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by basic designation only. The most recent version of the reference applies.

1. USACE – EM 1110-1-1005 (January 2007). Engineering and Design – Control and Topographic Surveying.

2. USACE – EM 1110-2-1003 (November 2013). Engineering and Design – Hydrographic Surveying.

### 1.04 PROJECT DATUMS

A. All topographic and hydrographic surveys shall be prepared using the Project datum listed in these Specifications and as shown on the Drawings.

1. Horizontal Datum: Maine State Plane East Zone, NAD83 in U.S. Survey Feet.

2. Vertical Datum: NAVD88 in U.S. Survey Feet.

## 1.05 LICENSED SURVEYOR QUALIFICATIONS AND RESPONSIBILITIES

A. The Remediation Contractor shall retain a licensed surveyor that will be responsible for conducting Final Backfill Acceptance Surveys, the Pre-Construction Survey, and the Final As-built Survey. The Remediation Contractor's licensed surveyor shall satisfy the following minimum qualification requirements:

1. Professional Land Surveyor with current registration in the State of Maine.
2. Hydrographic surveys shall be supervised by a hydrographer certified by the American Congress on Surveying and Mapping.
3. The surveying firm and project personnel shall have performed hydrographic surveying services for at least three dredging and backfilling projects of similar size and complexity (provide list of projects, reference contacts, and phone numbers).
4. The hydrographic surveyor shall have actively engaged in hydrographic survey operations during the past 3 years.

B. The Remediation Contractor's proposed licensed surveyor will be subject to review and approval by the RPM.

C. The responsibilities of the Remediation Contractor's licensed surveyor shall include, but not be limited to, the following:

1. Establishment of survey control points as required to complete the Work.
2. Establishment of supplemental benchmarks, control points, staff gauges, and similar information, as needed to conduct the Work.
3. Installation of automatic recording tide gauge for dredging and backfilling operations.
4. Initial layout of all work elements.
5. Initial calibration and verification of survey system accuracy.
6. Pre-construction Survey, Final As-built Surveys, and Acceptance Surveys for Final Backfill material placement activities.
7. Calculation of final quantities for the Remediation Contractor's final payment request.
8. Preparation of As-built Drawings.

D. The Remediation Contractor shall assume full responsibility for the coordination, scheduling, accuracy, and quality of the licensed surveyor's work. The licensed surveyor shall coordinate with the Remediation Contractor's QC Manager as necessary to fulfill project QC requirements, in accordance with Section 01 31 00 – Project Management and Coordination and Section 01 45 00 – Quality Control.

E. In addition to the submittals specified in this Section, the RPM reserves the right to request, at any time, copies of all other survey data, calculations, and supporting documentation generated by the licensed surveyor in support of the Work.

## 1.06 SUBMITTALS

A. The Remediation Contractor shall submit a Survey Plan to the RPM for review and acceptance as part of the Construction Work Plan in accordance with Section 01 33 00 – Submittal Procedures.

B. Pre-Construction, Final Backfill Acceptance, and Final As-built Surveys. The Remediation Contractor shall provide a submittal to the RPM within 48 hours of completion. The submittal must include an AutoCAD electronic file, Plan View Drawings with 0.5-foot contour intervals, and spot elevations depicting high and low points plotted at 1 foot equal to 50 feet. The AutoCAD electronic file shall include a TIN-based DTM. ASCII-format processed survey data shall be provided in x, y, z (easting, northing, elevation) format. Each data file shall include a descriptive header including, but not limited to, software and equipment information, client, project, horizontal and vertical datum, units, tidal correction, survey type, alignment, and stations surveyed.

C. Prior to submitting a request for progress payment, the Remediation Contractor shall furnish to the RPM copies of all field notes, computations, any records relating to the quantity survey or to the layout of the Work, and PC-compatible versions of any computer software required to interpret finished data and records. The Remediation Contractor is responsible for converting data and drawing files to a standard software version approved by the RPM. Standard ASCII format is pre-approved for data files.

D. The Remediation Contractor shall maintain on site a complete, accurate log of control of survey work as it progresses.

E. The Remediation Contractor shall keep updated survey field notes in a standard field book. These field notes shall include all upland survey work performed by the Remediation Contractor's surveyor in establishing line, grade, and slopes for the construction work. Keep separate updated field notes for in-water survey work performed by the Remediation Contractor. Copies of these field notes shall be provided to the RPM upon request.

F. Progress Surveys. The Remediation Contractor shall submit to the RPM, within 12 hours of completing excavation or placement activity, the results of ongoing progress surveys and records (WINOPS, DREDGEPACK by Hypack, Inc., or equivalent) required to document compliance with the minimum backfill requirements shown on the Drawings.

### 1.07 REMEDIATION CONTRACTOR SURVEYS

A. The Remediation Contractor shall establish such additional lines, grades, and controls as needed for construction.

B. The Remediation Contractor shall perform all Work in conformance with the lines, grades, and dimensions indicated on the Drawings. If a discrepancy is noted between the Drawings, the Remediation Contractor shall immediately bring this to the RPM's attention. Where tolerances are stated, the Remediation Contractor shall perform the Work within those tolerances. The RPM will determine if the Work conforms to such lines, grades, and dimensions, and his/her determination shall be final.

C. The Remediation Contractor assumes full responsibility for detailed dimensions and elevations measured from primary control points.

## PART 2 – PRODUCTS

Not used.

## PART 3 – EXECUTION

### 3.01 GENERAL

A. The Remediation Contractor shall exercise care during the execution of the survey work to minimize any disturbance to existing property and to the landscape and waters in the areas surrounding the Site. Survey crews shall comply with all provisions of the Site-specific CHASP when traversing into controlled areas.

1. If the survey work provided by the Remediation Contractor does not meet the Contract requirements, the Remediation Contractor shall, upon the RPM's written notice, remove and replace the individual or individuals doing the survey work. The RPM may subcontract control of surveying at the Remediation Contractor's expense, which will be deducted from moneys due or to become due to the Remediation Contractor.

2. The RPM reserves the right to check all work laid out by the Remediation Contractor during the progress of the Work, as deemed necessary to verify conformance with the Drawings and these Specifications. The Remediation Contractor shall allow a reasonable time to permit such

checks (24 hours, excluding Sundays and holidays) before completing the Work. These checks will be made during the regular working hours.

### 3.02 PRESERVATION OF STAKES AND MARKS

A. The Remediation Contractor shall carefully preserve all primary controls. The Remediation Contractor will be charged for the replacement costs of stakes and marks damaged or destroyed by the Remediation Contractor's operation. Such charges will be deducted from amounts otherwise due or to become due to the Remediation Contractor at the current time and material rates.

B. The Remediation Contractor shall not remove major survey control points without the approval of the RPM.

### 3.03 SURVEY CONTROL AND REFERENCE POINTS

A. Existing survey control points are noted on the Drawings and may be used by the Remediation Contractor to establish Project baseline, stationing, offsets, and Limits of Work. The existing survey control points may also be used to establish any supplemental survey control points. Show all surveys in MLLW in U.S. feet.

B. The Remediation Contractor shall protect all survey control points prior to starting the Work and preserve permanent reference points during construction. The Remediation Contractor shall not relocate Site reference points without prior written approval from the RPM.

C. The Remediation Contractor shall promptly report to the RPM the loss, damage, or destruction of any reference point or relocation required because of changes in grades or other reasons. The Remediation Contractor shall replace dislocated survey control points based on original survey control at no additional cost to the RPM. Replacement of dislocated survey control points shall be done by a land surveyor licensed in the State of Maine.

### 3.04 INSPECTION

A. The Remediation Contractor shall verify locations of Site reference and survey control points prior to starting the Work. The Remediation Contractor shall promptly notify the RPM of any discrepancies discovered. The Remediation Contractor shall verify layouts periodically during construction.

### 3.05 SURVEY REQUIREMENTS

A. The Remediation Contractor shall reference survey and Site reference points to the provided control monuments and record locations of survey control points, with horizontal and vertical data, on Project Record Documents.

B. Topographic Surveys:

1. The Remediation Contractor shall conduct topographic surveys for areas above 0 feet MLLW before and after all excavation and backfill activities and in accordance with USACE Engineering and Design – Control and Topographic Surveying (USACE EM 1110-1-1005 [January 2007]). Along the shoreline bank, the Remediation Contractor shall conduct these surveys to supplement the hydrographic surveys required for the in-water work. The Remediation Contractor shall conduct surveys on a minimum 5-foot by 5-foot grid, including grade breaks from which a 0.5-foot contour map will be required in an electronic format. The topographic surveys shall cover all Work areas with sufficient overlap beyond the Work area to allow for tying the survey into existing grades.

2. All control surveys for elevation shall be +/-0.01 foot and, for horizontal, control angles shall be to the nearest 20 seconds +/-10 seconds, and measured distances shall be to +/-0.01 foot. All upland measurement surveys shall be within the following accuracies: horizontal: +/- 0.033 feet +1 ppm at 1 RMS (67% confidence level); and vertical: +/- 0.066 feet +1 ppm at 1 RMS (67% confidence level). RTK-GPS methods are acceptable during positional dilution of precision values of 7.0 feet or less and the use of a Geoid model or Site calibration. The Remediation Contractor shall verify the RTK-GPS system on at least three survey control points near the limits of the Site, as established by differential leveling methods from a project benchmark or survey control point. The Remediation Contractor shall avoid multi-path environments. The Remediation Contractor shall equip range pole tips with a “topo shoe” or device to prevent the tip of the range pole from penetrating the ground surface, or make a conscious effort to capture the ground surface and prevent the tip of the range pole from sinking into the ground.

3. The Remediation Contractor shall provide all materials as required to properly perform surveys, including but not limited to, instruments, tapes, rods, measures, mounts and tripods, stakes and hubs, nails, ribbons, other reference markers, and all else required. All material shall be of good professional quality and in first-class condition.

4. All lasers, transits, and other instruments shall be calibrated and maintained in accurate calibration throughout the execution of the Work. The Remediation Contractor shall submit calibration certificates to the RPM prior to the use of any instrument.

5. The Remediation Contractor shall furnish all materials and accessories (e.g., grade markers, stakes, pins, and spikes) required for proper location of grade points and line. All marks given shall be carefully preserved and, if destroyed or removed without the RPM’s approval, they shall be reset, if necessary, at the Remediation Contractor’s expense.

C. Hydrographic Surveys:

1. The Remediation Contractor shall conduct Pre-construction, Final Backfill Acceptance, and Final As-built Surveys using an integrated hydrographic surveying system consisting of a survey grade multi-beam fathometer, inertial RTK-GPS with motion platform, tide gauge, and computer and software. The system shall be capable of +/- 2 inches horizontal positioning accuracy and +/- 3 inches vertical positioning accuracy.

2. The Remediation Contractor shall conduct Dredge/Excavation Acceptance Surveys for each CU using leadline or survey rod measurements taken on a 5-foot grid to verify required dredge/excavation depths and grades prior to placement of Initial Backfill Lift material and moving of the Mobile Turbidity Curtain System to an adjacent CU.

3. Progress surveys may be performed using a single-beam fathometer.

4. Hydrographic survey procedures (e.g., positioning modes, electronic positioning system calibration, data reduction, adjustment, processing, and plotting) shall conform to industry standards.

5. Horizontal location observations shall compensate for errors, geodetic corrections, and atmospheric variations.

6. Data recording, record annotating, and processing procedures shall be consistent with recognized hydrographic survey standards, in accordance with the USACE Hydrographic Surveying Engineering Manual for Navigation and Dredging Support Surveys (USACE EM 1110-2-1003 [November 2013]).

7. Failure to perform and process such surveys in accordance with recognized standards will result in a rejection and nonpayment for work performed.

8. Survey deliverables shall indicate which National Oceanic and Atmospheric Administration tide gauge was used to adjust the survey data to MLLW and to compare with the RTK vertical data.

9. The Remediation Contractor's surveyor shall conduct and document the QC procedures recommended by the equipment manufacturer.

10. The Remediation Contractor's surveyor shall install an automatic recording tide gauge with a telemetry system for transmitting data to the dredges and survey vessel(s). The tide gauges shall provide a continuous recording of tidal change for every 15-minute interval or for each 0.1-foot change—whichever occurs first. Record tide levels in the Project vertical datum, and visually provide these levels in the operator's cab of the

dredge at all times during the dredging and backfilling process to allow proper adjustment of dredge and backfill depth.

11. Soundings:

    a) Sounding lines shall extend a minimum of 50 feet beyond the Project survey boundaries or as otherwise approved by the RPM. Intervals between soundings on each line shall not exceed 1 foot during raw data collection, and data shall not be decimated more than 5 feet for the DTM. In areas in which there are breaks in the slope, the 5-foot decimated data may need to be augmented at a denser interval to accurately depict the slope break.

    b) The Remediation Contractor's surveyor shall complete all post-backfill completion surveys within the same survey area with the same survey coverage as the Pre-construction Survey.

    c) All sonar collection procedures, methods, and equipment specifications shall be in accordance with the USACE Hydrographic Surveying Engineering Manual for Navigation and Dredging Support Surveys (USACE EM 1110-2-1003 [November 2013]).

D. The Remediation Contractor shall conduct survey events requiring a licensed surveyor as follows:

1. Pre-construction Survey. Data derived from the Pre-construction Survey shall be used in establishing initial conditions and for computing dredging and backfill quantities. No dredging, excavation, or initial lift backfill shall be permitted before the RPM has approved the Pre-construction Survey.

    a) The Owner and RPM shall be notified at least 5 working days in advance of the Pre-construction Survey, and the Owner and RPM shall be permitted to accompany the survey party and to inspect data and methods used in preparing the baseline map. This survey will serve as the basis for computing payment quantities.

2. Final Backfill Acceptance Survey by SMA. Data derived from multi-beam surveys after Final Backfill placement shall be used in verifying required backfill elevations and grades. This survey shall be repeated at no additional cost to the Owner, should additional work be required to attain the required backfill elevations and grades.

3. Final As-built Survey. This survey shall document the post-construction elevations and contours at the Site. Data derived from this survey shall be

used in preparing the Record Drawings in accordance with Section 01 70 00 – Project Record Documents and Project Closeout.

4. All surveys requiring a licensed surveyor shall be accomplished with the same licensed surveyor and equipment and use the same data processing and interpolation methods.

## 3.06 PREPARATION

A. The Remediation Contractor's surveyor shall establish and protect survey control points from traffic, construction equipment, dredging equipment, and vessel traffic.

B. The Remediation Contractor's surveyor shall furnish, set, and maintain, in good order, all ranges, buoys, and other markers necessary to define the Work and to facilitate inspection.

C. The Remediation Contractor's surveyor shall establish and maintain a tide gauge in a location where it may be clearly seen during dredging operations and inspection. Include all costs for providing the tide gauge and other survey control in the bid price for surveying.

D. The Remediation Contractor's surveyor shall establish a method of horizontal positioning and vertical control before excavation and dredging begin. The proposed method and maintenance of the horizontal positioning and vertical control system shall be subject to the approval of the RPM and if, at any time, the method fails to provide an accurate location for the excavation or dredging operation, the Remediation Contractor will be required to suspend operations. The Remediation Contractor shall lay out all work using horizontal and vertical measurements from physical structures, as indicated on the Drawings. The accuracy of all measurements taken from these points is the Remediation Contractor's responsibility. The Remediation Contractor shall furnish and maintain all stakes, templates, platforms, equipment, range markers, transponder stations, and labor as may be required to lay out all work from the control points or features shown on the Drawings. The Remediation Contractor shall maintain all points established for the Work until authorized to remove them.

E. The Remediation Contractor's surveyor shall establish a positioning control system for dredging as described in Section 35 20 23 – Dredging and Excavation.

## 3.07 ACCEPTANCE SURVEYS

A. Acceptance Survey(s) by CU and SMA. Data derived from the Acceptance Surveys will be used in verifying depths, grades, and thicknesses, as well as computing the quantities for payment. If the Acceptance Survey does not demonstrate that the required grades, elevations, or thicknesses have been achieved, additional work will be required and additional surveying will be necessary following that work. Additional surveys will be completed at no cost to the Owner.

B. Should the Work be determined incomplete, the Remediation Contractor shall immediately perform such additional work as may be necessary to complete the Work to the satisfaction of the RPM. Final estimates will be subject to deductions and adjustments to deductions previously made because of excessive overdepth dredging and/or excavation, dredging and/or excavation outside the indicated or authorized areas, or disposal of material in an unauthorized manner.

## 3.08 PROGRESS SURVEYS

A. The Remediation Contractor's surveyor shall conduct progress surveys for Final Backfill material placement on a daily basis during intertidal work and at least twice weekly during subtidal work, using the equipment and methods specified in Article 3.05 and elsewhere in this Section.

B. The areal coverage of daily progress surveys for intertidal work areas shall encompass the entire area of that day's work, plus an additional area of at least 20 feet beyond the outside perimeter of the day's work (including areas that have been previously excavated and backfilled). The Remediation Contractor's surveyor shall survey and record the toe, crest, and corners of all cut and fill slopes.

C. The areal coverage of progress surveys for subtidal work areas shall encompass the entire area of that day's backfill placement, plus an additional area of at least 50 feet beyond the outside perimeter of the backfill area (including areas that have been previously backfilled).

D. The Remediation Contractor shall submit the results of progress surveys to the RPM within 24 hours of completing the survey. The RPM will use the progress survey submittals to assess the Remediation Contractor's compliance with the Contract Documents. The Owner reserves the right to direct the Remediation Contractor to cease work, at no expense to the Owner, in the event that the Remediation Contractor fails to submit the results of progress surveys within the specified time frame.

E. The progress surveys shall be submitted in the form of a grid plan and cross-section Drawings, as prepared by the Remediation Contractor. The grid plan shall indicate the location of each cross section. The cross sections shall be computer generated and shall conform to the following format and informational requirements:

  1. Plot cross sections at a horizontal scale of 1 inch equals 10 feet (maximum) and vertical scale of 1 inch equals 5 feet (maximum), with axes shown on margins.

2. Note grid line identification number and/or coordinates for each cross section.

3. Show existing grade, required dredging and excavation lines, allowable overdepth limits, actual dredging and excavation grades, and interim and Final Backfill grades.

4. Show survey point locations.

5. Show SMA boundaries.

6. Indicate applicable dates for backfilling and associated surveying activities.

7. Date and sign each cross section prior to submitting to the RPM.

F. The Remediation Contractor shall conduct progress computations for any period for which progress payments are requested. For progress payments, the Remediation Contractor shall prepare the Final Backfill quantity calculations using the TIN volume technique and Autodesk Civil 3D, Autodesk Land Development Desktop, HYPACKTM MAX, Terramodel, or other commercially available software, as approved by the RPM.

G. Prior to submitting a request for progress payment, the Remediation Contractor's surveyor shall furnish the RPM copies of all field notes, computations, any records relating to the quantity survey or to the layout of the Work, and a PC-compatible version of any computer software required to interpret finished data and records. The RPM will use them as necessary to verify the progress payment request. The Remediation Contractor shall retain copies of all such material furnished to the RPM.

H. The Owner may conduct independent progress surveys for QA purposes. The Owner will notify the Remediation Contractor if review of survey data indicates a discrepancy between the Remediation Contractor's and the Owner's progress survey, and the Owner may request that the Remediation Contractor re-survey the area(s) where discrepancies are present. Any re-surveying and associated re-work required due to surveying error(s) on the part of the Remediation Contractor or Remediation Contractor's independent surveyor shall be provided at no additional cost to the Owner.

I. In the event that the Remediation Contractor's or the Owner's progress surveys indicate that the Work is out of compliance with the Contract Documents, the Owner may direct the Remediation Contractor to adjust excavation, dredging, and/or backfilling procedures until compliance is achieved, at no additional expense to the Owner. The Owner further reserves the right to direct the Remediation Contractor to stop work if it is determined, in the opinion of the Owner, that the Remediation Contractor's methods are not suitable to achieve the specified construction tolerances. In the event that the Owner stops the Work, the Remediation Contractor shall take whatever measures are required, including mobilization of alternative equipment, to achieve the specified construction tolerances, at no additional cost to the Owner.

## 3.09 FINAL AS-BUILT SURVEY

A. Upon completion of the Work, the Remediation Contractor's surveyor shall complete a Final As-built Survey and Plan Drawings of the Work.

B. The As-built Survey shall include a topographic survey and a hydrographic survey of all final grades within the Project limits. A separate Plan Drawing shall also be prepared, showing the final dredge and excavation grades within the work area. The As-built Survey shall include the location of all existing structures within the Project limits and any cut or broken pile stubs that remain, as well as any structures installed or modified as part of the Work.

C. The results of the As-built Survey shall be presented in the form of contour Plan Drawings with 0.5-foot contour intervals. The location of installed or existing utilities and structures shall be clearly indicated with appropriate symbols. Break points shall be indicated for all slopes. Spot elevations shall be indicated in areas of limited topographic relief, as appropriate. Associated survey data shall also be submitted to the RPM, in accordance with the requirements of Article 1.05 of this Section.

D. All As-built Survey Drawings shall bear the stamp of the surveyor responsible for the survey work.

E. Two copies of Draft As-built Drawings and five copies of the Final As-built Drawings shall be provided to the RPM.

F. An electronic copy of Final As-built Drawings in PDF and AutoCAD formats shall be provided to the RPM.

**END OF SECTION**

## PART 1 – GENERAL

### 1.01 SCOPE

A. The Remediation Contractor shall furnish, install, monitor, and maintain plants and seeds in impacted tidal wetland areas, as specified herein and as shown on the Drawings. Final planting areas will be delineated based on the results of a pre-planting survey conducted by the RPM in consultation with the Maine DEP.

B. The Remediation Contractor shall place initial subgrade materials, including backfill, per requirements in Section 35 20 26 – Backfill and Material Placement. In areas to be revegetated, the Remediation Contractor must place an additional 6 inches of Habitat Amended Backfill as shown on the Drawings, prior to plant and seed installation.

### 1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittal Procedures.

B. Section 35 20 26 – Backfill and Material Placement.

### 1.03 SUBMITTALS

A. The Remediation Contractor shall submit a detailed Construction Work Plan, including a section on Revegetation, in accordance with Section 01 33 00 – Submittal Procedures.

B. The Remediation Contractor shall submit certificates from plant stock suppliers and seed vendors.

1. The Remediation Contractor shall submit certificates from plant stock supplier for each group of plant stock required, stating botanical name, common name, origin, age, date of packaging, name and address of supplier, and county and state of origin. The Remediation Contractor shall submit certificates to the RPM at least 10 days prior to planting.

2. The Remediation Contractor shall submit certificates from seed vendors for each seed mixture or type of seed required. The certificates shall include botanical name and common name of all species included in the seed mixture, percentage of each species of seed by weight in a mixture, percentage of pure seed for each species included in the mixture, germination percentage, amount of undesirable plant seeds present in the mixture, date of packaging, name and address of supplier, and county and state of origin. The Remediation Contractor shall submit complete certificates to the RPM for approval at least 15 days prior to seeding.

C. The Remediation Contractor shall submit the following Post-Construction information in accordance with Section 01 33 00 – Submittal Procedures:

1. Record Drawings:

a) Submit As-built Drawings that depict the date, location, and type of planting and seeding. Record Drawings shall also include the date that each area was planted and the quantity of plants by species planted at each location. As-built Drawings shall be submitted with the initial and final approval requests for the initial planting and for any maintenance re-planting or re-seeding. As-built Drawings shall be submitted within 7 days after the completion of initial planting.

2. Initial Approval:

a) The Remediation Contractor shall submit in writing a request to the RPM for initial approval of the wetland area. The initial approval request shall contain an As-built Drawing of the subject area. The RPM will grant initial approval of the wetland area when the requirements of Articles 3.01, 3.02, and 3.03 have been met.

3. Final Approval:

a) The Remediation Contractor shall submit in writing a request to the RPM for final approval of the wetland area. The final approval request shall contain an As-built Drawing of the subject area. The RPM will grant final approval of the Work when initial approval for the wetland area has been previously granted and the final inspection, specified in Article 3.06, confirms that satisfactory conditions have been met or appropriate remedial measures have been taken.

## 1.04 DEFINITIONS

A. Planting:

1. Planting includes placement and maintenance of seeds, root plugs, cuttings, and containerized plants.

B. Acceptable Plant Material:

1. Plants shall be free of insects and diseases, appear healthy, and exhibit visible signs of viability such as green leaves or stems. Plants shall not appear chlorotic or exhibit signs of desiccation. Plants shall not exhibit visible signs of herbivory. Leaf margins shall be predominantly green

with limited areas of spots or blotches. Dormant plants shall exhibit healthy roots or rhizomes and/or leaf buds.

## PART 2 – PRODUCTS

### 2.01 HABITAT AMENDED BACKFILL

A. Habitat Amended Backfill material will be primarily sand, with up to 15% silt (passing a No. 200 sieve), and up to 15% gravel (retained by a No. 4 sieve size).

B. Habitat Amended Backfill shall be run-of-bank materials or screened run-of-bank materials mixed with topsoil to provide a minimum pre-placement TOC content of 2% with a maximum of 5% TOC. Any amendments to the Habitat Amended Backfill shall not include commercially or municipally produced organic waste or sewage sludge. Composted waste materials may be used if they comply with the chemical standards employed in Section 35 20 26 – Backfill and Material Placement. Any proposed amendments will require approval by the RPM.

### 2.02 PLANT STOCK

A. The most common plant species within the Work area are shown on the Drawings and include common three-square (*Schoenoplectus pungens*), hardstem bulrush (*Schoenoplectus acutus*), seaside arrowgrass (*Triglochin maritima*), and beaked spikerush (*Eleocharis rostellata*). The remediation is currently only anticipated to impact areas of common three-square, and planting is assumed to be in-kind, but the final species to be planted will depend on final remedial impacts and shall be confirmed with the RPM.

B. Plants shall be true to their name as specified. All plants shall be obtained from nursery stock in the northeastern United States (Connecticut, Maine, Massachusetts, New Hampshire, or Vermont) and produced from species that are native to the region. The source of plant material shall be submitted to the RPM for approval. Any field-collected plant material (e.g., seeds or live stakes) shall be collected from the same region. The Remediation Contractor shall provide documentation that plants have been pre-conditioned for placement by being held in a wet environment.

C. Plants shall be free of insects and diseases and shall meet the definition of Acceptable Plant Material (see Article 1.03). No live plants shall contain weed species.

D. All plant materials, including any collected field stock, shall comply with state and federal laws with respect to inspection for plant diseases and insect infestations. Collected plant materials shall be obtained in strict compliance with any applicable state or federal wetland or species protection programs.

E. Each plant species shall be handled and placed in a manner that is consistent with good trade practice to verify plants are in acceptable condition at their time of arrival at the Site. Plants that do not meet the definition of Acceptable Plant Material shall be rejected.

F. All plant stock shall be stored in aboveground locations in non-construction areas accepted by the RPM, if not directly transplanted. All plant stock shall have soil placed around the roots sufficient to protect from desiccation and to provide nourishment during storage. All plants stored in the field prior to installation shall be kept cool and shall be sheltered from the drying effects of direct sunlight and prevailing winds. Plants should not be subject to freezing or drying. It is the Remediation Contractor’s responsibility to supply adequate water for all plant stock in order to maintain it in a healthy, vigorous state suitable for transplanting.

G. Plants shall be a minimum of a 2-inch plug size and shall be of a similar height and configuration as plants found in non-impacted portions of the Site at the time of planting.

## 2.03 SEED MIXTURES

A. Seed mixtures shall include the species currently growing in the Work area, as shown on the Drawings. The percentage of weed seed shall not exceed 1.0% by weight. Seeds shall originate only from the northeastern United States (Connecticut, Maine, Massachusetts, New Hampshire, and/or Vermont).

B. Seed mixtures should be delivered in original sealed containers. Seeds in wet, torn, or otherwise obviously damaged packaging are not acceptable. Containers shall be labeled with the following information:

1. Analysis of seed mixture.
2. Percentage of pure seed by species.
3. Percentage of weed seed.
4. Year of production.
5. Net weight.
6. Date when tagged and location.
7. Percentage of germination.
8. Name and address of distributor.

C. Seeds shall be stored in weather- and rodent-proof enclosures.

## 2.04 EROSION CONTROL BLANKET

A. The erosion control blanket shall be installed by the Remediation Contractor, if determined necessary for successful restoration by the Remediation Contractor and the RPM.

## PART 3 – EXECUTION

## 3.01 EROSION AND SEDIMENT CONTROL

A. Prior to implementing any of the Work described in this Section, the Remediation Contractor shall install all erosion control fabric, if deemed necessary by the Remediation Contractor and the RPM.

## 3.02 PREPARING SOIL FOR SEEDING

A. Areas to be seeded shall be hand raked prior to seeding to ensure appropriate contact of seeds with the soil. Gullies, washes, and disturbed areas that develop after final dressing shall be repaired before they are seeded.

B. Trash and other debris that will interfere with seeding operations shall be removed or disposed of as approved by the RPM.

C. If erosion control fabric is employed:

1. Where present, the Remediation Contractor shall remove and dispose of damaged erosion control fabric as directed by the RPM.

2. Where present, the Remediation Contractor shall relocate to its original location and resecure any displaced erosion control fabric. Any stakes used to secure the erosion control fabric (installed by others) protruding more than 2 inches above the sediment surface shall be pounded to within approximately 2 inches of the sediment surface or removed.

D. The Remediation Contractor shall provide the RPM with unfettered access to inspect plant material, field collection locations, nursery facilities, and attendance at monitoring events.

## 3.03 PLANTING AND APPLYING SEED

A. Planting:

1. The Remediation Contractor shall conduct plantings during the spring or early summer (May 1 to July 15) following remediation to ensure plant establishment prior to first frost. Plant material shall be of similar size to un-impacted wetland vegetation within the Limit of Work at the time of planting as planted material will have optimal chances of establishment.

2. The revegetation area shall be planted prior to seeding, and seeds shall be broadcast spread from outside the planting areas to avoid disturbing planted plugs.

3. The Remediation Contractor shall use species consistent with Article 2.02, and as shown on the Drawings, and plant in a grid 2 feet on center.

4. If erosion control fabric has been installed, cut, or otherwise penetrate the fabric at the planting location to allow the plant to be installed. Removal or cutting of fabric shall be limited to the minimum amount necessary to install the plant.

5. The Remediation Contractor shall use a dibble bar or similar to create a space in the backfill material for the installation of the plant.

6. The Remediation Contractor shall remove non-biodegradable containers prior to planting.

7. The Remediation Contractor shall install the plant by hand during low or intermediate tide periods, when the Site can be accessed by foot from land.

8. The Remediation Contractor shall set plants into their final locations following the recommended horticultural practice for that species, taking specific note to plant emergent plants at the shallow end of their depth tolerances.

9. Root stocks, if employed and introduced into hydric soils, may require a hand tool to facilitate planting. The Remediation Contractor shall space the plantings based upon horticultural experience for each species and the desired density of the stand of vegetation sought. This shall be accomplished with the coordination and guidance of the RPM.

10. The Remediation Contractor shall lay sections of folded back fabric, where present, adjacent to the newly placed planting, and tack down using a non-metallic, biodegradable material.

11. The Remediation Contractor shall install herbivory control, as needed and approved by the RPM.

B. Seeding:

1. The Remediation Contractor shall use seed mix consistent with the pre-existing species occurring in the Work area, unless alternative mixes have been reviewed and approved for use by the RPM.

2. Seeding rates shall be 40 to 50 pounds of pure live seed per acre unless otherwise approved by the RPM. The percentage of seed germination and

pure live seed results shall be used to adjust the quantity of seeds, as necessary, to maintain the specified seeding rate.

3. Seed mix shall be randomly broadcast from outside of the planting area while the revegetation areas are not inundated. Only seeds treated to ensure negative buoyancy may be applied as the revegetation area is inundated twice daily.

4. The Remediation Contractor shall ensure the entire area receives a uniform coverage of seed. Re-seed areas with gaps in the areas of seeding in excess of 4 square feet.

5. The Remediation Contractor shall not compact backfill materials prior to seeding.

6. The Remediation Contractor shall employ hand broadcast methods for seeding.

C. Sequencing and Scheduling:

1. The Remediation Contractor shall immediately notify the RPM if they encounter conditions that prevent the installation of plants or seeds within the wetland area. If adjustments to the wetland area boundaries are necessary, the RPM will notify Maine DEP and issue revised wetland boundaries.

2. Promptly after planting and/or seeding within the wetland area, the Remediation Contractor shall schedule and attend an inspection of planted areas with the RPM. The Remediation Contractor shall promptly replace missing plants, plants damaged during installation, or any plants that did not meet the definition in Paragraph 1.03B and Article 2.02 at the time of planting.

3. The Remediation Contractor shall schedule and attend a field inspection with the RPM within 10 days prior to submitting requests for initial and final approvals.

## 3.04 MAINTENANCE

A. Plant maintenance responsibilities begin immediately after the installation of plant material or seeds in any area, or portion thereof, and shall continue until September 15 of the planting year or the date of first frost—whichever is earlier. Until September 15, or date of first frost of the year of planting, following installation of plant material in any area, or portion thereof, the Remediation Contractor shall replace missing, dead, or unhealthy plants with a plant meeting the definition of Acceptable Plant Material in this Section, of the same size and species as specified. Natural plant reproduction within the wetland area shall not be counted in assessing the presence or condition of the installed plants. Dormant plants may be installed during the last month of the maintenance period.

B. An initial watering of seeded areas shall be performed at a rate of 25,000 gallons per acre if at least 0.5 inch of rain does not fall within 3 days of seeding or the Site is not inundated sufficiently to saturate surface soils. Watering shall be repeated after the second and fourth weeks following seeding if natural rainfall is less than 1.5 inches per 2-week period or the Site is not inundated sufficiently to saturate surface soils at least five times per 2-week period. The Remediation Contractor shall avoid creating rills and furrows as a result of watering and repair and reseed any rills and furrows resulting from over watering.

C. Non-native species shall be removed from all planting or seeding locations within which they are observed. The Remediation Contractor shall hand-pull, or remove using hand tools, all stems, leaves, and associated roots of the observed non-native plants, taking care to minimize disturbance of the surrounding sediment. All plant parts shall be carefully placed in black plastic bags (0.1-mm-thick minimum) or similar enclosure and securely tied or sealed and disposed of in a proper trash container.

D. The Remediation Contractor shall maintain herbivory controls if employed.

E. Where present, the Remediation Contractor shall relocate to the original location and resecure any displaced erosion control fabric. The Remediation Contractor shall repair any breaks or openings in the wetland boundary material, where present, with additional backfill, sandbags, or silt/safety fencing as directed by the RPM. Any stakes used to secure the erosion control fabric protruding more than 2 inches above the sediment surface shall be pounded to within approximately 2 inches of the sediment surface or removed.

F. The Remediation Contractor shall notify the RPM 48 hours prior to and following any maintenance activity.

## 3.05 PROTECTION OF WORK

A. The Remediation Contractor shall mark planted areas to prevent intrusion by foot traffic and/or equipment.

## 3.06 ACCEPTANCE

A. The vegetated areas will be accepted by the RPM at the end of the warranty period specified in Article 3.07 if a satisfactory condition as defined in Article 3.07 exists.

## 3.07 WARRANTY PERIOD

A. Revegetated areas shall be subject to a warranty period of not less than 2 calendar years from completion of the Project and establishment of permanent vegetation over 95% of the area at the sole discretion of the RPM.

B. At the end of the warranty period, the RPM will perform an inspection upon written request by the Remediation Contractor. Revegetated areas not demonstrating satisfactory condition of vegetation as outlined above shall be repaired, reseeded, replanted, and maintained to meet all requirements as specified herein at a cost borne solely by the Remediation Contractor.

C. After all necessary corrective work has been completed, the RPM will certify, in writing, the final acceptance of the revegetated areas.

**END OF SECTION**

## PART 1 – GENERAL

### 1.01 SCOPE

A. The Work includes furnishing all supervision, labor, materials, tools, equipment, and incidentals required for excavation, dredging, offloading, and stockpiling as described on the Drawings and in these Specifications.

1. The Remediation Contractor shall perform all dredging and excavation using equipment that is capable of meeting the lines and grades, tolerance, quality, and environmental protectiveness requirements of the Work.

2. Dredge barges may be grounded over non-remediated areas to dredge sediment in the dry. Conventional earth moving or hand removal equipment may also be used to remove sediment in the dry with required environmental controls and BMPs outlined in Section 01 57 19 – Temporary Environmental Controls.

3. The Remediation Contractor shall preserve and protect the MEPDES and PERC outfalls that actively discharge within SMA-2 as shown on the Drawings while conducting slow and careful excavation in narrow strips and immediately backfilling within a 10-foot offset from the outfall structures.

4. The Remediation Contractor shall transport dredged and excavated material via barge to the Barge Offloading Area in coordination with the RPM. The Remediation Contractor shall offload dredged and excavated material directly into sealed trucks or sealed containers provided by the Remediation Contractor, and no stockpiling shall occur within the Nearshore Support Area. The Remediation Contractor will transport the material to TSSA No. 2 located at the upland Remediation Support Area shown on the Drawings. The RPM will dewater sediment in TSSA No. 2 and transfer dewatered material to TSSA No. 1 for rail loading and final off-site transport and disposal.

5. The estimated payable volumes to achieve the Required Dredge Depth lines and grades are provided on the Bid Form. Dredging volumes include a 6-inch allowable paid overdepth allowance for removal within remediation areas with overlying water using marine dredging equipment. The Bid Form assumes marine dredging equipment will be used in SMA-2 and SMA-3 below MHW. Excavation conducted in the dry in areas with no overlying water with marine dredging equipment, land-based equipment, or hand methods, does not include a 3-inch paid overdepth allowance.

## 1.02 RELATED SECTIONS

A. Section 00 71 00 – Contracting Definitions.

B. Section 01 11 00 – Summary of Work.

C. Section 01 33 00 – Submittal Procedures.

D. Section 01 31 00 – Project Management and Coordination.

E. Section 01 57 19 – Temporary Environmental Controls.

F. Section 02 21 00 – Surveying.

G. Section 35 20 26 – Backfill and Material Placement.

## 1.03 SUBMITTALS

A. Prior to Mobilization:

1. The Remediation Contractor shall prepare and submit a detailed, written Construction Work Plan in accordance with Section 01 33 00 – Submittal Procedures.

B. During Construction:

1. The Remediation Contractor shall complete DARs each workday per Section 01 33 00 – Submittal Procedures and Section 00 31 00 – Project Management and Coordination.

2. The Remediation Contractor shall prepare and submit Weekly Reports in accordance with Section 01 31 00 – Project Management and Coordination and Section 01 33 00 – Submittal Procedures.

3. Interim and Final Surveys:

   a) The Remediation Contractor shall provide interim progress surveys to document dredge progress per Section 02 21 00 – Surveying.

   b) The Remediation Contractor shall provide Dredge/Excavation Surveys by CU for approval by RPM per Section 02 21 00 – Surveying before placing backfill on the post-dredge surface, where applicable.

## 1.04 JOB CONDITIONS

A. Character of Materials:

1. Available data from previously conducted Site sampling events with representative logs and associated information are provided in Appendix B of these Specifications.

2. The Remediation Contractor shall satisfy themselves regarding the nature of materials present at the Site prior to bidding. The type of materials encountered at the Site may vary from the conditions described in Appendix B.

    a) Variations in the type of materials encountered may occur that do not differ materially from those indicated in these Specifications and, if encountered, will not be considered as a basis for claims of differing Site conditions.

B. The Remediation Contractor shall be responsible for field verification of the locations of utilities within the Work areas including, but not limited to, those shown on the Drawings. The Remediation Contractor shall perform dredging cognizant of potential buried utilities that may be either inactive (associated with former Site operations) or active utilities such as the MEPDES and PERC outfalls (associated with the Site and adjacent industrial operations) and coordinate a utility locate service and utility identification and location with the RPM to check removal areas.

C. The Remediation Contractor shall notify the RPM not less than 2 days in advance of the proposed utility interruption and shall not proceed with utility interruptions without the RPM's written permission.

D. Debris:

1. Debris that may be encountered during the Work shall be incidental to the Dredging and intertidal Excavation work and will not be paid for separately or considered as a basis for claims of differing Site conditions.

E. Interference with Navigation:

1. The Remediation Contractor shall make allowances in the Construction Schedule, if appropriate, for potential delays or interruptions related to vessel management and equipment moves due to other navigation on the Penobscot River.

2. Any damage to the Remediation Contractor's equipment due to the Remediation Contractor's failure to move when required shall be at the Remediation Contractor's sole risk and expense.

3. The Remediation Contractor shall make allowances in the Construction Schedule for delays and interruptions to Site access due to freezing and ice

floes that occur in the Penobscot River and within the Limit of Work between November and April of any year.

F. Protection of Fish, Wildlife, and Aquatic Vegetation:

1. The Remediation Contractor shall perform all work to minimize interference or disturbance to fish and wildlife, including compliance with permit requirements, as outlined in Section 01 57 19 – Temporary Environmental Controls.

2. Any penalties and costs associated with damage to fish, wildlife, and aquatic vegetation caused by the Remediation Contractor shall be borne solely by the Remediation Contractor.

### 1.05 NOTIFICATIONS

A. The Remediation Contractor shall provide the necessary notifications as described in Section 01 11 00 – Summary of Work.

B. The Remediation Contractor shall send notice, with a copy to the RPM, to the Commander of the USCG, Northern New England Sector, at least 14 days prior to the commencement of dredging, notifying the USCG as to the start of dredging operations.

## PART 2 – PRODUCTS

### 2.01 GENERAL

A. All materials shall conform to those provided on the Drawings or equivalents, as provided in the Remediation Contractor’s Construction Work Plan, as reviewed and approved by the RPM.

B. Absorbent Booms and Pads:

1. The Remediation Contractor shall have spill control and containment kits, absorbent booms, and oil sorbent pads on site at all times to address unforeseen releases or discharges to the water column, if any, as described in Section 01 57 19 – Temporary Environmental Controls.

C. Turbidity Controls:

1. The Remediation Contractor shall have a turbidity control system during dredging and intertidal excavation as described in Section 01 57 19 – Temporary Environmental Controls.

## PART 3 – EXECUTION

### 3.01 GENERAL

A. Owner Inspections:

1. The Remediation Contractor shall verify that gauges, targets, ranges, and other markers are in place and usable for their intended purpose. The Remediation Contractor shall furnish, at the request of the RPM, necessary labor, equipment, and materials for inspecting and surveying the Remediation Contractor's work.

B. Sequence of Construction:

1. The Remediation Contractor shall perform dredging activities in accordance with the sequence of construction as specified in the RPM-approved Construction Schedule. The sequence of the Remediation Contractor's work may be altered by the RPM, as necessary, to maintain compliance with the Project Permits, enable access to the property by others, or as otherwise deemed necessary by the Owner.

2. The Remediation Contractor shall complete dredging/excavation and backfilling in SMA-1 prior to starting work in SMA-2 or SMA-3.

3. Unless an alternate sequence is approved by the RPM, the Remediation Contractor shall excavate and dredge from upstream to downstream and from higher elevations to lower elevations.

4. Once required Dredging or Excavation is completed in a CU, the Remediation Contractor shall conduct a Dredge/Excavation Acceptance Survey by CU in accordance with Section 02 21 00 – Surveying to verify that required elevations and grades have been met. If high spots remain above the required dredge elevations and grades, the Remediation Contractor shall remove such high spots to the satisfaction of the RPM. Dredging or excavation shall be deemed complete only upon the RPM's review and acceptance of the Dredge/Excavation Acceptance Survey.

5. Once a CU has been verified and prior to repositioning of the Mobile Turbidity Curtain System, place Initial Backfill Lift, as required in Section 35 20 26 – Backfill and Material Placement.

6. The Remediation Contractor shall place Final Backfill, as required in Section 35 20 26 – Backfill and Material Placement, after all dredging and excavation and Initial Backfill Lift placement within an SMA has been accepted by the RPM as complete.

C. Barge Loading:

1. The Remediation Contractor shall load equipment and material barges evenly, using methods that do not create an unsafe situation or a situation causing spillage or submergence (tipping) of the barge.

D. Productivity:

1. The Remediation Contractor shall complete all work within the RPM-approved Construction Schedule. Significant changes to operating procedures or equipment, such as proposed dredge production rates or changes to the duration of the Work, must be reviewed and approved by the RPM.

2. The total estimated quantity of material to be removed by Dredging or Excavation within the specified SMA limits, including 3H:1V side slopes is shown in Section 00 41 43 – Bid Form (RESERVED). The Remediation Contractor is responsible for calculating dredging/excavation quantities assumed for its means and methods in order to achieve the required dredge/excavation lines and elevations.

E. Interference with Navigation:

1. The Remediation Contractor shall conduct the Work while minimizing interference with navigation. The Work shall be conducted in accordance with all navigational regulations.

## 3.02 REMEDIATION CONTRACTOR CONDUCT OF WORK

A. Dredging and intertidal Excavation shall not begin until:

1. The Construction Work Plan has been reviewed and approved by the RPM, and the RPM has issued a Notice to Proceed.

2. Agency-required notifications have been completed in accordance with the Project Permits.

3. The Pre-construction Survey Plan Drawing and associated CAD files are approved by the RPM as described in Section 02 21 00 – Surveying.

4. The Remediation Contractor participates in the Pre-construction Meeting.

B. Layout of the Work:

1. The Remediation Contractor shall establish an accurate method of horizontal and vertical control and layout the Work before dredging begins as described in Section 02 21 00 – Surveying.

C. Excavation Equipment:

1. Conventional land-based earth moving equipment may be used to remove sediment in the dry from within SMA-1, SMA-2, and SMA-3 intertidal areas.

2. Conventional land-based mechanical or pneumatic excavation equipment or diver-operated dredge equipment shall be used to conduct careful removal of sediments within 10 feet of the MEPDES and PERC outfalls, as shown on the Drawings. The excavations shall occur in intervals, and be followed by immediate backfill after the RPM has verified that the required excavation grades have been achieved.

D. Marine Equipment:

1. The Remediation Contractor shall perform all dredging under this Contract using a mechanical-type dredge to be specified in the Construction Work Plan and as approved by the RPM. Mechanical dredging equipment shall employ a hydraulically operated enclosed (environmental) bucket system mounted on a fixed-arm hydraulic excavator, or equivalent, as approved by the RPM. The dredging bucket shall include a hydraulically operated closure system.

2. The dredging bucket shall be an environmental dredge bucket, or RPM-approved equivalent, designed to maintain enclosure of sediments when the bucket is being raised through the water column and to minimize, to the maximum extent practical, the generation of suspended sediments during bucket lowering, closing, and raising in the water column.

3. The dredge and its associated floating platform shall be operated to maintain a draft suitable to work within the shallow waters. Dredge barges and material barges are allowed to ground during dredging and offloading to facilitate removal in the dry at low tides within shallow areas of SMA-1, SMA-2, and SMA-3. However, once barges come in contact with the bottom, they shall not be moved until the incoming tide allows. Under no circumstances shall marine equipment be pushed or pulled when in contact with the bottom.

4. The floating platform, material barges, and associated equipment shall be maintained to meet the requirements of the Work and all applicable marine regulations, including the prompt repair of equipment failures.

5. All tow/tug boats used for propelling barges and other equipment shall be equipped with GPS navigational equipment, radar, corrected compass, at least two marine VHF radios approved for use on site by the RPM, and depth-sounding equipment, which is to be maintained in good operating condition during each tow. The Remediation Contractor shall specify in

the Construction Work Plan the number and size of tow/tug boats to be used in the dredge plan. The tow/tug boats used by the Remediation Contractor for this purpose shall be of a size adequate for pushing the anticipated load and have necessary reserve power for maneuvering with material barges under emergency conditions, as well as for control of material barges at the offloading area.

6. The Remediation Contractor shall operate all marine equipment, including, but not limited to tow/tug boats, crew boats, and survey vessels, in a manner that minimizes disturbance to existing sediments and placed backfill within the Marine Area in order to prevent or reduce, to the extent practicable, the potential for sediment resuspension and recontamination. This includes control of propwash from vessels as well as anchors and spuds.

7. The Remediation Contractor shall provide and maintain markings on all material barges clearly indicating the draft of the barge. Each barge shall be used with an ullage table (i.e., displacement table) to provide required information regarding tonnage located in and on the barge. The Remediation Contractor shall load barges evenly to maintain the stability of the barge. During sediment removal/loading operations, the Remediation Contractor shall measure and record on the DAR the tonnage of each barge. The tonnage reporting (displacement) shall be documented and recorded upon the departure of the barge from the dredge area. During the entire period of the Work, the Remediation Contractor shall provide and maintain sufficient spot or floodlights, as necessary, to permit the reading of the draft on the sides of material barges at the bow and stern from the tow boat when visibility is impaired and at night, as approved by the RPM. The Remediation Contractor shall verify that adequate time is allowed by the tow boat captain for these readings to be obtained. The Remediation Contractor shall include Tonnage Report Logs within the DAR.

8. The Remediation Contractor shall provide lights for floating equipment and material barges during periods of restricted visibility. Lights shall also be provided for buoys, turbidity controls, or other activity markers that could endanger or obstruct navigation. Lights shall be provided for equipment being used to perform the Work, even when not in use and shall conform to USCG requirements for visibility and color.

9. If work beyond the defined work hours is required and prior approval is obtained from the RPM, the Remediation Contractor shall provide lights for work approved during non-daylight hours, as defined by 30 minutes before sunset and 30 minutes after sunrise. This will consist of providing, installing, operating, maintaining, moving, and removing portable light

towers and equipment-mounted lighting fixtures for the duration of all dredging activities occurring during non-daylight hours.

E. Positioning Equipment and Methods:

1. The Remediation Contractor shall use RTK-GPS for horizontal positioning during all dredging operations and hydrographic surveying. The Remediation Contractor shall equip all dredges and survey vessels with RTK-GPS receivers compatible with the Remediation Contractor's provided RTK-GPS base station and telemetry system. Vertical elevations may be obtained by RTK-GPS or use of a telemetried tide gauge installed at the Site. If RTK-GPS is used by the Remediation Contractor for water level determination, the telemetried recording tide gauge shall still be installed and used as a cross-reference and backup for the RTK-GPS system.

2. Each dredge and the dredge bucket shall be positioned horizontally and vertically using the RTK-GPS and an integrated positioning and display system. This system shall provide real-time data to the dredge operator and the RPM, displaying digitally and graphically the dredge position (X, Y, Z), the dredge bucket position (X, Y, Z), the Required Dredge Line or Elevation, depth below the dredge bucket, and the depth of sediment to be removed at that location. The system shall automatically update after each cycle to show the remaining depth of sediment above the required dredge line or elevation. The Remediation Contractor shall provide, install, and maintain all software and hardware necessary for this system.

3. Dredging shall be performed using a precision dredge capable of providing +/- 10-centimeter (4-inch) horizontal and vertical positioning accuracy.

4. The dredge positioning software shall be capable of:

   a) Using a true 3-dimensional computational system to calculate the position of the bucket, taking into account the tilt and list of the dredge platform, as well as the standard positioning sensors.

   b) Inputting a dredge prism template (an X, Y, Z file on a 1-foot by 1-foot gridded interval).

   c) Recording all excavator sensor information electronically so the position and movements of the excavator can be reviewed at a later date (playback capability).

   d) Producing plots showing the location of each dredge bucket in the dredge area as part of the DAR.

e) Showing the dredge operator in real-time the depth of material as the bucket takes a bite.

1) Note: IHC Systems’ XPM System and Hypack, Inc.’s Dredgepack System are examples of such a dredge positioning system.

5. The Remediation Contractor shall show that the error budget of the dredge positioning system allows it to work within the stated overdredge tolerances in in Section 00 71 00 – Contracting Definitions. The error budget shall include all errors associated with measuring the positioning of the bucket.

6. The Remediation Contractor’s selected positioning system shall be approved by the RPM.

7. The Remediation Contractor shall demonstrate the ability to achieve, monitor, and report the horizontal and vertical positioning accuracies in the Construction Work Plan. The Remediation Contractor shall verify its error budget (i.e., QC check of all sensors one time per day) and include it in the DAR.

F. Excavation:

1. The Remediation Contractor shall excavate from the top of the bank, working from higher elevations to lower elevations.

2. The Remediation Contractor shall make the cut to the lines and grades shown on the Drawings. No excessive excavation shall be allowed.

3. The Remediation Contractor shall perform slow and careful Excavation in narrow strips, followed by immediate backfilling, beneath and within 10 feet of the existing MEPDES and PERC outfalls shown on the Drawings. The Remediation Contractor shall not use conventional dredging equipment within 10 feet of the outfalls. The outfalls will remain active during and after construction and shall not be disturbed. The Remediation Contractor shall repair damage resulting from dredging operations or other Remediation Contractor construction activities in support of the Work to the original condition prior to damage, and repair to a condition approved by the RPM. The Owner will bear no costs associated with damage to such outfall structures or penalties imposed for disruption of service.

4. The Remediation Contractor shall place Backfill in accordance with Section 35 20 26 – Backfill and Material Placement following completion of Excavation work within the same tidal cycle and before the incoming tide.

G. Dredging:

1. The Remediation Contractor shall dredge working from higher elevations to lower elevations. The Remediation Contractor shall not undercut slopes.

2. The Remediation Contractor shall dredge to the lines, grades, slopes, and elevations shown on the Drawings. Each pass of the dredge equipment shall be complete.

3. The CU surrounding sample location SD-SC-07, as shown on the Drawings, is an area of suspected hard subgrade. This area shall be dredged to either 3.5 feet below existing grade or refusal, whichever occurs first as verified by the RPM.

4. The following BMPs shall be used, at a minimum:

    a) Do not stockpile sediment in the water.

    b) Do not overfill the bucket.

    c) Do not take multiple bites.

    d) Leveling of the completed dredging surface by dragging a beam or the clamshell bucket is not permitted.

5. The Remediation Contractor shall implement measures to minimize the entrainment of excess water during dredging.

6. No excessive dredging shall be allowed.

7. The Remediation Contractor shall control the dispersion of suspended solids (turbidity) away from the point of dredging and due to vessel propwash during dredging activities in order to prevent or reduce, to the extent practicable, the potential for sediment recontamination. The Remediation Contractor shall use a turbidity curtain as described in Section 01 57 19 – Temporary Environmental Controls.

8. The Remediation Contractor shall provide and maintain in-water access to dredges, barges, tow/tug boats, and other related equipment. The Remediation Contractor shall ascertain conditions that can affect the access such as climate, winds, currents, tides, waves, depths, shoaling, and scouring tendencies. If the Remediation Contractor chooses to have access at another location(s) for personnel loading and offloading, the location(s) shall be pre-identified as part of the bid, and the Remediation Contractor must secure permits and approvals to access those location(s) and obtain approval by the RPM.

9. The Remediation Contractor's Dredging shall be at an appropriate rate and steadiness to minimize disturbance of sediment so as to reduce to the extent practical, sediment turbidity, mudwaving, or other phenomena that would create movement of contaminated sediment from the Marine Area.

10. In areas shown on the Drawings as having, or suspected of having, hard subgrade materials, the Remediation Contractor shall coordinate carefully with the RPM while dredging. If/when that occurs, the Remediation Contractor shall attempt to dredge the suspect hard subgrade material at that location and investigate and record the extent of the hard subgrade. The Remediation Contractor shall establish the appropriate (revised) dredge boundary at any of these hard subgrade locations in coordination with the RPM.

11. The Dredging/Excavation within an area will be considered complete by the RPM when Dredge/Excavation Acceptance Surveys by CU are conducted in accordance with Section 02 21 00 – Surveying demonstrate that the required grade has been achieved across at least 90% of the CU with the caveat that "high spots" above the required elevations (i.e., up to 10% of the area) are relatively isolated (i.e., non-contiguous) and not the result of intentional bias during implementation. In addition, no measurements within a CU shall be more than 3 inches above the required grade. Verified high-subgrade areas will be included in the calculated percentage of CU areas achieving target elevation.

12. The Remediation Contractor shall comply with dredge elevation verification measurement requirements described in these Specifications and in the CQA Plan.

H. Initial Backfill Lift:

1. Once a CU has been verified and prior to repositioning of the Mobile Turbidity Curtain System, place the Initial Backfill Lift as required in Section 35 20 26 – Backfill and Material Placement.

I. Decanting of Overlying Water on Haul Barge(s):

1. Dredged material barges shall by equipped with sideboards and scuppers located around the perimeter of the deck line that fully contain the dredged material and prevent loss of material back to the water. No overtopping of the sideboards will be allowed.

2. The scuppers shall be covered by filter fabric and/or hay bales (or similarly approved by the RPM) to filter water and retain sediment while allowing water to drain. The Remediation Contractor shall not directly discharge water from the material barge back into the Site waters without passing it through filter media. The method for filtering return effluent

shall be described in the Construction Work Plan and approved by the RPM.

a) The Remediation Contractor shall inspect the filter material on a daily basis to ensure that the filter material is effective in removing suspended sediment from the effluent.

b) The Remediation Contractor shall maintain or replace filter material as necessary in order to ensure the filtering system remains effective at removing suspended solids throughout the duration of the Work at no additional cost to the Owner.

## 3.03 WATER QUALITY MONITORING

A. The Remediation Contractor is responsible for meeting water quality criteria as defined in the WQMP in accordance with Section 01 57 19 – Temporary Environmental Controls and applicable local, state, and federal standards.

B. If water quality criteria are exceeded, the Remediation Contractor shall take immediate steps to correct the exceedance and improve water quality conditions in accordance with Section 01 57 19 – Temporary Environmental Controls.

## 3.04 OFFLOADING AND COORDINATION WITH RPM

A. Excavated and dredged material shall be unloaded directly into sealed containers or trucks at the Barge Offloading Area and temporarily staged within the Nearshore Support Area shown on the Drawings. Spilled material shall be immediately picked up and deposited on the sediment barge or sediment container. All material shall be transported to the TSSA No. 2 truck offload ramp within the Remediation Support Area by the Remediation Contractor. Stockpiling dredged/excavated sediment within the Barge Offloading Area or Nearshore Support Area is not allowed.

1. The water-based transportation shall be via barge or scow to the general area shown on the Drawings as the Barge Offloading Area. At the Barge Offing Area, offload sediment using equipment and methods that are acceptable to the RPM and in compliance with Permit conditions. Potentially acceptable methods for offloading the dredged material from the sediment barge/scow to the Nearshore Support Area include an anchored barge-mounted crane or excavator to lift filled containers, front-end loaders to place sediment directly into sealed trucks, or the equivalent.

2. The Remediation Contractor shall construct the drip apron for drip control during offloading as shown on the Drawings.

3. The Remediation Contractor can propose an alternate docking system, docking area, and offloading system, such as a conveyor offloading system, subject to the approval of the RPM and, potentially, applicable Permit-authorizing agencies.

B. Temporary stockpiles within the Remediation Support Area shall be managed to control dust and erosion by the RPM.

C. Temporary stockpiles shall be fully contained to prevent the unfiltered release of water that comes into contact with stockpiled materials.

D. Sediment offloaded to the Nearshore Support Area shall be dry enough such that there is no free water observed overlying the sediment and such that no free water is generated that cannot be retained in the truck, vehicle, or vessel during transport. The Remediation Contractor shall supply and maintain liners and tarp covers for containers and/or trucks in the event they are needed to contain loads during transport to the Remediation Support Area.

E. The Remediation Contractor shall avoid spilling clumps of contaminated sediment and/or debris from the haul trucks when travelling between the Nearshore Support Area and Remediation Support Area. Material spilled during movement shall be immediately collected and transported to TSSA No. 2.

F. The RPM will process sediment on site such that sediments meet the Paint Filter Liquids Test (USEPA Test Method 9095B) prior to off-site transport and at the disposal site without loss of liquids in transit.

G. Off-site transport and disposal will be performed by the RPM’s transportation and disposal Subcontractor. The RPM is responsible for the handling and pretreatment of waste materials (i.e., dewatering and loading) in the Remediation Support Area.

H. Sediments to be removed from the Site will be loaded by the RPM into train gondolas provided by the transportation and disposal Subcontractor as permitted by the appropriate local, state, and federal authorities, and as required by the operations of the approved disposal facility.

I. Each gondola load will be shipped with its own specific Chain-of-custody Form that will accompany the container from the time that it is loaded, en-route to its destination and when it arrives and is accepted by the receiving facility for disposal. The RPM will act as agent for the Owner and sign the Chain-of-custody Form. Each container shall be shipped with a Chain-of-custody Form.

J. The RPM will verify that free water is removed from waste materials prior to transport. Solidifying agents (e.g., lime and Portland cement) shall not be added to the material at the Nearshore Support Area unless approved by the RPM.

K. The RPM will be responsible for managing the gondola interior liner and/or tarp covering system while on site to ensure the liners are in place prior to loading and that each container is properly covered with the supplied tarp or other cover system to secure the contents of the container during transport. The RPM will supply the tarps for the train gondolas.

L. The RPM will provide labor required for maintaining and operating scales to weigh each loaded gondola or truck prior to exiting the Site.

M. The RPM will load gondolas arriving at the Site so that waste materials are removed from the Site in an approved manner as quickly as possible, taking account of Project scheduling restraints and on-site temporary storage capacity.

## 3.05 ENVIRONMENTAL PROTECTION REQUIREMENTS

A. The Remediation Contractor shall provide and maintain during the duration of the Contract, environmental protective measures in accordance with Section 01 57 19 – Temporary Environmental Controls. Also, the Remediation Contractor shall provide environmental protective measures required to correct conditions, including, but not limited to, dust and/or organic vapors that exceed action levels established in the CHASP, nuisance odors, oil spills, sheen development, or mobile debris during all work. The Contractor shall comply with federal, state, and local regulations and the Project Permits pertaining to water, air, and noise pollution.

B. The Remediation Contractor shall clean and decontaminate equipment that has become exposed to Site sediments during conduct of the Work prior to conducting other construction activities. See Section 01 57 19 – Temporary Environmental Controls for additional details.

## 3.06 HAZARDOUS MATERIAL

A. If encountered, hazardous material shall be disposed of in accordance with applicable federal, state, and local regulations. The Owner does not expect hazardous material to be encountered or removed during performance of the Work. If such material or waste is encountered, the Remediation Contractor shall immediately notify the RPM to determine the course of action to be taken.

## 3.07 FINAL EXAMINATION AND ACCEPTANCE

A. Upon examination and acceptance by the Owner and RPM, the dredging work will be accepted as complete. Final payment shall be subject to deductions or correction from work that is non-compliant or otherwise completed in an unauthorized manner.

**END OF SECTION**

## PART 1 – GENERAL

### 1.01 SCOPE

A. The Work consists of furnishing all transportation, labor, materials, equipment, and incidentals necessary to place clean Backfill material over SMA-1, SMA-2, and SMA-3 areas as shown on the Drawings.

B. Backfill work consists of a layer of Initial Backfill Lift comprising 6 inches of Backfill material to cover the post-dredge surface within a CU, as defined in Section 00 01 00 – Contracting Definitions, after dredging is accepted as complete and prior to moving the Mobile Turbidity Curtain System. Final Backfill in dredge areas will be performed after all required dredging and Initial Backfill Lift activities are complete.

C. Backfill material will be placed to final grades immediately following Excavation work conducted “in the dry” and accepted as complete by the RPM within the same tidal cycle and prior to tidal inundation of the Work area.

### 1.02 RELATED SECTIONS

A. Section 00 01 00 – Contracting Definitions.

B. Section 01 33 00 – Submittal Procedures.

C. Section 01 31 00 – Project Management and Coordination.

D. Section 01 50 00 – Construction Facilities and Temporary Controls.

E. Section 01 57 19 – Temporary Environmental Controls.

F. Section 02 21 00 – Surveying.

G. Section 32 91 00 – Revegetation.

H. Section 35 20 23 – Dredging and Excavation.

### 1.03 REFERENCES

A. ASTM D422 – (2007) Standard Test Method for Particle-Size Analysis of Soils.

B. USEPA Publication SW846 – Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.

## 1.04 SUBMITTALS

A. The Remediation Contractor shall submit a Backfill Placement Plan as part of the Construction Work Plan in accordance with Section 01 33 00 – Submittal Procedures.

B. The Remediation Contractor shall submit a Borrow Source Characterization Report in accordance with the requirements of this Specification and Section 01 33 00 – Submittal Procedures.

C. The Remediation Contractor shall prepare and submit DARs and Weekly Construction Submittals in accordance with Section 01 31 00 – Project Management and Coordination and Section 01 33 00 – Submittal Procedures.

## 1.05 JOB CONDITIONS

A. The Remediation Contractor shall calculate its own estimate of the quantity of material to be used for the backfill material placement activities based on the Remediation Contractor's own calculation methods; the dredging, excavation, and backfill design as shown on the Drawings; and Remediation Contractor's means and methods for both dredging and backfill operations in order to account for Remediation Contractor's equipment tolerances. The Remediation Contractor shall account for its own estimated quantities in its bid.

## PART 2 – PRODUCTS

## 2.01 GENERAL

A. The Remediation Contractor shall provide all required backfill materials for the Work that meet the Project gradation and chemical concentrations criteria.

## 2.02 BORROW SOURCE AND MATERIALS CHARACTERIZATION

A. The Remediation Contractor shall perform the following activities, as specified below, to ensure imported materials are natural, native, virgin, and free of contaminants, including debris or recycled materials, and meet these Specifications:

1. The Remediation Contractor shall perform characterization of any Remediation Contractor-proposed sources of imported material prior to on-site delivery or placement. The characterization will include analysis of a borrow source sample, Site inspection, and Site characterization. The Remediation Contractor shall submit a Borrow Source Characterization Report summarizing all the information contained within this Section.

2. The Remediation Contractor shall submit a list of the sources for all materials to be placed. Coordinate with the RPM for pre-construction inspection of the cap material supplier sources.

3. The Remediation Contractor Shall inspect the borrow source. During such inspection, the Remediation Contractor shall ensure the materials to be delivered to the Site meet the appropriate Specifications. The Remediation Contractor shall provide notification to the RPM within 7 calendar days of such inspections. At RPM's discretion, the RPM or another Owner's Representative may accompany the Remediation Contractor to witness such inspections. This witnessing shall in no way release the Remediation Contractor from complying with these Specifications and shall in no way be construed as approval of any particular source of material.

4. The Remediation Contractor shall provide the RPM with a 5-gallon sample from each borrow source. Each sample should comprise no less than five sub-samples taken throughout any one source. The Remediation Contractor shall verify that the samples are representative of all materials to be imported. The Remediation Contractor shall provide samples to the RPM at least 1 month prior to the start of backfilling activities.

5. The Remediation Contractor (or its material supplier) shall conduct physical and chemical testing to confirm that the materials meet these Specification requirements for use at the Site. Materials must meet the gradation specifications provided in this Section. Backfill may be used on site, provided the chemical testing indicates parameter concentrations are less than the Site MPS of 2.2 mg/kg for mercury and free of other common contaminants. Arsenic concentrations must be in the range of the background arsenic levels published in the Maine RAGs user guidelines.

    a) The RPM reserves the right to request additional samples of materials in order to conduct its own testing for QA purposes.

    b) One representative sample shall be collected for each proposed material if laboratory analytical testing is performed. Any costs associated with testing will be the responsibility of the Remediation Contractor. If sample results show that the material does not meet the requirements, the Remediation Contractor shall identify a new source for the material and provide the required data report for the new source of material prior to the delivery and use of such material on the Site. The RPM reserves the right to request further sampling if concern arises that the characteristics of the selected materials have changed. The RPM maintains the right to reject any materials that have been determined to be substandard for any reason. In the event of rejection, it shall be the responsibility of the Remediation Contractor to remove all stockpiles of rejected material from the Site and provide suitable acceptable materials at no additional cost to the Owner.

6. The Remediation Contractor shall submit certificates for laboratories (certified by the Maine DEP) providing required testing to validate that the laboratory conforms to relevant paragraphs of ASTM D3740.

7. The Remediation Contractor shall test samples of all materials for chemical quality to be imported for the following:

   a) Volatile organic compounds, including Chloropicrin (USEPA 8260).

   b) Semivolatile organic compounds (USEPA 8270).

   c) Metals (USEPA 6000/7000 series).

   d) Polychlorinated biphenyls (USEPA 8082).

   e) Pesticides (USEPA 8081).

   f) Herbicides (USEPA 8151).

8. The Remediation Contractor shall test samples of all materials to be imported for grain size distribution (ASTM method D422-63).

9. The Remediation Contractor shall provide the results of such tests at least 14 calendar days before delivery of the materials to the Site. The results shall be provided in report form, with the reports clearly identifying the following:

   a) Source of samples.

   b) Sampling dates.

   c) Chain of custody.

   d) Sampling locations.

10. Material Certification. The Remediation Contractor shall submit certification from material supplier that the materials meet Specification requirements for gradation and chemical testing.

11. The RPM will evaluate proposed alternate gradation for all materials on a case-by-case basis, and approval will be at the sole discretion of the RPM. If the Remediation Contractor proposes to use an alternate gradation, the

gradational characteristics of the alternate material shall be submitted as part of the Remediation Contractor's bid for conditional approval, pending complete characterization (physical and chemical), as described in this Section. Approval of any material source by the RPM does not limit the Remediation Contractor's responsibility to meet any other requirements of these Specifications.

### 2.03 BACKFILL

A. Backfill material shall be clean; free of clay, loam, or other deleterious material; and shall contain no more than 5% material passing the U.S. No. 200 sieve. Material shall be free-draining and granular, obtained from natural deposits. Individual particles shall be free from all objectionable coatings. The material shall contain no organic matter.

B. Backfill material shall be graded between the limits specified below and subject to the approval of the RPM:

| Sieve Size | Percent Passing (by weight) |
|---|---|
| 4 inches | 90% to 100% |
| 3/4 inch | 50% to 75% |
| U.S. No. 4 | 35% to 55% |
| U.S. No. 10 | 25% to 45% |
| U.S. No. 40 | 10% to 25% |
| U.S. No. 200 | 0% to 5% (wet screen) |

## PART 3 – EXECUTION

### 3.01 GENERAL

A. The Remediation Contractor shall provide for secure transportation and storage of Backfill and Habitat Amended Backfill (see Section 32 91 00 – Revegetation) materials. The Remediation Contractor shall provide temporary stockpiling and storage on site, or on material barges or scows that incorporate erosion control measures and segregation from any contaminated material. Temporary stockpiling of all backfill materials shall be located separate from any contaminated material processing subareas (e.g., the TSSA No. 2) within the Remediation Support Area as shown on the Drawings. The Remediation Contractor shall indicate the clean storage area within the Remediation Support Area in the Temporary Facilities Layout to be submitted to the RPM per Section 01 50 00 – Construction Facilities and Temporary Controls.

B. The Remediation Contractor shall establish an accurate method of horizontal and vertical control as described in Section 02 21 00 – Surveying before backfilling commences. The proposed method and maintenance of the horizontal control system is subject to approval of the RPM and if, at any time, the method fails to provide an accurate location for backfilling operations, the RPM may suspend operations. The Remediation Contractor shall furnish, at its own expense, all material and labor as may be required to define and stake out the limits of the backfill areas shown on the Drawings.

C. Commercial shipping and recreational vessel traffic on the waterway will have precedence over the Remediation Contractor’s activities during the placement of backfill in the Marine Area and may require the Remediation Contractor to stop, move, adjust, and/or slow down to accommodate vessel movement. Such adjustments shall be performed by the Remediation Contractor at no additional cost to the Owner.

D. The Remediation Contractor shall implement measures to prevent any backfill materials from being misplaced on land or in the waterway during the loading and unloading of equipment, if applicable. The Remediation Contractor shall use spill plates and other approved equipment to prevent the loss of materials when loading and offloading, if applicable. All loss of materials shall be restored at no additional cost to the Owner.

E. The Remediation Contractor shall promptly notify the RPM if any material, dredge, barge, machinery, or appliance is lost, dumped, thrown overboard, sunk, or misplaced during the execution of the Work.

F. Environmental protection and turbidity control shall be conducted by the Remediation Contractor in accordance with Section 01 57 19 – Temporary Environmental Controls. Methods and procedures for backfill placement shall limit sediment resuspension and turbidity generation to maintain compliance with the Project’s water quality standards detailed in 01 57 19 – Temporary Environmental Controls. If water quality standards are exceeded, the Remediation Contractor will be notified by the RPM and shall immediately implement measures to mitigate the water quality impacts, including potential stoppage of work if directed by the RPM.

G. The Remediation Contractor shall review geotechnical properties of the existing sediment to understand potential mixing with backfill materials and backfill placement-induced settlement. The Remediation Contractor shall plan backfill material volumes and schedule for Final Backfill Acceptance Surveys accordingly.

H. The Remediation Contractor shall comply with backfill verification measurement requirements described in these Specifications and in the CQA Plan.

I. Backfilling within an area will be considered complete by the RPM when Final Backfill Acceptance Surveys conducted in accordance with Section 02 21 00 – Surveying demonstrate that the required grade has been achieved across at an entire CU within a tolerance of +/- 3 inches relative to the Target Backfill Line shown on the Drawings.

## 3.02 ORDER OF WORK

A. Dredging/Excavation:

1. The Remediation Contractor shall complete dredging, excavation, and backfill in SMA-1 prior to starting work in SMA-2 or SMA-3.

2. Once a CU has been verified and prior to repositioning of the Mobile Turbidity Curtain System, the Remediation Contractor shall place Initial Backfill Lift.

3. The Remediation Contractor shall place Final Backfill after all Dredging, Excavation, and Initial Backfill Lift placement within all SMAs has been accepted by the RPM as complete.

B. Initial Backfill Lift Placement:

1. The Remediation Contractor shall conduct Initial Backfill Lift placement work only after the RPM verifies the dredging work in each CU.

2. Initial Backfill Lift will be placed in a single CU after dredging or excavation is accepted as complete and prior to repositioning of the Mobile Turbidity Curtain System to an adjacent CU.

3. Initial Backfill Lift placement does not apply to areas excavated in the dry (i.e., with no overlying water). CUs within excavation areas shall be backfilled with Final Backfill to Finished Grade during the same tidal cycle as excavation work and prior to the incoming tide.

C. Final Backfill:

1. In excavation areas, Final Backfill shall be placed immediately following completion of the excavation within the same tidal cycle and prior to tidal inundation of the Work area (the full thickness of the backfill shall be achieved prior to inundation of the Backfill Work Area).

2. The Remediation Contractor shall conduct placement of Final Backfill in dredge areas after all dredging and Initial Backfill Lift placement has been accepted as complete. The Remediation Contractor shall place material upstream to downstream.

3. The Remediation Contractor shall place 6-inch layer of Habitat Amended Backfill material to the Target Backfill Line as required in Section 32 91 00 – Revegetation and as shown on the Drawings.

D. Placement work shall be performed from lower elevations to higher elevations and from upstream to downstream to the extent practicable.

E. Once backfill materials have been placed, the Remediation Contractor shall complete topographic and/or bathymetric surveys detailed in Section 02 21 00 – Surveying to confirm that the Target Backfill Line has been met. If low or thin spots are identified, the Remediation Contractor shall place additional material to the satisfaction of the RPM to achieve the required grade or thickness. The average allowable tolerance for the Final Backfill is +/- 6 inches from Target Backfill Line. If high spots are identified, the Remediation Contractor may be directed by the RPM to remove and properly dispose of the excess backfill material at no additional expense to the Owner.

## 3.03 QUALITY CONTROL

A. The Remediation Contractor shall establish procedures for monitoring the rate of placement of the backfill materials, including use of a positioning system as described in Section 35 20 23 – Dredging and Excavation. The methods should be capable of determining the area of backfill material coverage on a daily basis.

B. The Remediation Contractor shall supply the RPM with information pertaining to the previous day's backfill material placement activities on a daily basis in the DAR in accordance with Section 01 31 00 – Project Management and Coordination and Section 01 33 00 – Submittal Procedures.

## 3.04 INSPECTION OF MATERIALS AT THE SITE

A. Truck or barge loads of imported materials shall be visually inspected by the Remediation Contractor upon delivery for the presence of foreign, recycled, or reprocessed material. The RPM may, at any and all times, perform an independent inspection. Materials may be rejected if they are identified as substandard or if test results show them to be substandard.

B. The RPM reserves the right to reject any materials that do not meet these Specifications. In the event of rejections, it shall be the responsibility of the Remediation Contractor to remove all stockpiles of rejected material from the Site at no additional cost to the Owner.

## 3.05 SURVEYS AND BACKFILL PLACEMENT CONFIRMATION

A. The Remediation Contractor shall conduct a Final Backfill Acceptance Survey verifying the thickness and/or elevation of the material placement in accordance with Section 02 21 00 – Surveying.

B. The RPM may collect cores through the backfill material to verify final material placement thickness.

## 3.06 EQUIPMENT

A. The Remediation Contractor shall select the means and methods for backfill placement that will achieve the Target Backfill Line along with other Project specifications, as detailed in the Backfill Work Plan, to be submitted to and approved by the RPM.

B. If applicable, equipment used for dredging must be decontaminated, per Section 01 57 19 – Temporary Environmental Controls, prior to use in backfilling operations.

C. Equipment to be used for backfill material placement shall place the materials in a manner that does not disturb the subgrade or previous lifts of backfill material.

## 3.07 CONDUCT OF BACKFILLING

A. Layout of the Work:

1. Requirements for positioning equipment and methods as specified in Section 35 20 23 – Dredging and Excavation are also applicable to backfill material placement operations performed using marine construction equipment.

2. The Remediation Contractor shall lay out the Work from horizontal and vertical control points indicated on the Drawings and be responsible for all measurements taken from these points. The Remediation Contractor shall furnish, at the Remediation Contractor’s own expense, all stakes, templates, platforms, equipment, range markers, transponder stations, and labor as may be required to lay out the Work from the control points shown on the Drawings.

3. The Remediation Contractor shall maintain all points established for the Work until authorized to remove them. If such points are destroyed by the Remediation Contractor or disturbed through its negligence prior to an authorized removal, they shall be replaced by the Remediation Contractor at its own expense.

B. Backfilling:

1. The Remediation Contractor shall furnish and place materials as shown on the Drawings and described in these Specifications. Any backfill material that is deposited other than in the area indicated on the Drawings, or as approved by the RPM, will not be included in the measurement for payment, and the Remediation Contractor may be required to remove such misplaced material and deposit it where directed at its own expense.

2. Once a CU has been verified by the RPM and prior to repositioning of the Mobile Turbidity Curtain System, the Remediation Contractor shall place Initial Backfill Lift over the dredged surface at an average thickness of 6 inches.

3. Anchors and spuds shall not be set in areas where the Final Backfill has been placed and accepted by the RPM.

4. The Remediation Contractor shall monitor the materials placement work throughout the course of the Work for depth, slopes, location, and tolerances and be responsible for damages due to overplacement or placing backfill outside the specified limits for backfill placement.

5. The Remediation Contractor shall not drag equipment over backfilled areas to even out high spots or for any other reason.

6. Underwater stockpiling of backfill material shall not be performed.

## 3.08 TRANSPORTING BACKFILL MATERIAL FOR PLACEMENT

A. Haul barges shall be in good condition with no leaks in the hull. The barge shall be loaded with sufficient freeboard inside so that no material spills over the side walls. Load lines shall be clearly shown on the barge, and loading shall not take the barge below the load lines.

B. The tug boat shall be of sufficient horsepower for moving the barge and maneuvering through the area, bridges, and marine traffic encountered between the borrow site and the placement site.

C. The Remediation Contractor shall provide the following information (as part of the Backfill Placement section of the Construction Work Plan) on each material barge that will be used in accordance with Section 01 33 00 – Submittal Procedures.

   1. Dimensions and capacity.

   2. Barge displacement curve.

D. The Remediation Contractor shall collect certified tickets from the borrow source for each load of material brought to the Site. The tickets shall be submitted to the RPM as part of the Weekly Construction Report.

## 3.09 WATER QUALITY MONITORING

A. The Remediation Contractor is responsible for meeting water quality criteria, as defined in Appendix E – Water Quality Monitoring Plan, in accordance with

Section 01 57 19 – Temporary Environmental Controls and applicable local, state, and federal standards.

**END OF SECTION**

## PART 1 – GENERAL

### 1.01 SCOPE

A. The RPM is responsible for the management of all construction water generated within the Remediation Support Area.

B. The Remediation Contractor shall be responsible for the management of all construction water generated as part of its operations at the Nearshore Support Area, Barge Offloading Area, or any other area used by the Remediation Contractor.

C. The Work specified in this Section consists of the labor, equipment, tools, materials, and services necessary for the management of contact, non-contact, and decontamination water as described herein and as shown on the Drawings. Water generated during the dewatering of dredged sediments within the Remediation Support Area will be managed by the RPM as contact water.

D. The Work may include construction and maintenance of transfer piping (new and existing) to the on-site GWTP and provisions for storage and transport to the GWTP. Pre-treatment of contact water may be required to achieve the acceptance criteria of the GWTP. The GWTP will have a maximum treatment capacity of 20,000 gallons per day, and the effluent will have a TSS concentration of less than 200 mg/L. The location, capacities, and discharge points will be determined by the GWTP operator.

### 1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittal Procedures.

B. Section 01 57 19 – Temporary Environmental Controls.

### 1.03 SUBMITTALS

A. Pre-construction Submittals. The Remediation Contractor shall submit required plans per Section 01 33 00 – Submittal Procedures.

## PART 2 – PRODUCTS

### 2.01 WATER MANAGEMENT PRODUCTS

A. The RPM will provide the proper pumps, tanks, transfer piping, hoses, and similar materials, which include safeguards against leaks, freezing, punctures, or breakage to ensure effective Site water management.

## PART 3 – EXECUTION

### 3.01 GENERAL REQUIREMENTS

A. The following definitions shall apply to non-contact water, contact water, and decontamination water:

1. Non-contact water shall be stormwater contacting only non-contaminated surfaces either existing or after stripping and grubbing, with the exception of areas designated for TSSAs. In TSSA areas designated for disposal, non-contact waters may include waters collected from clean covered areas (i.e., plastic liner over stockpiles).

2. Contact water shall be any water contained in or removed from the dredged and excavated contaminated materials during stockpiling or fluid generated during the dewatering process within the Remediation Support Area (to be performed by the RPM).

3. Decontamination water is generated by the decontamination process for both equipment and personnel (e.g., water generated within the on-site decontamination pad).

B. The RPM will have accessible and on hand, at all times during construction, sufficient dewatering equipment in good working condition. Additionally, sufficient backup equipment will be available for construction water management in the event of breakdowns in the primary equipment or to sustain any unexpected increase in water removal.

C. The RPM will provide experienced, qualified personnel to perform activities associated with this Section.

D. Contact water generated from sediment offloading and dewatering activities, that contains TSS concentrations less than 200 mg/L, shall be directed from the source to the influent manifold of the GWTP for treatment. Contact water that contains TSS concentrations greater than 200 mg/L shall be filtered prior to transport of the water to the GWTP.

E. Non-contact water shall be discharged through the appropriate BMPs in a manner to prevent local flooding, ponding, and damage to new and existing facilities or adjacent sites.

F. Water that has been used for decontamination of vehicles, equipment, and personnel shall be considered decontamination water and shall be transferred to the GWTP.

G. If materials that meet the criteria for requiring off-site disposal are staged in TSSA No. 1, any stormwater in contact with the sediment or water that drains from the sediment will be collected and managed by the RPM.

H. The Remediation Contractor shall control storm runoff non-contact water from the Barge Offloading Area, Nearshore Support Area, or any other area used by the Remediation Contractor.

I. Construction water management measures shall be inspected by the RPM and the Remediation Contractor daily. Repairs, if needed, shall be made as soon as practical.

J. Construction water management practices shall comply with the following requirements:

1. The RPM will prepare a schedule of operations, a description of the water transfer system to the GWTP, including safeguards against puncture, leaks, and breakage to protect contact waters from entering or contacting clean areas; capacity calculations; locations; and details for pumps, sumps, well points, collection and discharge lines and other items proposed for use and a program of operations to effectively control water encountered during the planned Construction Schedule.

2. All measures implemented related to construction water management shall be made in such a manner to comply with the SWPPP and relevant local, state, and federal requirements for the Remediation Support Area. The RPM will also include capacity calculations, locations, and details for pumps, sumps, well points, collection and discharge lines, and other items proposed for use.

K. Prohibited construction practices include, but are not limited to, the following:

1. Dumping of any grubbed, stripped, or dredged material and contact water into any stormwater drains, sewers, stream corridor, wetlands, and/or surface waters at unspecified locations and/or at locations not approved by the RPM.

2. The operation of construction equipment and vehicles within or along any stream corridor, wetland, or surface waters, which results in the discharge of contaminated materials or water.

3. The pumping of silt-laden, untreated water from trenches, excavations, soil stockpiles, truck-washing pads, sumps, or other areas on site into any surface waters, stream corridors, wetlands or locations.

L. Stormwater monitoring will be performed by the RPM and the Remediation Contractor at discharge points. Inspection of erosion and sedimentation controls shall be performed by the Remediation Contractor in accordance with Section 01 57 19 – Temporary Environmental Controls to help ensure these controls are in accordance with the SWPPP. The Remediation Contractor shall immediately correct any observed deficiency.

## 3.02 ADJUSTMENT OF PRACTICES

A. If the planned measures do not result in effective removal and/or management of non-contact water (e.g., stormwater) to the satisfaction of the regulatory agencies having jurisdiction over the Project, the Remediation Contractor shall, at its own expense, immediately adjust their program and/or institute additional measures so as to satisfy the regulatory agencies.

B. If the Remediation Contractor fails or refuses to comply promptly, the RPM may issue an order stopping all or part of the Work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for excess costs or damages by the Remediation Contractor.

**END OF SECTION**

# Appendix G

# Construction Quality Assurance Plan

# CONSTRUCTION QUALITY ASSURANCE PLAN

## Southern Cove

Orrington Remediation Site
Orrington, Maine

*Prepared by:*

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April 22, 2016

# Table of Contents

# List of Figures

# Acronyms

| | |
|---|---|
| BMP | best management practice |
| CMI Plan | *Southern Cove, Orrington Remediation Site, Corrective Measures Implementation Plan* |
| CQA | Construction Quality Assurance |
| DGPS | differential global positioning system |
| ESA | Endangered Species Act |
| Maine DEP | Maine Department of Environmental Protection |
| NMFS | National Marine Fisheries Service |
| WQFMP | Water Quality and Fish Monitoring Plan |

# Section 1. Introduction

## 1.1 Purpose of CQA Plan

This Construction Quality Assurance (CQA) Plan, herein referred to the CQA Plan, establishes the quality assurance (QA) monitoring and documentation procedures that will be used during the Southern Cove Corrective Measures Implementation (CMI) activities at the Orrington Remediation Site (Site) in Orrington, Maine. The CQA program set forth in this document shall be used by the Remediation Project Manager and the CQA Engineer to verify that CMI activities are accomplished in accordance with the requirements of the CMI Plan and Contract Documents, including the Drawings, Specifications, and other applicable construction documents.

## 1.2 CQA and Construction Quality Control

The CQA Plan is a site-specific document that addresses the following: (i) the CQA Engineer responsibilities and authorities; (ii) monitoring and testing activities that will be performed during construction; and (iii) CQA documentation requirements. In the context of this CQA Plan, CQA and Construction Quality Control (CQC or QC) are defined as follows:

- CQA is the planned and systematic means and actions that provide confidence that construction materials, methods, and results meet or exceed design criteria and requirements. The CQA activities provide for collection of mutual and independent third-party measurements of construction conditions, as well as review and confirmation of the quality of data collected as part of the CQC activities.
- CQC is the planned system of inspections and testing by the contractor’s team (or their subcontractors) to monitor and control the characteristics of an item, a service, removal, or installation in relation to design requirements. The CQC activities provide for a collection of construction condition measurements.

In the context of this document, CQA refers to the following:

- Means and actions to independently assess conformity of the various components of the excavation, dredging, backfill material placement, sediment processing, water treatment, and transport and off-site disposal activities with the requirements of the approved design

In the context of this document, CQC refers to the following:

- Those actions taken by the contractor’s team (or their subcontractors) to determine compliance with the Contract Documents regarding the various components of the project including excavation, dredging, backfill material placement, sediment processing, water treatment, and transport and off-site disposal activities with the requirements of the approved design

Project personnel are essential in achieving project success and will be responsible for identifying issues that could adversely affect the quality of the work. Project staff will be trained to understand the project requirements and be responsible for identifying, reporting, documenting, and verifying the appropriate corrective actions have been implemented to ensure items and services conform to the applicable Specifications.

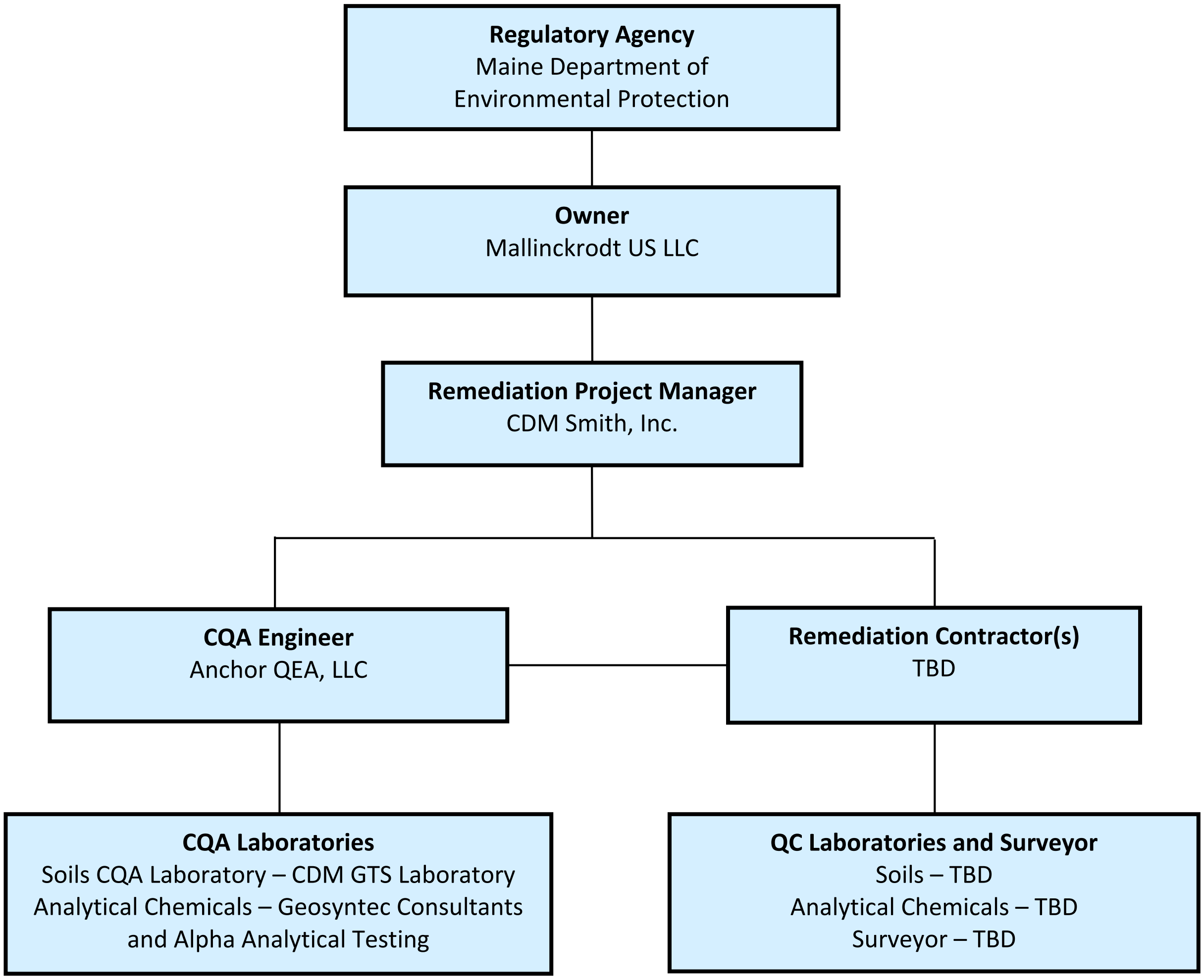
# 1.3 Roles and Responsibilities

## 1.3.1 Organization of Personnel

The CQA organizational structure is provided in Figure 1. The duties, responsibilities, and authorities of the entities and personnel positions identified in this figure as they relate to the CQA program are described below.

As shown in Figure 1-1, in some cases the entities are not yet identified (i.e., still need to be determined [TBD]). The CQA Engineer will issue updated project personnel organization charts that identify by name the responsible individuals and their affiliation after completion of the Southern Cove CMI procurement activities.

**Figure 1-1: CQA Organizational Structure – Corrective Measures Implementation**



(This figure will be updated and submitted to the Maine Department of Environmental Protection [Maine DEP] after selection of Remediation Contractor(s).)

### 1.3.2 Regulatory Agency

Maine DEP will conduct oversight of the remediation requirements at the Site and will review and approve the Southern Cove CMI.

### 1.3.3 Owner

The Owner of the Site is Mallinckrodt US LLC (Mallinckrodt). Mallinckrodt is responsible for the completion of the corrective measures and has contracted with CDM Smith, Inc. (CDM Smith) to serve as the Remediation Project Manager for the Site.

### 1.3.4 Remediation Project Manager

The Remediation Project Manager, CDM Smith, will retain a Remediation Contractor(s) to implement the Contract Documents in accordance with the approved CMI Plan. Additionally, the Remediation Project Manager will retain a CQA Engineer to verify the remediation activities are completed per the approved CMI Plan and Contract Documents.

### 1.3.5 Remediation Contractor

The Remediation Contractor(s) are TBD. The scope of the Remediation Contractor's activities is to construct and perform the work to satisfy the CMI Plan as set forth in the Contract Documents.

### 1.3.6 CQA Engineer

Anchor QEA, LLC (Anchor QEA) will serve as the CQA Engineer. As such, the CQA program will be directed and supervised by Anchor QEA. The CQA Engineer will be directly accessible to Mallinckrodt and the Remediation Project Manager for technical direction during construction. The CQA Engineer will perform the following QA activities:

- Review conformance of material and construction to verify compliance with the intent of the requirements of the CMI Plan and Contract Documents
- Review other site-specific documentation, including the Remediation Contractor's bid
- Conduct periodic Site inspections
- Participate in project meetings as set forth specified in Section 2.1
- Perform daily CQA activities (e.g., review field reports, interact with the Remediation Contractor on a frequent basis)
- Prepare and keep field CQA documentations
- Oversee the ongoing preparation of as-built drawings by the Remediation Contractor
- Review the Remediation Contractor surveyor work products
- Verify the calibration and conditions of on-site CQA and positioning equipment
- Coordinate collection and shipping of laboratory test samples to the CQA laboratories
- Review and report results of laboratory testing
- Review the Remediation Contractor's submittals
- Report any unresolved deviations from the CMI Plan and Contract Documents

- Observe and verify that environmental controls are in place and performing properly
- Prepare and certify (P.E. stamp) the Final CQA Report

### 1.3.7 Soils CQA Laboratory

The soils CQA laboratory will be a geotechnical testing laboratory firm that has experience in the physical testing of soils, and is familiar with and properly equipped to perform the geotechnical testing required by the CQA Plan. The soils CQA laboratory will be the CDM GTS Laboratory in Somerville, Massachusetts.

### 1.3.8 Analytical CQA Laboratory

The analytical CQA laboratory will be an analytical testing laboratory firm that has experience in the chemical testing of sediment, and is familiar with and properly equipped to perform the analytical testing required by the CQA Plan. Mercury testing will be performed by the on-site Geosyntec Consultants laboratory and other analytical testing will be performed by the analytical CQA laboratory, Alpha Analytical Testing in Westborough, Massachusetts.

## 1.4 Applicable References

Organizations whose standards are referenced in the CQA Plan and the Specifications are as follows:

- ASTM: American Society for Testing and Materials
- GSI: Geosynthetic Institute
- OSHA: Occupational Safety and Health Administration
- Maine DEP: Maine Department of Environmental Protection
- Maine DOT: Maine Department of Transportation

Any reference to standards of any society, institute, association, or governmental agency will pertain to the edition in effect as of the date of this CQA Plan unless stated otherwise.

# Section 2. Project Overview

## 2.1 Background

The Southern Cove is located in the Penobscot River bordering the Site located at 99 Industrial Way, Orrington, Maine, as shown in Figure 2-1. A full description of the Site, which includes a former manufacturing plant and five landfills, is included in the *Site Investigation Report* (CDM, 1998), and the *Corrective Measures Studies* (CDM, 2003). The Southern Cove lies to the south of the historical manufacturing plant area, on the eastern side of the main channel of the Penobscot River. The Penobscot River is subject to average tidal fluctuations up to 16 feet and a portion of the cove is tidal mudflats exposed under low tide conditions. During winter months, broken up ice blocks from upstream flows collect within the cove.

Two outfalls and two drainages that currently discharge to the Southern Cove are shown in Figure 2-1**.** One of the two outfalls is the effluent pipe from the on-site water treatment facility, which runs beneath the beach at the northern side of the Southern Cove and discharges into the river. The other outfall is the cooling water discharge pipe from the Penobscot Energy Recovery Company (PERC) facility is buried beneath the beach and runs offshore near the central portion of the Southern Cove. The two drainages that flow into the cove are the Northern Drainage Ditch and the Southerly Stream.

## 2.2 Summary of the Southern Cove Corrective Measures

As described in the CMI Plan, the corrective measures proposed for the Southern Cove include the following activities:

- Mobilization of excavation, dredging, and backfilling equipment
- Removal (excavation/dredging) of sediment
- Placement of final backfill in excavation areas performed “in the dry”
- Pre- and post-dredge/excavation surveying to verify required removal depths are achieved
- Placement of post-dredge initial lift backfill material in dredge areas following the completion of a Certification Unit (CU)
- Placement of final backfill over all Sediment Management Areas (SMAs) after all dredging and initial lift backfill is completed
- Post-backfill surveying to verify removal areas have been returned to pre-construction grades
- Sediment processing and preparation for transport and disposal
- Transport by rail, and final placement of dredged materials in an approved off-site upland disposal facility
- Water treatment and discharge into the Penobscot River in accordance with Maine Pollution Discharge Elimination System (MEPDES) Permit ME0000639
- Water quality (i.e., turbidity) monitoring during construction to demonstrate the effectiveness of environmental controls
- Site restoration including revegetation in disturbed intertidal wetland work areas


MAINE
Mt Katahdin Baxter Peak
Project Location
Augusta
Landfill Ridge Area
Landfill 5
Landfill 2
Landfill 4
Landfill 3
Landfill 1
Northern Ditch
Southerly Stream
SMA 2
Southern Cove
SMA 1
SMA 3

# Section 3. Meetings and Documentation

## 3.1 Project Meetings

### 3.1.1 Pre-construction Meeting

Prior to initiating construction activities at the Site, a pre-construction kick-off meeting will be held by the Remediation Project Manager. At a minimum, the meeting will be attended by the Remediation Project Manager, CQA Engineer, and the Remediation Contractor and its key subcontractors. The meeting may also be attended by representatives of Maine DEP and the Owner.

The purpose of this meeting is to begin planning for coordination of tasks, present the schedule and sequence of work, discuss anticipated problems that might cause difficulties and delays in construction, and present the procedures for clarifications and changes to the Final Design and Contract Documents.

The pre-construction meeting should include discussion of the following activities:

- Reviewing the responsibilities of each party
- Confirming the official versions of all Contract Documents that shall be used for the Landfill 2 construction, update/finalize the project personnel organization charts, and establish lines of authority and communication
- Reviewing critical design details of the project
- Establishing an understanding by the parties of the CQA Plan as compared to the Specifications and CQA and CQC procedures
- Establishing work area security and safety protocol in accordance with the Remediation Contractor's health and safety plan
- Describing soil borrow source locations and haul routes
- Establishing soil and other material stockpiling and equipment staging locations
- Confirming the methods for documenting and reporting, and for distributing documents and reports
- Discussing the procedure that will be followed to request, evaluate, accept, and issue clarifications or changes to the design or Specifications
- Confirming the acceptance and verification process for task completion prior to schedule sequence advancement
- Establishing procedures for processing applications for payment

Items discussed during the pre-construction meeting will be documented by a person designated by the Remediation Project Manager at the beginning of the meeting, and minutes will be distributed after the meeting.

### 3.1.2 Progress Meetings

A progress meeting (via teleconference and/or at the Site) will be held each week (at a minimum) during construction between the Remediation Contractor, CQA Engineer, and Remediation Project Manager. Topics covered at the progress meetings will normally include: health and safety; status of work performed to date; planned activities for upcoming work; status of submittals, field clarifications, and design changes; community relations; and general open discussion. Matters requiring action raised in the progress meetings will be communicated to the appropriate parties. Minutes of the progress meetings will be distributed to each party present at the meeting promptly after each meeting by the Remediation Contractor. These minutes of the weekly progress meetings will also serve as weekly field summaries throughout the remediation construction.

Daily progress meetings will be held on most days between the CQA Engineer, Remediation Project Manager, and Remediation Contractor prior to the start of work in the mornings or at the end of each day. The purpose of these meetings will be to discuss health and safety topics, review the previous day's activities, review the upcoming day's activities, and identify prerequisite activities or potential foreseen construction challenges. Major items discussed during the daily meetings will be documented in the CQA Engineer's daily field reports.

## 3.2 CQA Documentation

### 3.2.1 Daily Field Reports

The CQA Engineer will prepare daily field reports that will provide a daily record of construction progress, summarize assurance activities, and highlight matters requiring the Remediation Contractor's action. The daily reports will be filed and a copy maintained in a bound log book that is kept on site.

The daily report will typically include the following items:

- Project name, location, and date
- Weather conditions (temperature, wind, and precipitation)
- Construction activity underway
- Equipment, personnel, and work at each unit
- Materials delivered and used
- Compliance with design requirements (e.g., specifications and drawings)
- Measures taken to secure the Site
- Records of CQA data or measurements obtained
- Items requiring action and resolution
- Names of Site visitors
- Meetings
- Laboratory reports on testing material
- Photographs taken
- Field modifications

### 3.2.2 Weekly Summary Reports

The CQA Engineer, in cooperation with the Remediation Contractor, will prepare weekly summaries of progress. These summaries will facilitate the preparation of the Weekly Summary Reports. The Weekly Summary Report will identify progress organized by activity, as follows:

- Excavation and dredging
  - Area worked (supported by Contractor's log)

  - Volume of material removed (supported by Contractor's log)
  - Surveys completed (supported by Contractor's log)
  - Problems encountered
  - Corrective actions (if any)
- Backfill material placement
  - Area worked (supported by Contractor's log)
  - Weight/volume of material placed
  - Problems encountered
  - Corrective actions (if any)
- Environmental controls
  - Samples collected
  - Summary of visual results
  - Summary of water quality monitoring
  - Problems encountered
  - Corrective actions (if any)

### 3.2.3 Field Change Form

Changes to the design will require acceptance by the Remediation Project Manager, CQA Engineer, and Maine DEP. The field change form will include the description and the reason for the field change, the date, and signatures of the relevant parties. Material substitutions may not be considered to be field changes if such changes are accepted by the CQA Engineer as part of the technical submittal review process.

### 3.2.4 CQA Final Report

Upon completion of the work, the CQA Engineer will prepare a QC Report, which will certify that the work was performed in compliance with the Contract Documents (as amended by any field changes that were properly authorized and implemented). The report will summarize field observations, measurements, inspections completed, data received, communications with other members of the project team or Maine DEP, any water quality exceedances, additional environmental controls that were implemented, problems encountered, and resolutions. The QC Report will be supported by submittals received from the Remediation Contractor, such as survey results and weigh tickets, inspection reports, and written communication from members of the project team or Maine DEP. Water quality results will also be separately recorded and reported as defined in the *Water Quality Monitoring Plan* (Anchor QEA, in preparation).

The QC Report will include the following information:

- Significant and/or unusual occurrences
- Phases of construction in progress
- Material and/or equipment delivered to, or leaving, the site
- Weather conditions and their impact on construction activities

- Test and/or control activities performed with results and deficiencies noted, along with corrective actions
- Reference to test reports and/or data
- References to relevant documents (specifications and drawings)
- Submittals and deliverables reviewed, with contract reference, by whom, and action taken
- Off-site surveillance activities, including actions taken
- Description of non-conformance or deficiencies identified
- Instructions given or received
- Changed conditions, delays, or conflicts encountered and directives given that change the existing contract performance requirements

QC Reports will be signed and dated by the CQA Engineer. The QC Report will include copies of test reports as well as copies of reports prepared by QC personnel. The CQA Final Report will be submitted to Maine DEP within 90 days after completion of construction.

# Section 4. Construction Quality Assurance

CQA testing will be performed to confirm that the corrective measures were implemented in accordance with the Contract Documents. This work will be implemented by the CQA Engineer.

Additionally, QC testing will be conducted by the Remediation Contractor and reviewed on an ongoing basis by the CQA Engineer. The requirements, testing methods, and frequencies of QC testing are presented in the Specifications and the Contractor CQC Plan.

## 4.1 Pre-construction Qualifying of Material Sources

Prior to applicable aspects of the construction, the Remediation Contractor will be required to provide initial material QC information (i.e., certification[s], analytical data, QC test results, data sheet, and/or shop drawings from the suppliers/manufactures) and/or samples of proposed materials as set forth in the Contract Documents. The CQA Engineer will examine the provided QC information and/or samples of the proposed material(s) to verify that the materials meet the project requirements.

If, during the pre-construction qualification, a sample fails to meet the requirements of the Specifications, the CQA Engineer will notify the Remediation Contractor. Use of the material will not be allowed unless the material is prequalified by further tests or otherwise accepted by the Remediation Project Manager and the CQA Engineer. Additional tests, if necessary, will be coordinated by the CQA Engineer at the Remediation Contractor's expense.

## 4.2 Site Preparation

CQA monitoring activities for site preparation will include verification and documentation of the following:

- Erosion and sediment controls are in place prior to the start of clearing, grubbing, and stripping and that they are maintained throughout construction.
- Access road(s) are maintained in accordance with the Contract Documents.
- Trees, brush, and stumps are shredded, chipped, or otherwise reduced in size for proper handling, re-use, and/or disposal in pre-authorized areas.
- Minimal disturbance to surrounding areas (e.g., outside the limit of work) occurs during work activities, and any such areas are properly addressed/restored by the Remediation Contractor.
- Contaminated soil, sediment, stripped topsoil, grubbing material, and other materials are handled and disposed of in accordance with the Contract Documents.
- The location and configuration of stockpile areas are in compliance with the Contract Documents and different materials are stockpiled separately.

## 4.3 Erosion and Sediment Control

The CQA Engineer will observe the Remediation Contractor's work activities and will verify that prior to initiating work in any given area, erosion and sediment controls, as set forth in the Contract Documents have been installed. The CQA Engineer will routinely verify that the Remediation Contractor keeps the Site free from excessive sediment and in as neat a condition as possible. This includes the project area, haul roads, borrow areas, stockpile areas, Site entrance roads, and nearby waterways. The CQA Engineer will routinely observe that the Remediation Contractor's erosion control system is in adequate condition and is not releasing excess amounts of sediment from the Site.

## 4.4 Environmental Monitoring

Water and air quality monitoring will be conducted during activities that require the excavation, dredging, handling, or processing of contaminated sediments. Monitoring activities are described in detail in the following documents:

- *Water Quality Monitoring Plan* (Anchor QEA, in preparation)
- *Contractor Health and Safety Plan* (to be prepared 2016)
- *Site Health and Safety Plan (CDM Smith, 2014)*
- *Perimeter Air Monitoring Plan* (CDM Smith, 2015)

## 4.5 Dredging and Excavation

The CQA Engineer will monitor and document the removal of sediments within the three SMAs shown in the Drawings. These CQA activities generally include the following:

- Documenting the construction equipment used for excavation and dredging
- Reviewing the Remediation Contractor's surveys documenting removal progress
- Verifying survey and position control equipment are calibrated
- Verifying environmental controls are in place and working
- Inspecting work on site

### 4.5.1 Survey and Positional Control

All equipment used for excavation, dredging, post-dredge backfilling, and other remediation-related survey purposes in the Southern Cove will employ hydrographic surveying, engineering, and equipment positioning software. Methods for in-water survey work (including acoustical and physical methods) will generally conform to guidelines set forth in the guidance document EM 1110-2-1003, Engineering and Design-Hydrographic Surveying (USACE, 2013). All positioning data for the survey will be based on Real-time Kinematic (RTK) Global Positioning System (GPS), which typically provides accuracies of plus 1 centimeter horizontally and plus 4 centimeters vertically.

RTK corrections will be provided from either a project base station via radio link or Maine State RTK network, depending on the availability of a state network. Survey personnel will coordinate with other RTK GPS users on the project and make use of shared resources. All survey data and control will be referenced to the following datum:

- Horizontal datum
    - Maine State Plane Coordinate System
    - Eastern Zone
    - North American Datum 1983, 1997 adjustment [NAD 83(97)]
    - Units: U.S. survey feet
- Vertical datum

- North American Vertical Datum of 1988 (NAVD88)
- Units: U.S. survey feet

Calibration of the equipment will follow the manufacturer's procedure; additional information regarding the control of measuring and test equipment can be found in the Operation and Maintenance Manuals for the test equipment.

The Remediation Contractor will also use dredge positioning instrumentation and software to control the work and document the progress of the underwater sediment removal activities. Examples of systems that may be used include IHC Systems' Excavator Position Monitor (XPM) System and Hypack, Inc.'s Dredgepack.

### 4.5.2 Removal Verification Approach

The verification plans and performance criteria for dredging address the following objectives:

- Verification that excavation and dredging has achieved the horizontal and vertical extent required by the design
- The required excavation or dredge thickness over 90% of the work area has been achieved

Verification of the completion of excavation and dredging will be performed on a CU basis. A CU is an excavation or dredging subarea with an SMA that will be used for assessing compliance with thickness removal. Excavation CUs will generally be sized to facilitate excavation and follow-on backfill over a single low-tide cycle (i.e., "in the dry"), whereas subtidal CUs will be sized by moonpool area within the mobile turbidity curtain system. CUs will be defined by the Remediation Contractor in consultation with the Remediation Project Manager in pre-construction work plan documentation. Post-dredge bathymetric surveys will be performed using manual survey methods within the mobile turbidity curtain system moonpool unless a multi-beam acoustical system or single-beam remote controlled system is available and can be used within the moonpool enclosure. Un-edited survey data will be processed to verify attainment of target elevation in accordance with the compliance criteria provided in the Specifications and summarized below.

The first step of post-dredge verification is to establish if the required design cutline has been met. The proposed approach to verify compliance with the design is based on achieving the required grade across at least 90% of the CU, excluding locations where rock or clay (i.e., hard subgrade) constrained the depth of dredging. Hard subgrade verification procedures are described in Section 4.5.3. In addition to achieving the required grade over 90% of the CU, the following additional requirements apply:

- Individual "high spots" above the required elevations (i.e., up to 10% of the area) should relatively isolated (i.e., non-contiguous) and are not the result of intentional bias during implementation.
- No area within a given CU area will be permitted to exceed the required grade by more than 3 inches.

In the event that post-dredge surveying indicates that required dredge elevations have not been achieved in accordance with the compliance criteria, the Remediation Project Manager may elect to hire a third-party surveyor to verify the Remediation Contractor's survey. The Remediation Project Manager will decide which survey should be used for compliance and will decide whether or not additional dredging is necessary to comply with the CMI Plan. If the third-party survey confirms that the target dredging was not completed, then additional dredging will be performed.

### 4.5.3 Manual Surveying Method for Delineation of Hard Subgrade Areas

When hard subgrade or un-dredgeable materials (clay, hard sand/gravel, or rock) are encountered and prevent the Remediation Contractor from achieving the design elevations, manual surveying in the form of poling or leadlining will be performed to determine the extent of the hard subgrade area. After the area is delineated, a summary figure will be created for review and approval by the Remediation Project Manager and the CQA Engineer. Accepted hard subgrade areas will be excluded from post-dredge verification compliance metrics.

## 4.6 Backfilling and Restoration

The CQA Engineer will monitor and evaluate the Remediation Contractor's proposed backfill material(s) and backfilling activities in accordance with Contract Documents.

### 4.6.1 Import Material Characterization

Prior to any on-site placement of import materials, the Remediation Contractor shall submit a Borrow Site Characterization Report to the CQA Engineer. The characterization report will include identification of the source (including a map documenting the origin of the material), Site inspection, and material sample and characterization (physical and chemical testing, as specified) to ensure that the import material will meet the chemical and physical specifications of its intended use.

### 4.6.2 Interim Lift Backfill and Final Backfill Verification

An initial backfill lift of 6 inches will be placed following acceptance of the required dredging within a CU and prior to moving the mobile turbidity curtain system to the adjacent CU. After all dredging and initial lift backfilling has been completed, final backfill will be placed to the required grade to approximate pre-dredge conditions over SMAs 1 through 3. The following QA/QC steps will be performed relative to backfilling:

- Verification of Import Material Quality: the chemical and physical characteristics of the materials to be used for backfilling will be verified for their intended use, in accordance with the Specifications.
- Verification of Required Grade: the satisfactory placement of backfill material over the required areas and to the required grade to match pre-dredge conditions will be verified, in accordance with the Specifications.

For post-dredge backfilling, achievement of the required grade will be demonstrated by verifying tolerances around pre-dredge grade are met for a specified CU for initial backfill layer placement and by SMA for final backfill placement. Placement of the 6-inch layer of initial backfill material will be verified by either manual survey methods, such as poling or leadline, or review of Remediation Contractor-provided theoretical quantities over the placement area (on a per-ton or per-cubic-yard basis). Placement of the minimum required grade of post-dredge backfill will be verified primarily by multi-beam bathymetric surveying. Maps will be developed following the placement of the backfill material comparing the final, placed surface to the pre-construction bathymetry. This information will be provided to the CQA Engineer as maps in hard copy and electronic formats.

Additional backfill material will be added if any area within an SMA does not meet the required target elevation within a tolerance of +/-3 inches. Special consideration will be made for areas at dredging side slope boundaries or in other areas of steep slopes.

### 4.6.3 Habitat Amended Backfill

In select areas, a layer of habitat amended backfill must be placed to support revegetation of impacted wetlands. In addition to the grain size testing, the Remediation Contractor shall also test the topsoil for organic content prior to placement, typically prior to shipment from the source, in accordance with the Specifications. Samples of the mixed material will be submitted to a qualified testing laboratory for analysis in accordance with applicable testing standards (i.e., ASTM D-422, ASTM D-4972, ASTM D-2974, and SW846 7471A). The sampling/testing frequency is included in the Contractor CQC Plan. The test results will be verified by the CQA Engineer.

### 4.6.4 Seeding and Planting

The CQA Engineer will monitor and document the application of seeding and planting including the following:

- Verifying that the proper type and proportions of plant material, seed mix, fertilizer, lime (if needed), and mulch are used by visually observing mixing/placement and randomly obtaining information printed on selected seed bags and fertilizer bags used in the mix
- Verifying that the soil surface to be planted and seeded is prepared in accordance with the Specifications
- Observing planting and seeding operations to verify complete coverage and timely application

As part of the CQC program, compliance with the Specifications will be verified by inspection of vendor certificates, inspection of data sheets, and/or visual inspection upon delivery. Installation of plants as per the design will be verified during oversight and routine on-site inspection. As part of the CQA program, periodic inspections of the plant delivery and installation will be performed to verify that the appropriate species have been placed within the correct location and properly installed.

## 4.7 Effluent Discharge Monitoring

Effluent from the post-dredge, sediment management, and dewatering facility will be directed to the on-site water treatment facility, which discharges to the Penobscot River under MEPDES Permit ME0000639. Monitoring of this discharge to the Penobscot River will be done as part of the facility's permit compliance program.

# Section 5. Deficiencies, Problems, and Repairs

If a deficiency or non-compliance is discovered, the CQA Engineer will promptly evaluate the extent and nature of the defect. The extent of the deficient area will be evaluated by additional tests and observations, a review of records, or other means deemed appropriate.

After defining the extent and nature of a defect, the CQA Engineer will notify the Remediation Project Manager and Remediation Contractor to discuss the situation with the Remediation Contractor and to schedule appropriate retests after the work deficiency is corrected.

The CQA Engineer will confirm that the Remediation Contractor corrects the deficiency to the satisfaction of the Remediation Project Manager and the CQA Engineer. If a project specification criterion cannot be met or unusual weather conditions hinder work, then the Remediation Project Manager and CQA Engineer will review/accept alternative solutions as proposed/presented by the Remediation Contractor. The CQA Engineer shall verify that the deficiency has been corrected by the Remediation Contractor before any additional work is performed by the Remediation Contractor in the area of the deficiency.

# Section 6. References

Anchor QEA, LLC, in preparation. Water Quality Monitoring Plan. Southern Cove, Orrington Remediation Site, Orrington, Maine. In preparation.

CDM (Camp Dresser & McKee Inc.), 1998. *Site Investigation Report Volume I*. HoltraChem Manufacturing Site, Orrington, Maine. December 22, 1998; Revised August 15, 2001.

CDM, 2003. *Corrective Measures Studies*. Mallinckrodt Inc., HoltraChem Manufacturing Site, Orrington, Maine. May 27, 2003; Revised September 19, 2003.

CDM Smith, Inc, 2014. Health and Safety Plan, Orrington Remediation Site, Orrington, Maine. October 9, 2014.

CDM Smith, Inc, 2015b. Perimeter Air Monitoring Plan (PAMP), Orrington Remediation Site, Orrington, Maine. June 25, 2015.

USACE (U.S. Army Corps of Engineers), 2013. Engineering and Design-Hydrographic Surveying. EM 1110-2-1003. November 2013.