NORMANDEAU ASSOCIATES
Environmental Consultants

Eversource Energy

Seacoast Reliability Project
Benthic Community Monitoring Plan

FINAL

Prepared For:
Eversource Energy
13 Legends Drive
Hooksett, NH 03106

Submitted On:
September 5, 2019

Prepared By:
Normandeau Associates, Inc.
25 Nashua Road
Bedford, NH 03110

www.normandeau.com

Table of Contents

Page

List of Figures

Page

List of Tables

Page

1.0 Introduction

Eversource's Seacoast Reliability Project (SRP) will include burying three cables in the sediments crossing Little Bay north of Adams Point within a corridor previously identified as "Cable Area" on navigation charts. The planned installation methods, primarily jet plow and hand burial, will release sediments into the water column creating a turbidity plume that will move with the tides and with the progress of installation along the route. The jet plow will create an ephemeral "trench" about a 0.3 meter wide for each cable that will be substantially backfilled as the installation progresses across the bay. Skids for the jet plow will depress the sediments to the sides of each cable. The majority of the sediments suspended into the water column will settle near each cable so that the total footprint for substrate affected by jet plowing will be about 6.3 acres. Cables will be installed in nearshore areas using diver assisted hand jets. In areas where burial depth cannot be achieved due to bedrock, concrete mattresses will be used to protect the cables. The concrete mattresses are considered permanent impacts, and are expected to affect no more than 0.2 acres.

As a result of the installation of these cables, there will be temporary changes to benthic habitat conditions and the benthic infaunal community.

NH DES's requirements related to benthic recovery monitoring are addressed in two conditions:

- Condition 42 – Benthic Habitat Monitoring
- Condition 43 – Benthic Infaunal Community Monitoring

This document addresses each of these conditions and specifies the monitoring and recovery evaluation protocols to be followed during the jet plow trial run, jet plow installation of cables, and hand jetting.

Condition 42, Benthic Habitat Monitoring, addresses monitoring the recovery of the substrate following cable installation by surveying topography and grain size distribution. This will be accomplished using a combination of multibeam sonar to measure bayfloor topography and near-surface sediment grain size collection. The purpose of Condition 43, Benthic Infaunal Community Plan, is to assess the impact of work associated with laying cable in Little Bay on the benthic infaunal community by sampling it before and after cable installation. Grain size samples collected in conjunction with infaunal samples will be used for habitat recovery evaluation.

2.0 Anticipated Effects to Benthos

Jet plowing will have two primary types of direct impacts on benthic resources: loss of sediment and infauna along the three cable routes and deposition of suspended sediments on adjacent substrate. As reported in the Revised Little Bay Impact Assessment (Normandeau 2017a) the total footprint of the plow along the three routes is approximately 6.3 acres. All of those impacts are temporary with the exception of approximately 0.2 acres, where the use of concrete mattresses may be required. Industry experience has found that most sediments fluidized by the jet plow remain in the narrow trench. Based on the grain size distribution observed along the project route, RPS (2016, 2017) predicted that sediments that are suspended and dispersed away from the jet plow will tend to redeposit close to the route. Sediment deposition greater than 1 mm was estimated to have the potential to

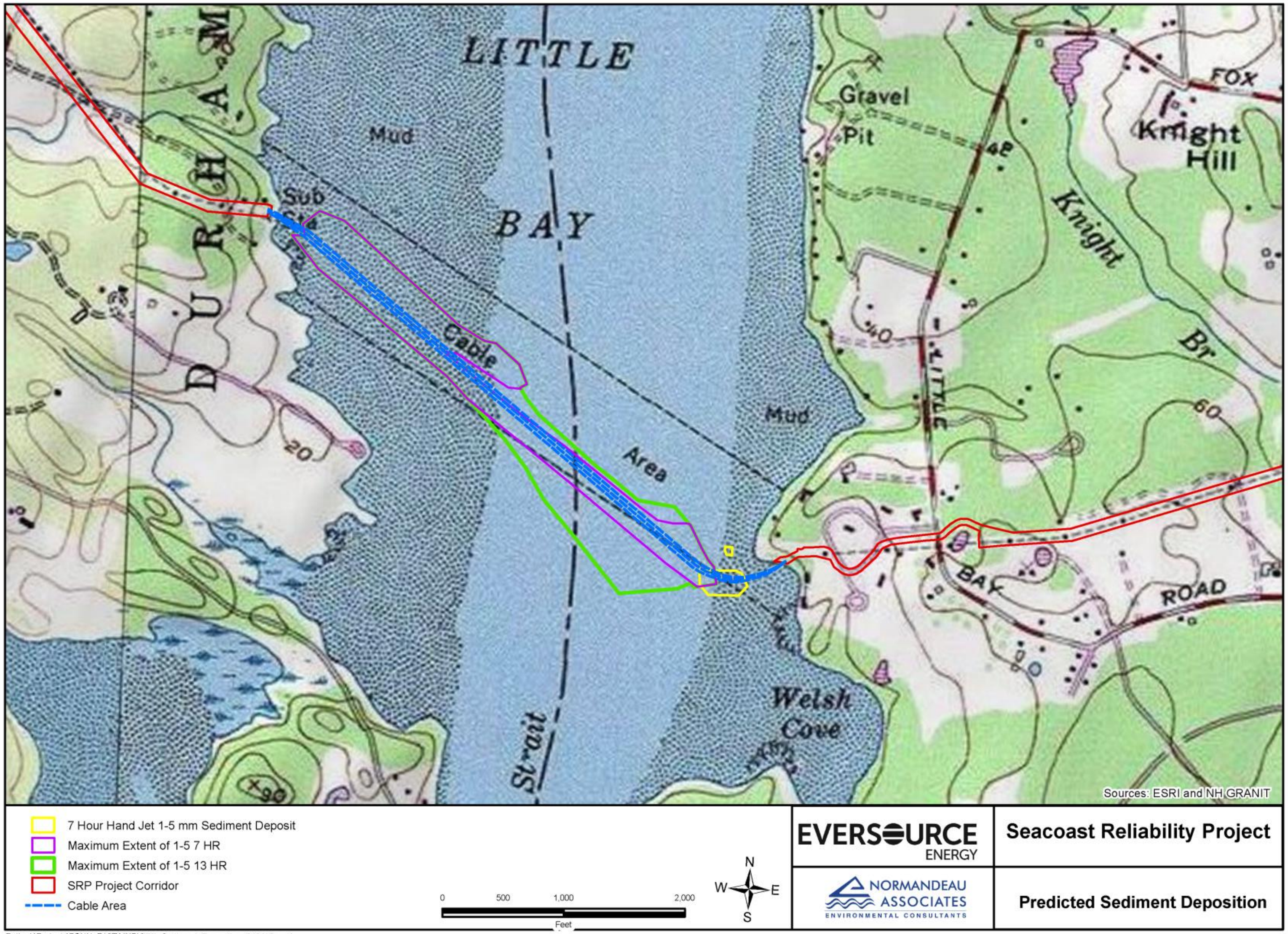

Figure 1. Area predicted to experience redeposition of sediments suspended during jet plowing or hand jetting.

adversely affect the benthic community. These predictions are shown in Figure 1, representing the slowest advance rate (100 m/hour or 13 hours to cross; RPS 2015) and the fastest advance rate (183 m/hour or 7 hours to cross; RPS 2017). The extent of deposition resulting from hand jetting where no turbidity barrier is feasible on the east side is also shown in Figure 1 (RPS 2017).

3.0 Benthic Habitat Monitoring (Condition 42)

NHDES Condition 42 states: *"At least sixty (60) days prior to the start of construction in Little Bay, the Applicant shall obtain NH DES and NHFGD approval of a Benthic Habitat Monitoring Plan {BHMP). The purpose of the plan is to determine if substrate conditions (topography and grain size distribution) in the Little Bay estuary in the vicinity of the proposed underground cables were significantly altered during construction. The plan shall include, but not be limited to, details regarding the method, accuracy and extent of the bathymetric survey, when the study will be conducted, the locations and methods for sampling and analyzing grain size distribution, how the data will be assessed, how data will be reported and provisions for inputting the data electronically into the NH DES Environmental Monitoring Database. The Applicant shall then implement the approved plan."*

Substrate condition, including microtopography and grain size distribution, are among the dominant factors defining benthic habitat. The installation of the three cables will temporarily affect bathymetry along an approximately 100-ft wide swath crossing Little Bay, potentially resulting in areas of excess deposition adjacent to the cables and areas of depression over the cables. The changes in microtopography could influence the composition and distribution of benthic infauna and the use of the substrate by epibenthic species (e.g., lobsters, crabs, and horseshoe crabs). Grain size distribution will be characterized during benthic infauna sampling (see Section 4.0).

Based on discussions with Eversource's marine contractor, Durocher Marine, it is not expected that there will be a substantial (i.e., more than a few inches) depression over each cable. Predictions for redeposition of sediments mobilized during cable installation indicated that the bulk of the sediments will settle back into the jet plow scar and with limited mounding of sediments adjacent to the cables. It is expected that normal currents and storm action will redistribute any displaced sediments resulting in natural restoration of bathymetry to the relatively smooth condition that existed prior to the cable installation.

Eversource proposes to conduct a series of high-resolution bathymetric surveys to characterize the effects of cable installation on microtopography.

3.1 Survey Area

The bathymetric survey will encompass an approximately 100 acre area around the cable route (Figure 2). The survey will be centered along the three cables and extend 100 m both north and south in order to place the conditions in the immediate vicinity of the new cables in context of abutting conditions. The total survey width will be approximately 230 m. The survey will cover the jet plow installation route and the area at the eastern end of the route where hand jetting cannot be confined within turbidity barriers. Shallow water depths along the western tidal flat will make surveying that area difficult and it will only be possible during a spring high tide.

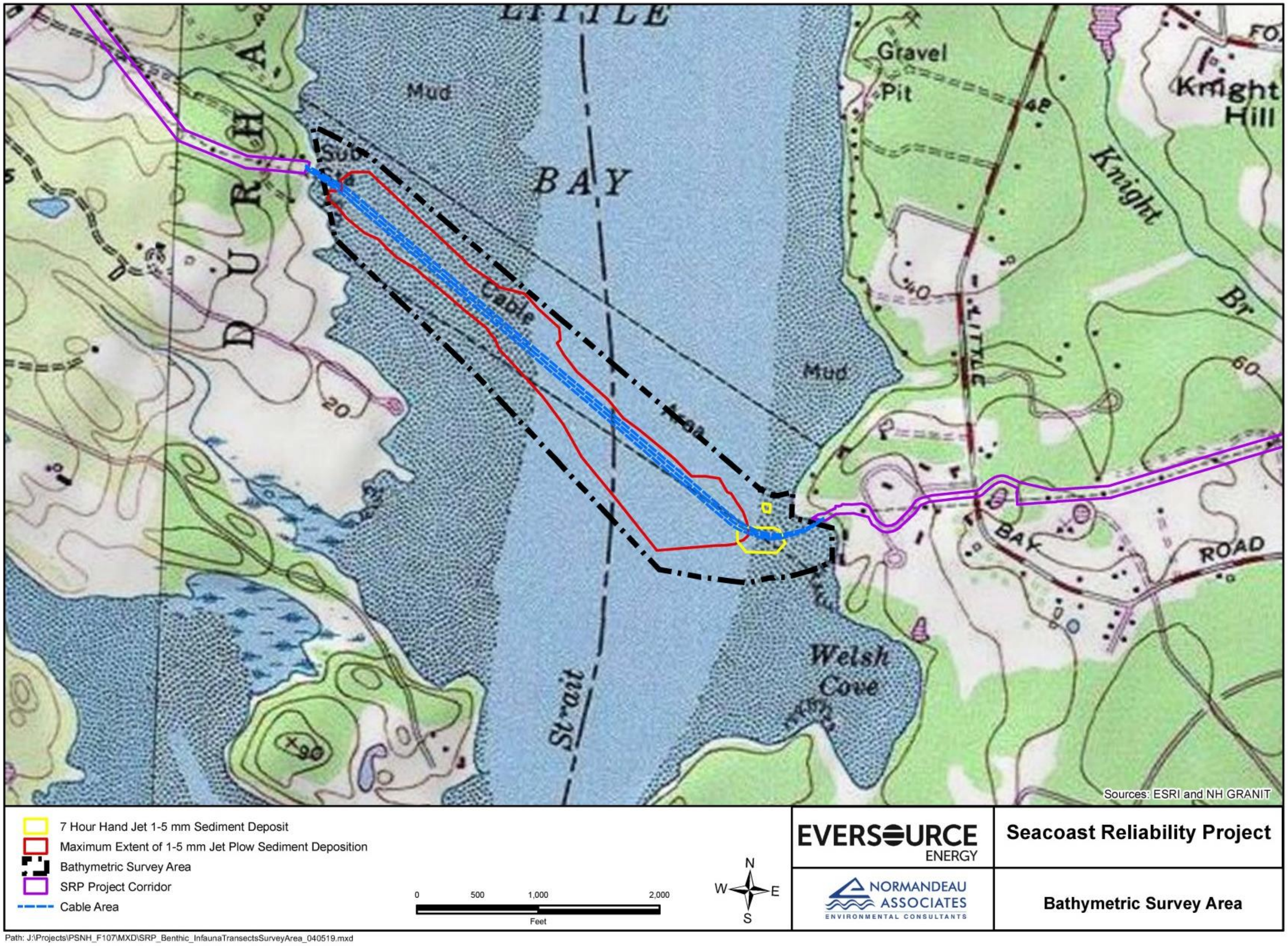

Figure 2. Bathymetric survey area.

3.2 Timing and Method

Eversource will conduct the detailed bathymetric survey before the jet plow trial run and within 2 weeks after jet plow cable installation is complete, weather and tides permitting, using a multibeam sonar system to map the sediment surface. An additional post-construction survey will be conducted during summer 2020 if the first post-construction survey indicates bathymetric changes attributable to the cable installation. The pre-installation survey will be used to characterize the naturally-occurring bathymetric conditions in the project area. The post-installation survey(s) will be used to characterize evidence of construction scars and recovery to natural conditions.

All surveys will be conducted using the same equipment, a multibeam echo sounder device capable of achieving the depth accuracy standard for repeatability recommended in the ACOE manual for hydrographic surveys (USACE 2013). The USACE standard for repeatability for sediment types and water depths expected in the SRP corridor is 0.3 ft (9.1 cm). Factors that can influence depth accuracy include water level measuring accuracy, water column sound speed compensation accuracy, motion/heading compensation accuracy, vessel offset measurement accuracy, and positioning accuracy. Eversource will require the contractor conducting this work to adhere to all relevant requirements and recommendations made in USACE (2013), including conducting a HYPACK-defined Quality Assurance “Performance Test” that will produce the site-specific accuracy. Data will have a horizontal resolution of about 1 ft (0.3 m), although this will vary by water depth. In deeper water resolution will be greater and in shallower water resolution will be lower.

The accuracy goal for this survey is appropriate from an ecological standpoint. Epibenthic fauna such as lobsters and horseshoe crabs that occur in Little Bay often create surface bowl-like depressions in muddy-clayey sediments that may be as deep as or even deeper than their bodies (about 7- 8 cm) (Cooper and Uzmann 1980; Lawton and Lavalli 1995; Jones 2000). These depressions are made for feeding or resting. A depression of 9 cm would not be particularly different than natural conditions (other than its elongated shape) and is not expected to create an impediment to recolonization or movement.

The surveys will provide 100% coverage of the area affected by the jet plow and hand jetting.

3.3 Data Analysis

Results will be presented as a shaded relief map and at a resolution that would enable a viewer of the datafile to discern horizontal dimensions of 1 ft. The map will be analyzed in order to describe the surface roughness of the substrate compared spatially within each survey. Representative cross-sections along the transects for the infaunal surveys (Section 4.0) will be presented. The amount of variation in bathymetry (e.g, evidence of biological activity such as surface depressions to the extent they are discernable as many are potentially smaller than 1 ft diameter; deviations from surrounding substrate) in the baseline survey will be described to form the basis for determining alterations from construction. Data from post-installation survey(s) will be overlaid on the baseline survey to document temporal changes in bathymetry.

Results of the baseline survey will be used to determine the extent of variations in bathymetry, particularly approximate depths and lateral dimensions of deviations from adjacent substrate (e.g., a roundish depression would be indicative of biological activity or possibly a small boat; an elongated depression in the baseline data could be indicative of other physical disturbance such as a grounded boat). The post-construction surveys will be overlaid on the baseline survey to produce difference maps.

The data will be examined for evidence of a depression directly over any of the cables or mounding adjacent to the cables that appears unrelated to any biological or meteorological processes. If the first post-construction survey results indicate bathymetric changes in excess of the natural variations observed in the baseline survey in absolute depth differences, shape, or area affected, a second post-construction survey will be conducted in the following summer to incorporate the effects of natural processes. This timing is reasonable because peak benthic infaunal recruitment will occur during the spring and summer months. If such changes are noted and the benthic infaunal survey to be conducted in the late June/early July (see Section 4.0) indicates that benthic infaunal community recovery has been limited based on the results of analyses described in Section 4.2.2, then a follow-up survey will be conducted a year later. If after two years, the data still show unacceptable changes in bathymetry (more than 10% of the benthic habitat showing scars above the cables), results of the benthic community surveys (see Section 4) will be assessed to determine whether mitigation is needed. While microtopography and grain size play a role in habitat suitability for benthic infauna, most of the species observed to date in Little Bay are not known to be highly selective for these characteristics. Thus, while substrate conditions are likely to change, at least temporarily, these changes may not be substantial enough to cause a change in the infaunal community or in the functional value of the community. If NHDES deems it is warranted, Eversource will consult with the agencies and potentially implement mitigation as discussed in Section 4.2.2. Mitigation could include options such as habitat restoration, habitat protection, or remediation funding, or other measures acceptable to NHDES. If NHDES determines that adequate infaunal community recovery has occurred in the first year (as indicated by the results of data analysis described in Section 4.2.2), no follow up bathymetric survey and no mitigation would be required.

Eversource will follow the protocols in NHDES' guide for uploading data to the Environmental Monitoring Database (EMD) (NHDES 2017). Sediment grain size will be the primary data submitted. Bathymetric data will be included if NHDES requests it and the EMD supports that type of information.

4.0 Benthic Infaunal Community Monitoring (Condition 43)

NHDES Condition 43 states: *"To assess the impact of work associated with laying cable in Little Bay on the benthic infaunal community, the Applicant shall conduct pre and post-construction monitoring of the benthic infaunal community in the Little Bay estuary. At least ninety (90) days prior to the scheduled date for conducting the pre-construction monitoring, the Applicant shall submit a plan to NH DES describing:*

- *how, when and where the monitoring will be conducted;*
- *how results will be assessed to determine impact on the benthic infaunal community;*
- *how and when results will be reported to NHDES;*
- *mitigation measures that will be implemented based on benthic infaunal community impacts and recovery; and*
- *when the data will be input electronically into the NHDES Environmental Monitoring Database.*

The Applicant shall then implement the approved plan. Results of the pre-construction monitoring shall be submitted to NH DES for approval no less than thirty (30) days prior to the scheduled cable installation date. A report comparing the pre to post- construction monitoring results shall be submitted to NH DES for approval no more than ninety (90) days after the post-construction monitoring is completed."

Installation of the three cables across Little Bay will unavoidably disturb the estuarine substrate in approximately 6.3 acres through a combination of displacement into the water column, compression by the jet plow skids, and redeposition of suspended sediments back on to the bay floor. As described in the SRP Natural Resource Impact Report (Normandeau 2016a), the benthic infaunal community in this footprint will be impacted. It is expected that the substrate will be restored to its approximate pre-construction condition, including grain size distribution and bathymetry, by natural processes within several months. Because the in-water cable installation is planned to take place during the fall, recruitment of infaunal organisms into the disturbed area is likely to be limited until the following spring through summer when benthic reproduction is typically at its peak. Eversource proposes to document the recovery of the infaunal community to demonstrate that there is no long term degradation of this resource in the project footprint and that the benthic community within the area of disturbance is functioning the same as that outside the disturbance.

Baseline sampling was conducted in early fall 2014 along three transects running perpendicular to the charted Cable Area in different depth strata with stations located evenly north and south of the originally proposed route as shown in the SRP Natural Resources Existing Conditions Report (Normandeau 2016b). This design was selected to enable a characterization of the benthic infaunal community in the project area. It also provides an indication of spatial variability, although a single year does not capture the full range of natural temporal variability that occurs in a system like Little Bay and does not account for events such as storms that affect large areas. In general, the baseline collections showed that within a depth stratum, the transects represented a single, fairly consistent community across the proposed construction zone indicating that a similar gradient-type design for post-installation monitoring should be effective in documenting recovery. For that reason, Eversource proposes a similar study design for the post-construction monitoring, locating stations along transects so that they fall both within and well outside the predicted area of disturbance. The transects will be aligned so that the mid-point stations are located at the centerline of the three cables (Figure 3).

4.1 Benthic Infaunal Community Monitoring Methods

Eversource demonstrated in their filings to the SEC that installation of cables in Little Bay substrate is unlikely to have an unreasonable long term adverse effect on the natural environment of the bay. Because installation will directly disturb the substrate and associated benthic infauna there will be unavoidable temporary changes in these resources. The purpose of the benthic infauna monitoring program is to demonstrate recovery of the benthic community to the same functional level as nearby areas in the bay. The primary value of the baseline survey is to demonstrate the similarity or dissimilarity of the infaunal community within each depth zone within the baseline timeframe. While it is informative to compare the community before and after cable installation, this temporal comparison is unable to clearly account for large scale events that could affect the project area. For example, winter storms or unusually large run-off events have the potential to affect large areas of the bay. Relying solely on a before-after comparison would limit the ability to separate this effect from the effects of installing the cables. Therefore, although before-after comparisons will be conducted and considered, we are primarily relying on comparison of non-impact with impact stations.

4.1.1 Sampling Locations and Timing

Benthic infauna samples will be collected from 5 locations from each of three transects crossing the cable route to assess recovery from jet plow installation of the cables as well as 5 locations on a transect east of the jet plowed section where currents are too fast to allow use of turbidity barriers around hand jetting (Figure 4). Each transect is oriented so that the central station is on the centerline of the cable route, two stations (one each north and south of the centerline) are located within areas where the sediment plume model predicted that suspended sediments will be redeposited, and two reference stations (one north and one south) where no sediment effects are expected (Figure 4). Transects are located in different depth regimes. This design will allow the evaluation of whether there is a gradient of community parameters with distance from the impact area. Note that originally the transects within each depth zone were expected to fall along relatively straight lines. During baseline sampling in July 2019, however, substrate at the original locations for channel stations B09 and B10 was gravelly or rocky such that suitable samples could not be collected and the habitat conditions were visually different than at Stations B06 through B08. Stations were relocated to be as close to the originally planned location as possible while remaining either in (B09) or outside (B10) the anticipated impact area. Collection of grain size and total organic carbon (TOC) data from the monitoring stations will be used to define habitat conditions at each station along a transect. Coordinates for each station are shown on Table 1.

Benthic surveys will be conducted during early to mid-summer (July-August) 2019 prior to any in-water work on the project to form a baseline dataset. EPA's National Coastal Condition Assessment (NCCA) program (USEPA 2014a) targets June through September for benthic sampling. Post-installation collections will be made during the same time frame in 2020. Scheduling the sampling for July-August will capture overwintering populations and spring-early summer recruitment. While it would be useful to sample during September following the majority of the annual reproduction making the data more comparable to the project sampling from 2014, in-water work for cable installation is scheduled to start in September making baseline collections more difficult. As long as baseline and post-installation sampling is done in the same season, results will be comparable.

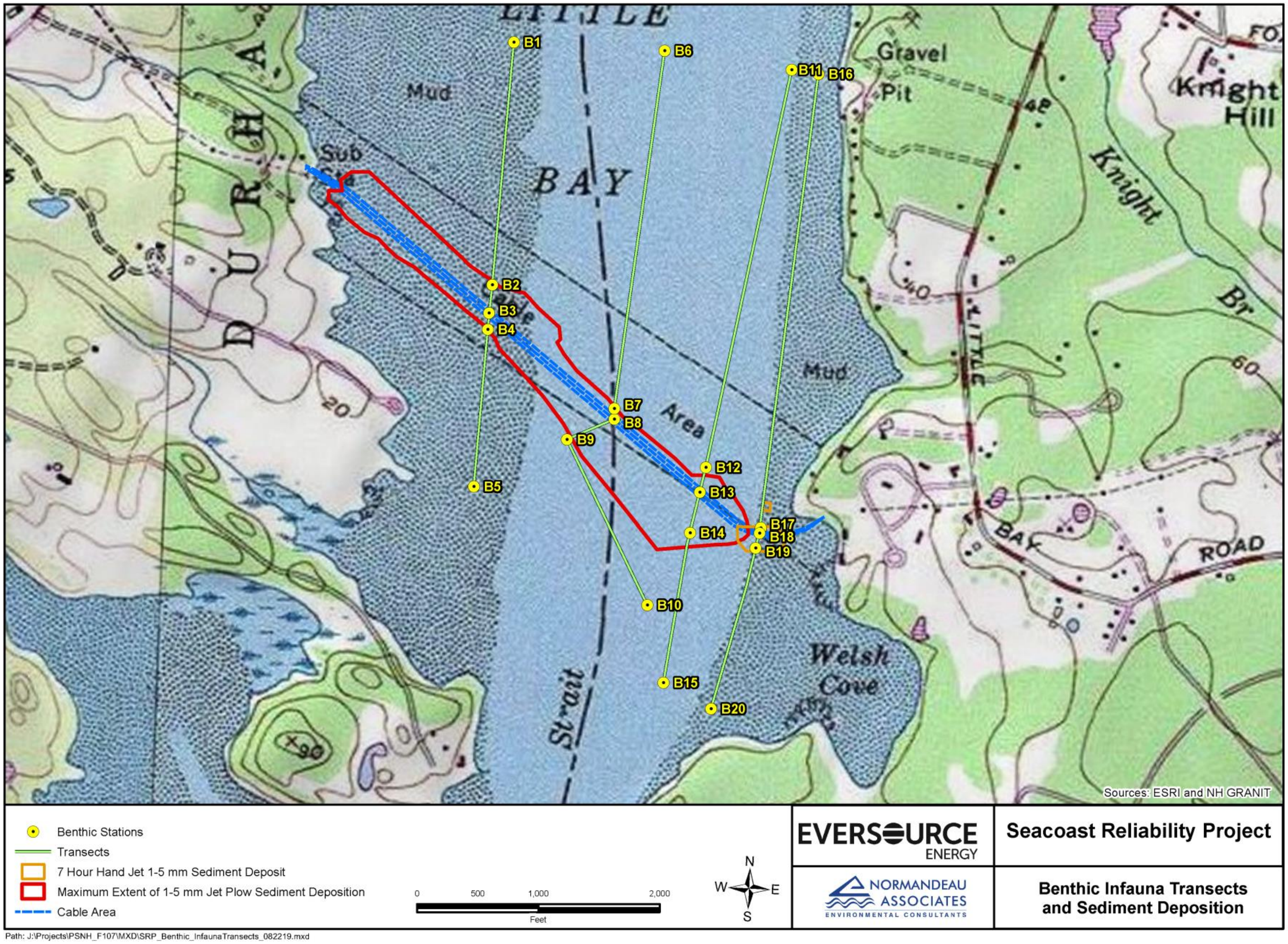

Figure 3. Location of benthic infauna monitoring stations relative to predicted deposition

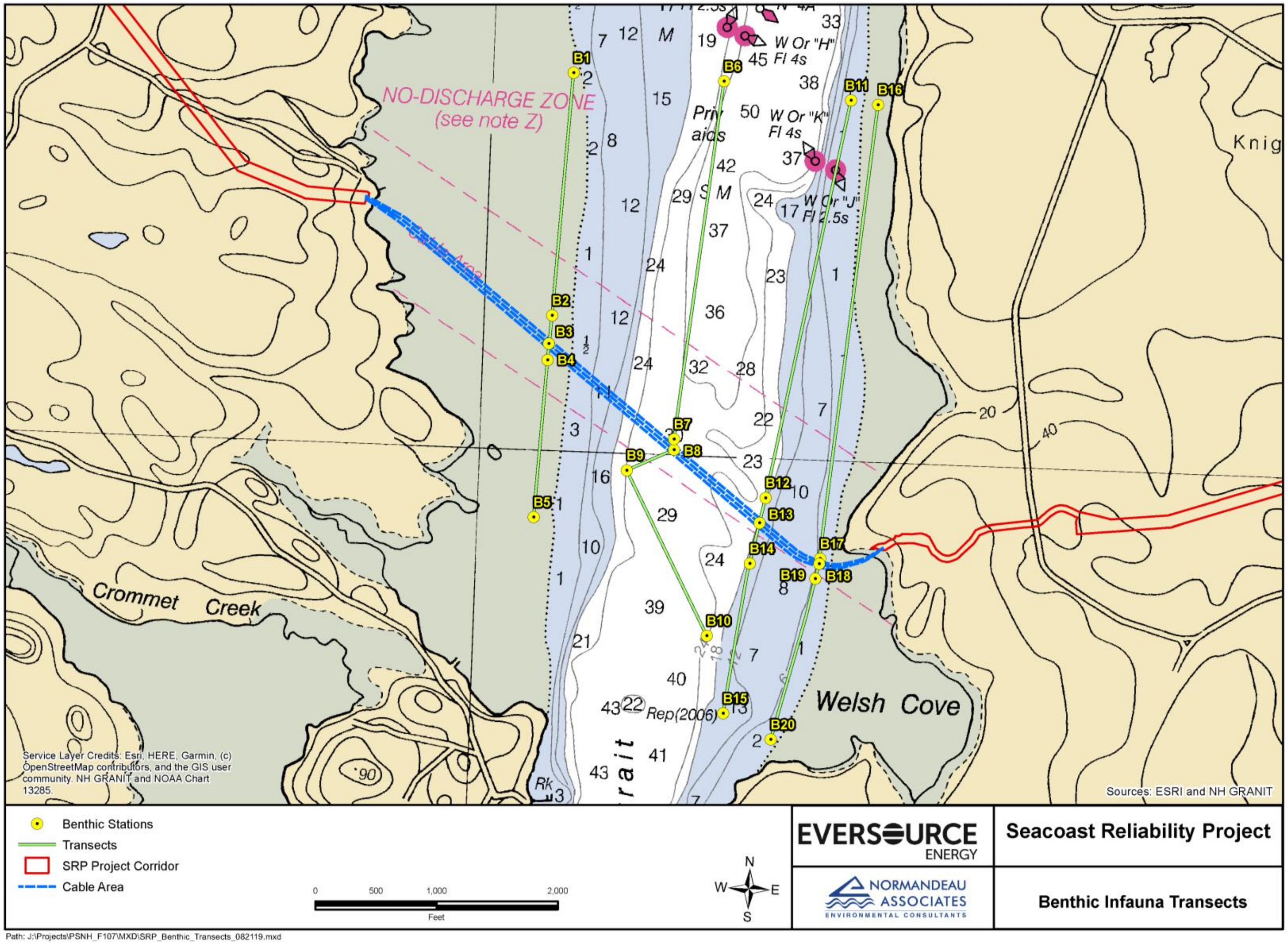

Figure 4. Location of benthic infauna monitoring stations relative to existing bathymetry

Table 1. Coordinates of Benthic Infauna Monitoring Stations

Transect	Purpose	Station	Latitude	Longitude	Transect	Purpose	Station	Latitude	Longitude
Intertidal (West)	Reference	B1	43.10856	-70.8642	Slope	Reference	B11	43.10817	-70.85577
	Impact	B2	43.10305	-70.8646		Impact	B12	43.09911	-70.8578
		B3	43.10241	-70.8646			B13	43.09854	-70.8579
		B4	43.10204	-70.8647			B14	43.09762	-70.8582
	Reference	B5	43.09848	-70.8649		Reference	B15	43.09421	-70.8588
Channel	Reference	B6	43.10850	-70.8595	Shallow Subtidal	Reference	B16	43.10817	-70.8553
	Impact	B7	43.10036	-70.8607		Impact	B17	43.09779	-70.856
		B8	43.10012	-70.8606			B18	43.09767	-70.856
		B9	43.0986	-70.8623			B19	43.09733	-70.8561
	Reference	B10	43.09563	-70.85902		Reference	B20	43.09366	-70.8573

4.1.2 Sampling Methods

Field methods will adhere to the protocols established by EPA's NCCA program (USEPA 2014a). By following these established methods, data from this monitoring plan will be directly comparable to the samples collected in the Project Area during permitting (Normandeau 2016a) and the samples collected in the Great Bay system during multiple years under the NCCA program.

Normandeau's survey vessel will navigate to each station using dGPS that has sub-meter accuracy and either anchored or held in position with the engine. The vessel will be oriented so that the davit supporting the grab sampler is located on the station's GPS coordinates. Triplicate benthic infauna samples will be collected using a 0.04 m^2 Young-modified van Veen grab. This grab typically obtains a sample of the upper 7 cm of the substrate where macroinvertebrates are concentrated. Care will be taken to move the sampler between grabs to ensure that undisturbed sediments are collected each time following the initial deployment. A fourth grab will be collected at each station to be analyzed for sediment grain size and total organic carbon (TOC), both measures of habitat conditions. This grab will be subsampled using small cores to collect sufficient material for laboratory analysis.

Once retrieved the top of the grab will be opened to confirm that the grab is acceptable as defined in Figure 5 (source: USEPA 2014a). If acceptable, the material from the grab will be washed through a 0.5 mm-mesh sieve to prepare the benthic infauna sample. Sieved material will be placed in a jar with buffered formaldehyde to preserve the organisms. Material from the fourth grab for sediment analysis will not be sieved.

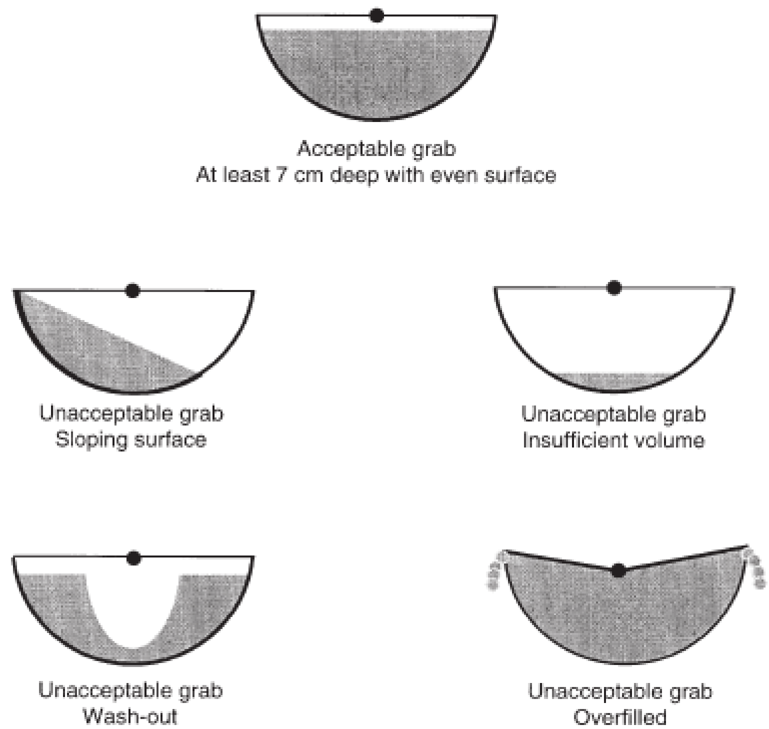

Figure 5. Illustration of acceptable & unacceptable grabs for benthic community analysis. An acceptable grab is at least 7 cm in depth (using a 0.04m^2 Van Veen sampler), but not oozing out of the top of the grab, and has a relatively level surface. (Source: USEPA 2014a).

Samples to be collected are summarized in Table 2.

Table 2. Summary of Benthic Grab Collections

Station	Purpose	Baseline		Post-Construction	
		No. of Infauna Samples	No. of Sediment Samples[a]	No. of Infauna Samples	No. of Sediment Samples[a]
B1	Tidal flat reference	3	1	3	1
B2	Tidal flat deposition	3	1	3	1
B3	Tidal flat jet plow	3	1	3	1
B4	Tidal flat deposition	3	1	3	1
B5	Tidal flat reference	3	1	3	1
B6	Channel reference	3	1	3	1
B7	Channel deposition	3	1	3	1

(continued)

Table 2. (Continued)

Station	Purpose	Baseline		Post-Construction	
		No. of Infauna Samples	No. of Sediment Samples[a]	No. of Infauna Samples	No. of Sediment Samples[a]
B8	Channel jet plow	3	1	3	1
B9	Channel deposition	3	1	3	1
B10	Channel reference	3	1	3	1
B11	Slope reference	3	1	3	1
B12	Slope deposition	3	1	3	1
B13	Slope jet plow	3	1	3	1
B14	Slope deposition	3	1	3	1
B15	Slope reference	3	1	3	1
B16	Hand jet reference	3	1	3	1
B17	Hand jet deposition	3	1	3	1
B18	Hand jet centerline	3	1	3	1
B19	Hand jet deposition	3	1	3	1
B20	Hand jet reference	3	1	3	1
Total		**60**	**20**	**60**	**20**

[a] grain size and TOC analysis

4.1.3 Laboratory Analysis

Benthic infauna samples will be analyzed in Normandeau's Bedford NH taxonomy laboratory following NCCA protocols in terms of sample handling and taxonomy (USEPA 2015) and Quality Assurance (USEPA 2014b).

Sediment grain size and TOC will be analyzed following NCCA protocols (USEPA 2015).

4.2 Data Analysis

Evaluation of recovery of benthic infaunal resources will focus primarily on comparison of a series of parameters and measures across the stations within a depth zone. Primary parameters include sediment grain size (percent silt-clay), TOC, total infaunal abundance, taxa richness, and community structure (Table 3); most were included in development of a benthic index for the nearshore Gulf of Maine using data from NCCA (Hale and Heltshe 2008). Statistical analyses for the primary parameters will provide a clear answer to the questions if benthic conditions within the footprint disturbed by installation of the cables are similar to those in the reference area and/or to pre-construction conditions. Those analyses are described below.

Additional secondary biological parameters (Table 4) will also be examined because they are useful in describing the marine benthic community. Although they will not be used to answer the question of whether the benthos has recovered from the physical disturbances of cable installation directly, they will help provide insight into what these changes are should they occur. These secondary parameters include derived measures (Shannon Weiner Diversity H' and Pielou's Evenness J') as well as groupings of organisms (opportunistic taxa; dominant taxa; and feeding guilds).

4.2.1 Physicochemical Factors

Sediment grain size is one of the primary factors affecting infaunal community structure. Some benthic species are highly associated with certain grain size categories, particularly in sandy substrates, although this relationship is not absolute and occurs over a gradient. A change in grain size (e.g, from predominantly silty such as occurs on the western tidal flat) to predominantly sandy (such as occurs in the channel), or vice versa, or a change within a major class (silt/clay or sand)) could potentially result in an altered community and should be considered as an indication that the installation of the cable had sorted and redistributed sediments more than was predicted by the model. A comparison of grain size data collected from the same locations in Little Bay months apart (September 2016 versus May 2017) showed that there is temporal variability in this characteristic (Normandeau 2017b) in terms of relative proportions of fines (silt + clay) and sands but those stations that were predominantly sandy in 2016 were still predominantly sandy in 2017 and the same held true for silty stations. Because of this temporal variability, it is likely that only a large change in grain size would affect the benthic infauna, therefore the criterion for detecting a difference potentially related to the project assesses changes in silt/clay and sand textures Table 3). Combined with grain size distribution, TOC reflects organic enrichment of the sediments (Pelletier et al. 2010) and provides an indicator of the feeding structure of the benthic infaunal community (e.g., deposit feeders versus filter feeders). However, physicochemical factors should not stand alone as an indication of project-related change in the benthos. If the criteria based directly on infauna parameters show no or limited differences between the impact station and non-impact stations, then the change in sediment grain size distribution or TOC would be considered to be inconsequential.

4.2.2 Biological Factors

Most of the factors to be considered for evaluating recovery of the disturbed habitats relate to biological attributes. The primary factors guiding assessment of infaunal recovery are all direct measures of community structure (species richness, abundance, and taxonomic composition). These three factors are commonly used to describe marine and estuarine benthic communities and were used for the NCCA program. These factors will be evaluated across stations within each transect and between the pre-construction and post-construction events using statistical tools for conducting a both a Control-Impact and a BACI (Before-After-Control-Impact) comparison (Table 4). Use of statistics provides a bias-free method of determining change. Analysis of variance and numerical classification have been widely accepted for impact analysis having been used for numerous other monitoring programs in New England, including the long-running Seabrook Station monitoring program.

Statistics don't necessarily provide insight into biological function however. Therefore Eversource proposes to include a number of secondary factors qualitatively to help interpret differences that are observed via statistics. These secondary factors include relative abundance of opportunistic species, comparison of numerical dominants, and feeding guild structure as well as derived statistics (Shannon Weiner diversity, Pielou's evenness) that reflect how robust the community is. Several opportunistic species (*Polydora cornuta*, *Streblospio benedicti* and *Capitella capitata*) were found in benthic samples collected in the project area in 2014 (Normandeau 2016b). These pioneering species have high fecundity rates, multiple reproductive periods per year and short life spans. While they contribute to the forage base for some benthic consumers, their presence tends to be ephemeral so they are not necessarily a good indicator of the full function and stability of the infaunal community. Assessment of the populations of opportunists can provide insight into differences in total abundance.

Similarly, benthic collections from the project area in 2014 showed that there were several species that were numerical dominants regardless of station within each depth zone (Normandeau 2016b). This survey also described the predominant feeding patterns of the benthic infauna, finding that stations within depth zones supported similar feeding types. Such patterns point to similarity in habitat conditions. Marked changes in either of these factors restricted only to either impact stations or reference stations could indicate changes in the substrate related to cable installation.

Both diversity indices proposed for inclusion in this assessment (Shannon Weiner diversity and Pielou's evenness) are suitable for comparisons within a particular dataset. Shannon Weiner diversity takes into account both numbers of species and their abundances while Pielou's evenness evaluates whether some species are more abundant than others. Combined they can provide an indication of resilience of the community to perturbations based on the premise that the more species in the community the greater likelihood that at least some of them are more tolerant of impacts than others. In general, higher evenness and diversity values are considered to be positive community attributes but there are no well-defined thresholds for these measures. Thus, comparisons will only be made within the project-specific dataset.

Should NHDES determine that the results of the survey conducted in the year following installation indicate that any of the impact stations has not recovered biologically, then the survey will be repeated a second year for the affected transect(s). Lack of recovery after two years would suggest a more long-term change in infaunal community structure and the need for mitigation, to be discussed with NHDES. Following this consultation, Eversource will submit a mitigation plan to NHDES for approval within 60 days of notification from NHDES for the need. Should Eversource fail to submit an acceptable mitigation plan within 60 days, NHDES will develop a plan, and Eversource will implement the approved plan. Potential mitigation could include options such as habitat restoration, habitat protection, or remediation funding. If NHDES determines that adequate infaunal recruitment has occurred in the first year, no follow up bathymetric survey and no mitigation would be required.

All data obtained during the benthic infaunal community monitoring program will be uploaded to NHDES' EMD upon completion of analysis.

Table 3. Primary Parameters for Measuring Successful Restoration of Benthic Habitat and Community

Parameter	Rationale for Including	Criterion for Acceptance (Comparison of BACI and Impact to Non-impact Stations within same depth zone)[a]
Physicochemical Factors		
Grain size distribution	Important factor influencing benthic infaunal community composition, particularly for species associated with sand (Sanders 1958; Snelgrove and Butman 1994); the phi scale is an expression of the grain size distribution reflecting all size components.	Comparison of the median phi value for pre- and post-construction at each station shows no change of median phi size from sand (phi between -1.0 and 4.0) to silt (phi between 4.0 and 8.0) or vice versa unless also observed in one or more reference stations along a specific transect, then it will be concluded that changes in grain size are not significant
TOC	Indicator of eutrophication level and factor influencing infaunal community structure; was generally low in NCCA Little Bay data and site specific samples. Sediment testing along the cable route in 2016 showed TOC levels below 2%. Examining benthic communities throughout the world, Hyland et al. (2005) found changes in benthic infaunal communities occurred at TOC >3%.	Post-construction TOC not to exceed 3% unless also observed in one or more reference stations along same transect
Biological Factors		
Total Infauna Abundance	Abundance of benthic infauna is an indicator of food resources for secondary consumers such as demersal fishes. However, taken alone absolute abundance can be deceptive because it does not reflect the "quality" of this forage base since numerous small infauna do not provide the same food value as fewer more robust organisms.	Normality of the data will be determined using SAS univariate procedures; based on this data transformation may be required before running a one-way ANOVA comparing stations within a transect and sampling periods.Significance will be based on $p \leq 0.1$. If data cannot be normalized, comparisons will be made using a nonparametric equivalent to ANOVA
Taxa Richness	Taxa richness is an indication of the diversity of the infaunal community and provides an indication of the resilience of the benthos to environmental perturbations.	Normality of the data will be determined using SAS univariate procedures; based on this data transformation may be required before running a one-way ANOVA comparing stationswithin a transect and sampling periods.Significance will be based on $p \leq 0.10$. If data cannot be normalized, comparisons will be made using a nonparametric equivalent to ANOVA

Species Diversity (Shannon Weiner H')	Diversity provides a measure of the resilience of a community. A community with a wide variety of species is better able to withstand ecological perturbations than a community based on few species. Higher diversity is considered a positive community attribute; no upper limit.	Means and standard deviations within each station along a transect will be presented graphically for baseline and post-construction results. If the means of the impact area stations fall within the range of the standard deviations of the reference stations, results will be considered similar. If there are differences among stations along a transect in baseline collections, but the post-construction results exhibit the same pattern as the baseline, it will be concluded that there are no substantial differences over time.
Evenness (Pielou's J')	Evenness indicates whether the community is dominated by a few species or if the abundance is more equally distributed across the majority of species. Evenness values can range from 0 to 1 with higher values considered to be a positive community attribute.	Means and standard deviations within each station along a transect will be presented graphically for baseline and post-construction results. If the means of the impact area stations fall within the range of the standard deviations of the reference stations, results will be considered similar. If there are differences among stations along a transect in baseline collections, but the post-construction results exhibit the same pattern as the baseline, it will be concluded that there are no substantial differences over time.
Similarity of Community Structure	Numerical classification measures the similarity of species composition and abundances among groups of samples. For marine benthos, a similarity of 60% is typically considered to indicate comparable communities (Boesch 1977). This is a powerful tool for handling complex datasets with numerous species.	Because project specific data reported in Normandeau (2016b) indicated community structure varied between the depth-oriented transects, this analysis will be conducted on a transect-by-transect basis, using both pre-construction and post-construction data. Based on Bray-Curtis similarity, impact station clusters must show a similarity value of 60% or higher to at least one non-impact station within a given transect

[a]By a date acceptable to NHDES, Eversource will provide NHDES with an example demonstrating the "Compliance Criteria for Acceptance" and, if requested by NHDES will revise the compliance criteria accordingly. In addition to the statistics noted in this table, Eversource will also provide NHDES with descriptive statistics for each parameter (including box and whisker plots) showing the differences between stations.

Table 4. Secondary, Descriptive Parameters for Interpreting Temporal or Spatial Differences in Benthic Community

Parameter	**Rationale for Including**[a]
Abundance of Opportunistic Species (e.g., *Polydora cornuta*, *Streblospio benedicti* and *Capitella capitata*)	Opportunistic species are small bodied species with high reproductive rates that are able to rapidly populate disturbed sediments. They are typically surface deposit feeders and represent early stages of community development but are often present in a community of a mixed successional stage. They can reflect a habitat that undergoes frequent low level disturbances. The species included in this factor were all observed in the 2014 collections in the project area. Because these species can be quite ephemeral, it is often valuable to exclude them from statistical analyses to examine the key attributes of the rest of the community members of which reflect the more stable component of the community (Nestler, et al. 2013).
Similarity of Dominant Species	Benthic infaunal in estuaries frequently exhibit a relatively high degree of small scale variability among the less abundant species. Dominant species generally occur over wider area and, therefore, may be more readily available for recruitment to disturbed substrates. Thus if dominant taxa differ between impacted and non-impacted stations or their relative abundances vary substantially this could be an indication that recovery has not occurred completely.
Feeding Guilds	Feeding guilds provide an indication of the successional stage of the benthic community. Surface deposit feeders are early settlers (potentially within days to weeks of disturbance because of their ability to reproduce frequently) whereas subsurface deposit feeders typically take longer to populate a disturbed area and have longer reproductive cycles (Wilber and Clarke 2007).

[a]Descriptive statistics (including box and whisker plots) showing the differences between the secondary parameters will be provided to NHDES

4.3 Reporting

Eversource will provide NHDES with analytical reports following both the pre-construction and the post-construction monitoring events. Condition 43 stipulates that the results of the pre-construction monitoring shall be submitted to NHDES no less than 30 days prior to the scheduled cable installation. Given the planned schedule for collecting pre-construction benthic community samples (July 2019), the planned date for the first cable installation (early October 2019), and the large number of samples required, Eversource cannot commit to producing a full analytical report on this schedule. A site-specific benthic survey conducted in 2014 found that the infaunal community was similar to historical records for Little Bay. Neither NH Natural Heritage Bureau nor National Oceanographic and Atmospheric Administration lists any benthic invertebrates occurring in New England as endangered, threatened or of special concern and none were found during the baseline collection therefore there is no concern that protected species could be present in the project footprint and harmed as a result of construction activities.

Eversource will submit a preliminary pre-construction benthic report that includes a description of the sampling effort, listing of the grain size and TOC data, and observations on the benthic grab samples prior to the installation of the first cable. This report will be supplemented with a full characterization of the infauna results no later than December 2019.

Post-construction monitoring results will be provided to NHDES within 90 days after the benthic infauna samples have been analyzed in 2020. The post-construction report will include the full statistical analyses described in Section 4.2 through which the pre-construction and post-construction results will be compared.

All benthic infauna, grain size, and TOC data will be provided to the Environmental Monitoring Database after the post-construction monitoring report has been approved by NHDES.

5.0 Literature Cited

Boesch DF. 1977. Application of numerical classification in ecological investigations of water pollution. US Environmental Protection Agency, Ecological Research Report Agency, Ecological Research Report. 114 p.

Cooper, RA and JR Uzmann. 1980. Ecology of Juvenile and Adult *Homarus*. Chapter 3 in Cobb JS and BF Phillips (eds.) *The Biology and Management of Lobsters, Vol. II Ecology and Management.* Academic Press, NY. pp. 97-142.

Hale SS and JF Heltshe. 2008. Signals from the benthos: Development and evaluation of a benthic index for the nearshore Gulf of Maine. Ecological Indicators 8: 338-350.

Hyland, J, L Balthis, I Karakassis, P Magni, A Petrov, J Shine,O Vestergaard, and R Warwick. 2005. Organic carbon content of sediments as an indicator of stress in the marine benthos. Mar Ecol Prog Ser 295: 91-103.Jones, SH. 2000. A Technical Characterization of Estuarine and Coastal New Hampshire. New Hampshire Estuaries Project publication. 279 p.

Lawton P. and KL Lavalli. 1995. Postlarval, Juvenile, Adolescent, and Adult Ecology. Chapter 4 in JR Factor (ed.) *Biology of the Lobster Homarus americanus.* Academic Press San Diego CA. pp. 47-88.

Nestler EC, Diaz RJ, Pembroke, AE. 2013. Outfall Benthic Monitoring Report: 2012 Results. Boston: Massachusetts Water Resources Authority. Report 2013-12. 36 pp. plus Appendices.

NHDES. 2017. One Step Data Providers: a "lite" guide for uploading monitoring data to the Environmental Monitoring Database (EMD). https://www.des.nh.gov/organization/divisions/water/wmb/emd/documents/one-stop-data-providers-lite.pdf

Normandeau. 2016a. Natural Resource Impact Assessment. Appendix 34 in Application of Public Service Company of New Hampshire d/b/a Eversource Energy for Certificate of Site and Facility for the Construction of a New 115 kV Electrical Transmission Line from Madbury Substation to Portsmouth Substation. Application to the New Hampshire Site Evaluation Committee, SEC Docket No.2015-04. April 12, 2016.

Normandeau. 2016b. Natural Resource Existing Conditions Report. Appendix 7 in Application of Public Service Company of New Hampshire d/b/a Eversource Energy for Certificate of Site and Facility for the Construction of a New 115 kV Electrical Transmission Line from Madbury Substation to Portsmouth Substation. Application to the New Hampshire Site Evaluation Committee, SEC Docket No.2015-04. April 12, 2016.

Normandeau. 2017a. Revised Little Bay Impact Assessment Report. Document 5 in Supplement 2 in Application of Public Service Company of New Hampshire d/b/a Eversource Energy for Certificate of Site and Facility for the Construction of a New 115 kV Electrical Transmission Line from Madbury Substation to Portsmouth Substation. Application to the New Hampshire Site Evaluation Committee, SEC Docket No.2015-04. September 15, 2017.

Normandeau. 2017b. Public Service of New Hampshire Seacoast Reliability Project. Supplement to Characterization of Sediment Quality Along Little Bay Crossing Durham to Newington, NH

Pelletier MC, DE Campbell, KT Ho, RM Burgess, CT Audette, and NE Detenbeck. 2010. Can Sediment Total Organic Carbon and Grain Size be Used to Diagnose Organic Enrichment in Estuaries? Environmental Toxicology and Chemistry, Vol. 30, No. 3, pp. 538–547

RPS. 2016. Modeling Sediment Dispersion from Cable Burial for Seacoast Reliability Project, Little Bay, New Hampshire. Appendix 35 in Application of Public Service Company of New Hampshire d/b/a Eversource Energy for Certificate of Site and Facility for the Construction of a New 115 kV Electrical Transmission Line from Madbury Substation to Portsmouth Substation. .Application to the New Hampshire Site Evaluation Committee, SEC Docket No.2015-04. April 12, 2016.

RPS. 2017. Revised Modeling Sediment Dispersion from Cable Burial for Seacoast Reliability Project, Upper Little Bay, New Hampshire. Document 1 in Supplemental Information, Application to the New Hampshire Site Evaluation Committee, SEC Docket No.2015-04. June 30, 2017.

Sanders, HL. 1958. Benthic studies in Buzzards Bay. I. Animal-sediment relationships. Limnology and Oceanography 3: 245-258.

Snelgrove, PVR and CA Butman. 1994. Animal-sediment relationships revisited: cause versus effect. Oceanography and Marine Biology: an Annual Review 32: 111-177.

US Army Corps of Engineers (USACE). 2013. Engineering and Design – Hydrographic Surveying. CECW-CE/CECW-OD. Manual 1110-2-1003.

USEPA. 2014a. National Coastal Condition Assessment: Field Operations Manual. EPA-841- R-14-007. U.S. Environmental Protection Agency, Washington, DC.

U.S. EPA. 2014b. National Coastal Condition Assessment Quality Assurance Project Plan. United States Environmental Protection Agency, Office of Water, Office of Wetlands, Oceans and Watersheds. Washington, D.C. EPA 841-R-14-005.

USEPA. National Coastal Condition Assessment 2015: Laboratory Operations Manual. EPA841-R-14-008. U.S. Environmental Protection Agency, Office of Water, Washington, DC. 2016.

Wilber DH and DG Clarke. 2007. Defining and assessing benthic recovery following dredging and dredged material disposal. Western Dredging Association. Proceedings of the 2007 Dredging Summit and Expo. Pp. 603-618.