NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS

Eversource Energy

Seacoast Reliability Project Bathymetry and Benthic Community Post-Construction Monitoring Report

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

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

www.normandeau.com

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1.0 Introduction

Eversource Energy (Eversource) constructed a 12.9-mile, 115 kV transmission project to improve the electrical reliability in the Seacoast region of New Hampshire. The Seacoast Reliability Project (SRP) included burying three cables approximately 1 mile across Little Bay north of Adams Point within a corridor previously identified as a “Cable Area” on navigation charts. The cables were installed using a jet plow along most of the route across Little Bay. Hand jetting was used to install cables close to shore where water depths were too shallow for use of the jet plow. The project was approved by the NH Site Evaluation Committee on January 29, 2019, and by the US Army Corps of Engineers on July 3, 2019.

Impacts anticipated for the jet plow installation were described in several project documents associated with Eversource’s permit application review with the SEC (Normandeau 2016a, 2016b, and 2017a; RPS 2016, 2017). The jet plow created an ephemeral “trench” about 0.3 meters wide for each cable that was expected to be substantially backfilled as the installation progressed across the bay. The footprint of the jet plow and its skids spanned 15 ft. While the areas between the skids and the jet plow were not likely to have been directly affected by the advancement of the plow, we assumed disturbed sediments were deposited in this area. Therefore we considered the entire 15-foot wide corridor to have been disturbed by cable installation. During jet plowing, sediments were released into the water column creating a turbidity plume that moved with the tides and with the progress of installation along the route. A detailed water quality monitoring plan (Normandeau 2019a) was implemented to document the spatial extent and quality of the suspended sediments during installation, as they varied with tidal stage and with the progress of installation along the route. The model also predicted that the majority of the sediments suspended into the water column would settle near each cable so that the total footprint for substrate affected by jet plowing was expected to be about 6.3 acres. Results indicated that the plume generally behaved as predicted in that it was very localized and ephemeral; however, concentrations of suspended sediments were typically well below predicted levels (Normandeau 2020a).

As a result of the installation of these cables, Eversource expected temporary changes to benthic habitat conditions (localized changes in bathymetry) and the benthic infaunal community (direct losses from disturbance). These temporary changes were predicted to recover, at least partially, within a year of the installation.

NHDES issued its final recommendations for approval on October 29, 2018, in which requirements related to benthic habitat monitoring are addressed in DES Conditions 42 and 43:

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

The Benthic Community Monitoring Plan (Normandeau 2019b) addressed each of these conditions and specified 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, addressed monitoring the recovery of the substrate following cable installation by surveying topography and grain size distribution. This was accomplished using a combination of multibeam sonar and LiDAR to measure bay floor topography and near-surface sediment grain size collection in the benthic infauna stations. The purpose of Condition 43, Benthic Infaunal Community Monitoring, was to assess the impact of the project on the benthic infaunal community by sampling it before and after cable installation.

A jet plow trial was conducted on September 9, 2019. The three submarine cables were installed via jet plow between October 15 and November 7, 2019 (Figure 1). The northernmost cable was installed first, over a period of 4 days, October 15–18, 2019. The installation of the middle cable began 9 days later on October 25 and occurred over a period of 2 days. The installation of the southernmost cable began 8 days later on November 6 and occurred over a period of 2 days. For the cable sections either too close to shore or with ledge too shallow to achieve the prescribed 3.5-ft burial depth, the cables were buried by divers operating water-propelled hand jets. This work was conducted periodically over 28 days between November 11 and December 18, 2020. In areas where burial depth could not be achieved due to bedrock, concrete mattresses were used to protect the cables. The concrete mattresses were considered permanent impacts and affected approximately 0.2 acres of intertidal habitat.

A baseline bathymetry survey was conducted in late August-early September 2019, prior to the jet plow trial; results were incorporated into the As-Built Cable plan that was submitted to NHDES. A post-construction bathymetric survey took place in March 2020. Results of the two surveys were provided in Normandeau (2020b). A second post-construction bathymetric survey was conducted in September 2020.

A baseline survey of benthic infaunal community structure was conducted in July–August 2019, and results were reported in Normandeau (2020c). A post-construction survey of benthic resources and sediment grain size was conducted in August, 2020.

This report summarizes the results from the 2019 pre-construction bathymetric surveys, the March 2020 and the September 2020 post-construction surveys, as well as the results of the post-construction monitoring of benthic resources and sediments conducted in August 2020.

2.0 Bathymetry

The benthic habitat monitoring requirements are addressed in DES Condition 42:

> *At least sixty (60) days prior to the start of construction in Little Bay, the Applicant shall obtain NHDES 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 NHDES Environmental Monitoring Database. The Applicant shall then implement the approved plan.*

The Benthic Community Monitoring Plan (Normandeau 2019b) describes the specifications for both bathymetry and grain size assessment. The bathymetric monitoring results are presented in this section. See Section 3.0 for grain size and total organic carbon results.

2.1 Methods

2.1.1 Surveys

The bathymetric surveys were conducted by Ocean Survey Inc. (OSI). The initial pre-construction bathymetric survey was conducted in August–September 2019, followed by a post-construction bathymetric survey in March 2020 (Normandeau 2020b). Because the installation was not completed until early January 2020, scheduling of the bathymetric survey was complicated by the need for spring tides and lack of ice. In addition, survey could not be conducted without a clear weather window of 4–5 days. Such conditions did not occur until March 2020. A second post-construction survey was conducted in August 2020 to assess the status of the bathymetric recovery. The two post-construction data sets were compared to the pre-construction data and to each other to determine the extent and type of impacts from construction relative to naturally occurring changes due to currents and weather, as recommended in the approved Benthic Habitat Monitoring Plan (Normandeau 2019) and in the first post-construction bathymetric report (Normandeau 2020b).

Survey Area

The bathymetric survey encompassed an approximately 94-acre area around the cable route (Figure 2). The survey was centered along the three cables (30 m in width) and extended 100 m (320 ft) both north and south for a total survey width of approximately 230 m (740 ft). This width was selected to allow us to assess the conditions in the immediate vicinity of the new cables where construction-related impacts were expected, as well as farther from the work area where little disturbance was expected.

The bathymetric surveys used a combination of boat-based multibeam sonar, and drone-mounted LiDAR with the goal of providing complete coverage within the submarine cable corridor. The multibeam echosounder data covered the deeper portions of the crossing and the aerial LIDAR covered the shallow intertidal mudflats and shoreline, with a degree of overlap between the two methods to allow “stitching” the results into a seamless bathymetric map.

The bathymetry surveys were conducted during spring high tides to take advantage of the extreme high water for boat-based work, and extreme low water for the LiDAR work, which was flown in the “dry.” The pre-construction multibeam survey was conducted between August 26 and September 1, 2019, and the LiDAR was flown on August 31 and September 1, 2019. The post-construction multibeam survey was conducted between March 8–12, 2020, and the LiDAR was flown on March 11 and 12, 2020. For the second post-construction survey, the multibeam survey was conducted between September 16-19, 2020, and the LiDAR was flown on September 17 and 18, 2020

All survey work was completed under the supervision of an ACSM/NSPS Certified Hydrographer.

Multibeam Echosounder Surveys

The multibeam surveys were conducted by an OSI field team experienced in shallow water multibeam operations. The vessel was a 24-ft survey launch operated in accordance with USCG regulations.

OSI used the following equipment and instrumentation:

- HYPACK trackline control and hydrographic data logging system
- Applanix POS MV inertial navigation system
- Reson SeaBat multibeam echosounder
- Sea-Bird SBE19 CTD profiler or AML Base X sound speed profiler
- Sea-Bird SBE37 or AML Micro X sound speed sensor

Survey vessel navigation, trackline control, and position fixing for the sounding survey was accomplished using the POS MV system interfaced with the HYPACK hydrographic software package. Precision water depth measurements were obtained by employing a Reson Seabat multibeam echosounder. During survey operations, digital depths output from the device were merged with navigation and motion sensor/heading data via the navigation program, which subsequently computed the precise position of each sounding.

The sound speed profile data was incorporated into the hydrographic data processing procedure to correct for depth errors introduced by variations in the sound speed profile. Depth sounding accuracy was verified by means of a bar check of the multibeam system nadir beam.

Aerial LIDAR Surveys

The Aerial LiDAR survey were conducted by American Rail Engineers AirShark (ARE), using FAA-certified UAS pilots. ARE used the following equipment and instrumentation:

- DJI M600 Aircraft equipped with RTK GPS
- On site Radio and Cell Phone communications with Airport and Crew
- Phoenix Aerial UAS LiDAR System
  - Riegel miniVUX LiDAR system
  - Novatel OEM / Lite SPAN IMU
  - Basler RGB Camera
- CHC NAV X900R GNSS Static Base Station for PPK Processing

Survey Units and Accuracy

All survey units were in feet and referenced horizontally to the New Hampshire State Plane Coordinate System, NAD83. The vertical datum for the survey was NAVD88. Real-time positioning of the survey vessel was accomplished using a POS MV inertial navigation system receiving RTK correctors from a local GPS base station. An inertially aided-post-processed kinematic (IAPPK) solution was compared to the real-time solution and applied to the sounding data during post-processing.

The primary vertical benchmark for this survey was "TIDAL 1 1975"—a local National Geodetic Survey (NGS) disk. To facilitate daily XYZ performance checks, OSI installed a temporary XYZ control at Adams Point which was compared to local NGS control.

2.1.2 Data Analysis and Products

Throughout the pre-construction and post-construction surveys, raw data files and records were reviewed while still on site to ensure data quality and data density. The final processing of the data was conducted by OSI in the office.

For the purposes of contour generation, multibeam and LiDAR XYZ data were binned based on a 1-ft by 1-ft grid. The reported elevation from each grid cell was an average of all points within the cell and positioned at the center of the cell. Each cell was colorized according to its average elevation and used to create pre-construction and post-construction bathymetric maps.

Three difference maps were generated by comparing the average elevations of the 1-ft square cells of the two maps being compared: 1) 2019 pre-construction and March 2020 post-construction; 2) March 2020 and September 20202 post-construction; and 3) 2019 pre-construction and September 2020 post-construction surveys. The difference maps were colorized by depth difference and presented at the same scale as the source maps. On each difference map, a "zero"-band (i.e., no difference) was based on total propagated uncertainty and statistical confidence and spanned 0.25 ft to either side of 0 (depicted in gray on the maps). The difference results were tabulated as both acreage and percentage based on 0.33-ft increments, as proposed in the monitoring plan.

As an additional ground check, multibeam performance (repeatability) tests were conducted for each survey as recommended by the US Army Corps of Engineers (USACE 2013) (Table 1).

2.2 Results

The pre-construction and two post-construction maps are provided in Appendix A (Figure A–1 to Figure A–3). Figure A–4 is the difference map which depicts elevation changes between the 2019 pre-construction and the March 2020 post-construction survey, as described in the first bathymetric report (Normandeau 2020b). Figure A–5 depicts elevation changes between the March and the September post-construction surveys. Figure A–6 depicts elevation changes between the 2019 pre-construction and September 2020 surveys.

2.2.1 General Bathymetry

The overall bathymetry of the bay is very similar among the three surveys, indicating no substantial change over the course of the year. The pre-construction map shows the general setting of the cable crossing area (Figure A–1). The western tidal flat is very flat, with a slope of less than 0.2% (2 ft change over 1600 ft). At the western edge of the channel, elevations drop from approximately 5 ft to 30 ft at an average slope of 5%. The channel bottom ranges between 25 and 40 ft deep, and shows the extreme variability associated with "sand waves," most of which were 3–4 ft in height. The largest one, south of the cable corridor, is approximately 12 ft high. The eastern edge of the channel rises steadily to 15 ft (slope 7%), flattens out on a shelf for approximately 350 ft (slope 1%) after which the eastern tidal flat rises again and then extends to shore (1% slope).

In the March 2020 post-construction map, there is evidence of disturbance from both the cable installation and the support vessels (Figure A–2). The three cable trenches are clearly visible, as is the 1200-ft jet plow trial path located south of the cables on the western tidal flat and channel slope. Tracks from twin propellers of several of the installer's support vessels are evident on the western tidal flat, as are a few single propeller tracks. Presumably, these tracks were made from the vessels needing to come in at very low water on rare occasions, as the boats were there on almost a daily basis, and that level of use is not visible. On the eastern shore, the cable route remains clearly visible, but there are few propeller tracks. The cable route is also visible in the channel, less so in the vicinity of the sand waves and more pronounced on the channel slopes. The concrete mattresses on the eastern and western shorelines are visible as raised surfaces.

In the September 2020 post-construction map, many of the cable tracks and propeller scars remain visible, but to a lesser degree and depth than in March 2020 (Figure A–3). The cable route is almost fully obscured on the channel bottom among the sand waves.

2.2.2 Difference Maps

The maps in Appendix A (Figure A–4, Figure A–5, and Figure A–6) represent the difference in elevation between two sets of maps. Figure A–4 compares the 2019 pre-construction conditions with March 2020 post-construction conditions. Figure A–5 compares March 2020 post-construction and September 2020 post-construction conditions. Figure A–6 compares 2019 pre-construction conditions with September 2020. The difference in substrate surface elevation, either increases or decreases, are indicated by color. The gray color represents areas with no discernable change (less than 0.33 ft [7.5 cm]) between the two maps. The cooler tones (blue, green, magenta) indicate decreases of more than 0.25 ft in post-construction surface elevations, with magenta indicating the greatest decrease. Conversely, the warmer tones (yellow, orange, red) indicate increases of more than 0.33 ft in post-construction surface elevation, with red indicating the greatest increase.

2019 Pre-construction/March 2020 Post-Construction

In the 2019 pre-construction/March 2020 post-construction difference map (Figure A–4), depressional areas are visible over the paths of the cable tracks and the jet plow trial route, with most areas showing between 0.3 and 1 ft of sediment loss. Some locations exceed 1 ft, and a few small areas exceed 2 ft. Areas of increases related to construction include the concrete mattresses at the shorelines where the hard surfaces of the mattresses are clearly visible. Areas of increase are also visible adjacent to the cable trenches due to sediment accretion. This is most pronounced on the western shore in the vicinity of the hand jetting. Narrow, discrete ridges are also visible paralleling the paths of the three cables on the western tidal flat. Most areas of increase are predominantly yellow, indicating increases of less than 0.5 ft, with a few small areas in orange (up to 1 ft).

In the channel, the sand waves are the dominant features, generally in the same location but the tops show changes in location and elevation. The cable paths are intermittently visible as minor (approximately 0.5 ft) depressions within small sections of the sand waves. It is clear from Appendix Figure A–4 that most bathymetric changes west and east of the channel are near the cable route and are therefore assumed to have been caused during cable installation. Within the channel, it appears that the sand waves are dynamic and are the dominant feature affecting change; the presence of construction-related change is less clear cut.

Areas of change were calculated in three sections to allow better discrimination between the project-related and natural (sand waves) changes: western side, channel, and eastern side. The western side included the slope of the channel to the 25-ft contour. The channel included the sand waves, between the 25-ft contour lines on the west and east slopes. The eastern side extended from the 25-ft contour to the shoreline. Table 2 presents the areas of elevational differences in 0.33-ft increments in each section, as well as the percent difference. These data were calculated for both the full corridor (740 ft; 230 m) and a narrower corridor that focused on the work area (300 ft, 94 m). In the construction-dominated sections (west and east sides), approximately 97% of the entire survey area, and 94.2% of the narrower survey corridor showed little change (less than 0.33 ft). In the sand waves, the percentage of area with little change decreased to 79.4% of the entire survey area, and 77% of the narrower survey corridor. The great majority of changes were less than 1.00 ft in elevation.

March 2020/September 2020 Post-Construction

The post-construction difference map between March 2020 and September 2020 surveys (Figure A–5) depicts the changes in substrate surface elevation over that 6-month period using the same color codes as the previous difference map. The differences between March and September (Table 3) indicate that the type of change follows the opposite pattern of what was observed between pre- and post-construction, which suggests that leveling and infilling are occurring. After construction, the trenches were depressions, and areas of mounding adjacent to the trenches and in the area of hand jetting were visible. The change that has occurred since March indicates that the trenches are infilling (yellow and orange) and the mounds are leveling (shades of green and blue). The deeper depressions on the construction map show the most infilling on the post-construction map (see Arrows 1 and 2 on Figure A–4 and Figure A–5), and conversely some areas of mounding show leveling and sediment loss (Arrow 3). Arrow 4 on Figure A–4 points to an area on the top of the channel slope where the jet plow would have to idle while resetting for the channel crossing. In Figure A–5, the hole, which was more than 2 ft deep, has partially infilled and the mounds on either side have leveled.

Estimates of the percent change between March 2020 and September 2020 indicate that 99.4% of the narrow corridor experienced less than a 0.33-ft increase or decrease in substrate elevation (Table 3). The changes that were observed were generally small in surface area and were predominantly infilling of sections of the trenches (0.4%). Mounds adjacent to the construction trenches lost elevation in several locations (0.2%).

2019 Pre-Construction/September 2020 Post-Construction

The overall change in bathymetry in the approximate year between the 2019 pre-construction survey and the September 2020 survey is shown in Figure A–6 and uses the same color codes as the previous difference maps—warm tones indicate an increase in substrate elevations, cool tones indicate a decrease in substrate elevations.

Estimates of the percent change between 2019 pre-construction and September 2020 post-construction indicate that 95.9% of the narrow corridor experienced less than a 0.33-ft increase or decrease in substrate elevation (Table 4). This equals a 1.7% increase in this elevation range since March 2020 (94.2%; Table 2) and represents a leveling of the substrate as the deeper spots infill and the higher ridges decrease.

In the sand waves, the percentage of area with little change was 64.8% of the narrower survey corridor. This value is a decrease when compared to the March 2020 value (77%; Table 2) and is predominantly due to the continued shifts in the sand waves on the channel bottom. The cable route represents a minor component, which is almost fully recovered or obscured by the sand wave action (Figure A–6).

2.2.3 Concrete Mattresses

The concrete mattresses were installed to provide protection for the transmission cables where ledge precluded burial to the full 3.5 ft depth on both shores. The mattresses consist of articulating concrete blocks, each about 12×12 inches and 9 inches high. Over the course of 2020, the crevices between the concrete blocks accumulated sediment and, in some areas, particularly on the west shore, the mattresses settled into the substrates (Figure 3; also compare Figure A–4 and Figure A–6). In the spring, the concrete surfaces in the lower intertidal zone showed colonization with green filamentous algae and as summer progressed, they became heavily colonized with immature rockweed (*Fucus vesiculosus*) (Figure 4). Numerous mud snails (*Ilyanassa* sp.), periwinkles (*Littorina* sp.), green crabs (*Carcinus maenas*) and hermit crabs (*Pagurus* sp.) were observed on the mattresses or in the interstices, and on an outgoing tide, small fish were seen sheltering in the crevices. The mattresses are expected to continue to accrete sediments, provide hard substrates for macroalgae to attach, and food and shelter for a variety of invertebrates and fish.

3.0 Benthic Communities

Jet plowing was expected to 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 was required. Industry experience has found that most sediments fluidized by the jet plow remain in the narrow trench associated with each cable. Based on the grain size distribution observed along the project route, RPS (2016, 2017) predicted that sediments that were suspended and dispersed away from the jet plow would tend to redeposit close to the route. Sediment deposition greater than 1 mm was estimated to have the potential to adversely affect the benthic community. These predictions are shown in Figure 5, representing the slowest advance rate (100 m/hour or 13 hours to cross; RPS 2016) 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 was feasible on the east side is also shown in Figure 5 (RPS 2017). Predicted deposition patterns were used to locate benthic infauna stations and the bathymetry survey.

3.1 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 infaunaI 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.*

A Benthic Habitat Monitoring Plan was approved by NH DES (Normandeau 2019b). This monitoring plan has been followed for siting, collection, and analysis of the pre-construction and post-construction benthic community.

Installation of the three cables across Little Bay unavoidably disturbed 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 was expected to be impacted. It was also expected, however, that the substrate would 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 took place during the fall 2019, recruitment of infaunal organisms into the disturbed area was expected to be limited until the following spring through summer when benthic reproduction is typically at its peak, thus post-construction monitoring was scheduled for the end of the 2020 primary recruitment period.

A preliminary 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 proposed the same study design for the 2019 pre-construction monitoring and the 2020 post-construction monitoring, locating stations along transects so that they fall both within and well outside the predicted area of disturbance. The transects were aligned so that the mid-point stations are located at the approximate centerline of the three cables (Figure 6).

This benthic section provides the results of the post-construction benthic infaunal community survey conducted in August 2020 and includes the results of sediment grain size and TOC sampling conducted along with benthic collections. It then compares the post-construction results to the pre-construction findings and assesses the status and recovery of the benthic infaunal community in the construction area.

3.2 Methods

3.2.1 Benthic Infaunal Community Monitoring Methods

Eversource stated in their filings to the SEC that installation of cables in Little Bay substrate was unlikely to have an unreasonable long term adverse effect on the natural environment of the bay. Because installation directly disturbed the substrate and associated benthic infauna there will be unavoidable temporary changes in these resources. The purpose of the benthic infauna monitoring program was to demonstrate recovery of the benthic community to a similar functional level as nearby areas in the bay. The primary value of the baseline survey was to demonstrate the similarity or dissimilarity of the infaunal community within each depth zone across the route within the baseline timeframe.

Sampling Locations and Timing

Benthic infauna samples were collected on August 17 and 18, 2020, from five locations along each of four transects: three crossing the cable route to assess recovery from jet plow installation of the cables as well as a fourth 5-station transect east of the jet plowed section where currents were too fast to allow use of turbidity barriers around hand jetting (Figure 6). Each transect was oriented so that the central station was on the approximate centerline of the cable route, two stations (one each north and south of the centerline) were located within areas where the sediment plume model predicted that suspended sediments would be redeposited, and two reference stations (one north and one south) where no sediment effects were expected (Figure 6). Transects were located in different depth regimes. This design allowed the evaluation of whether there was a gradient of community parameters with distance from the impact area within a given depth zone. 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 soft substrate 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. Grain size and total organic carbon (TOC) data from the monitoring stations were used to define habitat conditions at each station along a transect. Coordinates for each station are shown on Table 5.

Baseline benthic surveys were conducted in mid-summer (July–August) 2019 prior to any in-water work on the project, and consistent with EPA's National Coastal Condition Assessment (NCCA) program (USEPA 2014a) recommendation for sampling benthic infauna from June through September. Post-installation collections were made during the same time frame in 2020. This sampling schedule captures overwintering populations and spring-early summer recruitment. Benthic samples supporting the project application to the SEC were collected in September 2014 and help provide some historic perspective to conditions in Little Bay.

Sampling Methods

Field methods adhered to the protocols established by EPA's NCCA program (USEPA 2014a). By following these established methods, the samples collected in the Project Area are directly comparable to the samples collected in the Great Bay system during multiple years under the NCCA program.

Normandeau's survey vessel navigated to each station using dGPS that has sub-meter accuracy and the vessel was either anchored or held in position with the engine. The vessel was oriented so that the davit supporting the grab sampler was located on the station's GPS coordinates. Triplicate benthic infauna samples were collected at each station 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 was taken to move the sampler between grabs to ensure that undisturbed sediments are collected each time following the initial deployment. A fourth grab was collected at each station to be analyzed for sediment grain size and total organic carbon (TOC), both measures of habitat conditions. This grab was subsampled using small cores to collect sufficient material for laboratory analysis.

Once retrieved the top of the grab was opened to confirm that the grab was acceptable as defined in Figure 7 (source: USEPA 2014a). Material from acceptable grabs was washed through a 0.5 mm-mesh sieve to prepare the benthic infauna sample. Sieved material was placed in a jar with buffered formaldehyde to preserve the organisms. Material from the fourth grab for sediment analysis was not sieved.

Samples collected are summarized in Table 6.

Laboratory Analysis

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

Sediment grain size and TOC were analyzed following NCCA protocols (USEPA 2015) by Enthalpy Laboratories.

3.2.2 Data Analysis

Evaluation of recovery of benthic infaunal resources focuses 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 and median phi size), TOC, total infaunal abundance, taxa richness, and community structure as well as derived metrics (Shannon Weiner Diversity H′ and Pielou's Evenness J′) (Table 7). Statistical analyses were designed for the primary parameters to evaluate whether benthic conditions within the footprint disturbed by installation of the cables were similar to those in the reference area and/or to pre-construction conditions. Those analyses are described below.

Additional secondary biological parameters (Table 8) were also 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, the secondary parameters provide insight into the potential ecological effect of any changes. These secondary parameters included groupings of organisms (opportunistic taxa; dominant taxa; and feeding guilds) that provide indications of ecological function.

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 sediment gradient. Grain size data are presented using the Wentworth scale (based on particle diameters expressed in millimeters) and converted to the phi scale (the negative logarithm to the base 2 of the Wentworth value). The phi classification provides greater resolution at the smaller grain sizes where differences in infaunal benthic communities are more likely to be observed. 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 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 (Normandeau 2017b). 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 focuses on changes in silt/clay and sand textures (Table 7). TOC reflects organic enrichment of the sediments (Pelletier et al. 2010) and provides an indicator of the expected 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.

Biological Factors

Most of the factors 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 were evaluated across stations within each transect and between the pre-construction and post-construction events using statistical tools for conducting a BACI (Before-After-Control-Impact) comparison (Table 7). Analysis of variance

(ANOVA) and numerical classification have been widely accepted for impact analysis and are used for numerous other monitoring programs in New England, including the long-running Seabrook Station monitoring program in Seabrook, NH. The appropriateness of using ANOVA or a nonparametric equivalent for comparing baseline and post-construction data sets was based on the results of the post-construction survey. In addition to the direct parameters, two derived measures describing diversity (Shannon Weiner diversity and Pielou's evenness) are included as primary factors. The Shannon Weiner diversity index has no upper bound so provides no universal threshold for defining "good" or "bad" benthic conditions. However, within a given dataset, samples or stations can be categorized as more or less diverse. Pielou's evenness ranges from 0 to 1 with lower values indicating that some taxa have higher abundances than others and higher numbers indicating that abundances are more uniformly distributed among the taxa.

Community structure was compared across all stations using numerical classification based on Bray-Curtis similarity indices, computed for the square-root transformed abundances (no./0.04 m^2). For each survey period, the initial numerical classification was computed using all replicates to evaluate variability of species composition within stations. This analysis revealed relatively low variability within stations in both baseline and post-construction surveys. For evaluation of differences among stations and between surveys, two numerical classifications were conducted. One used only the post-construction survey data and examined whether stations along a transect were similar. A second used data from both surveys to examine whether changes had occurred over time. These evaluations were used to address the question of whether the benthic resources of the bay were showing impacts from the cable installation. Bray-Curtis similarities were used to classify the samples into groups using the group average method (Boesch 1977) using the computer program PRIMER-E.

Statistics do not necessarily provide insight into biological function however. Therefore, Eversource used a number of secondary factors qualitatively to help interpret differences that were observed via statistics. These secondary factors, including relative abundance of opportunistic species, comparison of numerical dominants, and feeding guild structure, reflect how robust the community is and were included in this assessment because of the patterns observed in the 2014 collections. 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. Benthic collections from the project area in 2014 also showed that there were several species that were numerical dominants regardless of station within each depth zone (Normandeau 2016b). The 2014 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 to ensure that data were handled the same way. Shannon Weiner diversity takes into account both numbers of species and their abundances while Pielou's evenness evaluates the extent to which 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 disturbance 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 were made only within the project-specific dataset.

All data obtained during the benthic infaunal community monitoring program will be uploaded to NHDES' EMD upon completion of the study. A data listing for the post-construction survey is included in Appendix C.

Data Manipulations

Several data manipulations were conducted prior to calculating community parameters for the 2020 survey, particularly the diversity indices of species richness, Shannon Weiner $\log_e$ diversity and Pielou's evenness. In each of these cases, only unique taxa were included. For example, when an individual was only identifiable to genus and there were individuals identifiable to a species within that genus, only the species-level individuals were included in the calculations. These exclusions were applied to the entire dataset and involved only a small number of individuals. Doing so enhances comparability across the samples. Specifically, these changes were made to the data set for calculations of species richness, diversity, and evenness:

- Individuals identified only to family and counts were low (Syllidae, Maldanidae, Sabellidae, Spionidae, Phyllodocidae, Platyhelminthes, Pyramidellidae, Nereididae or Capitellidae) or genus (*Spio* sp., *Glycera* sp.) were eliminated because there were individuals identifiable to a greater degree of precision.
- In cases where counts of imprecisely identified taxa are higher and there are multiple genera or species within family, these counts were compiled; this included: combining *Leitoscoloplos robustus, Leitoscoloplos fragilis* and *Leitoscoloplos* sp.; combining Cirratulidae, *Chaetozone* sp. A. and *Tharyx acutus;* combining *Polycirrus phophoreus, Polycirrus eximus* and *Polycirrus* sp.; and combining *Scoletoma* sp. and *Scoletoma tenuis.*
- For numerical classification, the count data (number per 0.04 m^2 or number per sample) were normalized by using a square root transformation. This reduces the effect of extremely high or extremely low abundances in the analysis.
- Nematodes were counted but excluded from any analyses as they are typically considered to be meiofauna, rather than macrofauna, and were likely to have been underrepresented in the sieved samples.

Note that although there were a few more taxonomic compressions or deletions in the post-construction data than the baseline data, these affected taxa that were not present in the baseline data. The criteria used to determine these actions were the same for both datasets. The resulting community statistics are, therefore, comparable between the two surveys.

Calculations of station means and standard deviations were based on the three replicates collected from each station. Calculations of transect means and standard deviations were based on the means from each of the five stations.

3.3 Results

3.3.1 Physicochemical Factors

General patterns in sediment grain size as reflected by percent fines were similar in the post-construction monitoring to those observed prior to construction (Table 9). In both surveys, the proportion of fine sediments was highest along the western tidal flat. Fines were lower along the eastern shallow subtidal transect and lowest along the channel and channel slope transects.

Several stations on the western transect (B02, B04 and B05) exhibited increases in the proportion of fines compared to baseline conditions. Only Station B05 showed a large enough increase in mean Phi size (from very fine sand to silt) to suggest that this increase in fines was potentially an ecologically important change in benthic habitat.

In contrast, on the eastern transect fines increased substantially only at Station B17 while decreasing at B18 and B20 compared to baseline conditions. Based on median grain size, these stations were characterized as fine to very fine sand during both baseline and post-construction surveys.

Both the channel and channel slope transects were predominantly sandy during baseline and post-construction surveys. Only channel slope Station B15 had a relatively large increase in fines (from 17% to 27%) between the surveys but median phi size only changed from medium to fine sand. No stations along either transect exhibited a substantial change in median phi size between surveys.

Total organic carbon (TOC) was higher at most stations in the post-construction survey than the baseline survey (Table 9). During the baseline collections, TOC exceeded 1% at only one station (B15) while in the post-construction survey TOC exceeded 1% at Stations B1–B6 and B15. Only at Station B15, however, did TOC exceed 3%, a threshold that could evoke an ecological response. The tendency for the shallower stations to have slightly higher TOC than the deeper stations with the exception of B15 observed in the baseline collections continued in post-construction collections. As observed in sediment cores collected in 2016 (Normandeau 2016c), TOC values tended to be higher in the western stations, consistent with higher levels of fines. In general, TOC levels in 2016 were higher than in either the baseline or the post-construction collections, with the notable exception of Station B15 in 2020.

3.3.2 Primary Biological Factors

As described in Section 3.2.2, benthic infaunal community attributes can be characterized in a number of different ways. Taken alone, each of these factors can provide a partial picture of the community ecology such that statistically significant changes in one or more of the factors may or may not represent an ecosystem level change directly relatable to the SRP construction activities. For this reason, the results of all attributes must be taken in total. Results of the baseline survey are presented for each of two directly measured parameters (total faunal abundance and taxa richness), two derived parameters (Shannon-Weiner diversity and Pielou's evenness), and one overarching community assessment (based on numerical classification of community structure).

For the baseline investigation, data were examined within individual stations as well as among the five stations that compose a depth-related transect. Post-construction data were analyzed the same way and also compared to the baseline results. As the transects were located to represent expected differences in sediment characteristics and water depth, results for each of the direct and derived parameters are presented by transect.

Among the stations located on the western tidal flat transect (Transect 1; Stations B01-B05), total mean post-construction infaunal abundance ranged from 1126 to 1772 organisms/0.04 m^2 and averaged 1348 organisms/0.04 m^2 (Table 10). Mean post-construction abundances were higher than in the baseline collections at all stations (Figure 8). One-way ANOVA showed that baseline abundances were significantly higher at reference Station B05 than impact stations B02 or B03, but every impact station was similar to at least one reference station (Table 11). There were no significant differences in abundance among Transect 1 stations in the post-construction collections (Table 11). Mean species richness in the post-construction collections ranged from 19.7 to 29.7 unique taxa per sample and averaged 23.6 across the transect in 2020; mean species richness was higher at all stations in 2020 than in the baseline collections. During the baseline period, there were no significant differences in species richness among stations (Table 11). In the post-construction collections, species richness was significantly higher at Station B05 than B01, however, every impact station along the transect was similar to at least one of the reference stations (Table 11). Variability in species richness was low both within and among stations (Figure 8). Both abundance and number of taxa are taken into account for Shannon–Weiner's diversity and Pielou's evenness. In the post-construction collections from this transect, diversity ranged from 2.02 to 2.33, averaging 2.2; evenness ranged from 0.68 to 0.72 and averaged 0.7. Mean diversity was higher at each station in 2020 than in the baseline collections. Variability in diversity was low within stations and among most stations (Figure 8). Mean evenness was higher at Stations B01, B04 and B05, lower at B03 and the same at B02 in 2020 than 2019.

Transect 2 (Stations B06-B10) was located in the channel where total mean abundance ranged from 870 to 1907 organisms/0.04 m^2 and averaged 1397 organisms/0.04 m^2 in the post-construction survey. Mean abundances were higher in the post-construction than the baseline collections at all stations along Transect 2 (Figure 9). Baseline abundances were similar at all stations whereas in the post-construction data, abundance at Station B09 was significantly higher than at B08 (Table 11). In 2020 samples, mean species richness ranged from 15.3 to 33.0 taxa per sample, averaging 22.9 taxa per sample, very similar to the baseline results except for Station B09 (Figure 9). The stations differed significantly in species richness during both the baseline and the post-construction surveys. In the baseline survey impact Station B08 species richness was significantly lower than either of the reference stations whereas in the post-construction collections, Station B08 was similar to both reference stations (B06 and B10) in terms of species richness (Table 11). Diversity ranged from 1.52 to 2.20, averaging 2.25 in 2020. Mean diversity values were close at Stations B06, B08 and B09, and lower in 2020 than 2019 at Stations B07 and B10. Evenness ranged from 0.53 to 0.69 in post-construction collections with a transect average of 0.6. The spatiotemporal pattern observed for diversity was also evident in evenness.

Along the eastern channel slope (Stations B11-B15, Transect 3), total mean abundance ranged from 910 to 1268 organisms/0.04 m^2 and averaged 1164 organisms per 0.04 m^2 in 2020. There were no significant differences in abundances among stations during either collection period (Table 11). Abundances at the impact stations were similar to those observed during the baseline collections (Figure 10). Northern reference station B11 exhibited substantially higher abundances and southern reference station B15 exhibited substantially lower abundances than in the baseline collections. Several stations (B12, B13 and B15) exhibited high variability among replicates in both surveys although means of all stations except B15 were within the variability of all other stations (Figure 10). Mean species richness in the post-construction samples ranged from 23 to 29.3 per sample and averaged 26.9 unique taxa along the entire transect and species richness was usually within one taxon of that in the baseline collections. As in the baseline period, Station B11 exhibited the lowest species richness along this transect following construction (Figure 10) although these spatial differences were not significant during either period (Table 11). Shannon-Wiener diversity ranged from 2.23 to 2.42 among the stations in post-construction collections and averaged 2.31 along the entire transect. The three northernmost stations (B11–B13) decreased slightly, B14 increased slightly and B15 increased a fair amount in diversity compared to baseline values. Evenness ranged from 0.68 to 0.73 among the stations, averaging 0.70 along the transect in 2020. With the exception of B15, differences in evenness values were negligible between surveys. Evenness at B15 increased following construction indicating a reduced dominance by one or several taxa.

On the eastern shallow subtidal transect (Transect 4), total mean abundance ranged from 817 to 1378 organisms/0.04 m^2 among stations B16-B20 and averaged 1178 organisms/0.04 m^2 in the post-construction survey. Mean abundance was higher at all stations except B17 in 2020 compared to the baseline survey (Figure 11). Abundances exhibited no significant spatial differences within either collection period (Table 11). Among the post-construction collections, mean species richness ranged from 22.7 to 28.0 unique taxa per sample, with a transect mean of 25.8. All stations except B17 showed an increase in species richness of five or more taxa compared to baseline conditions; the decline was less than one taxon at B17. Species richness was lowest at B16 as was observed in the baseline period (Figure 11). A one-way ANOVA found significant differences in species richness among stations in baseline collections although the Tukey's means test did not make the same distinction (Table 11). No significant differences in species richness were found among stations in the post-construction collections. Post-construction diversity ranged from 2.00 to 2.46, averaging 2.28 along the transect. Diversity increased at all stations except B17 (Figure 11). Evenness ranged from 0.63 to 0.76 and averaged 0.71 along the transect in the post-construction collections. B17 exhibited the largest decrease in evenness suggesting the presence of one or two numerical dominants following construction.

Community Structure Based on Station Means

Numerical classification of post-construction benthic infaunal community structure was examined using station replicates. The results of this analysis were consistent with the same analysis conducted on the baseline collections; that is, within station variability was low and stations were generally grouped with stations from the same depth zone. Results of this analysis are shown in Appendix D. Examining community structure using Bray-Curtis Similarity for station means provides a similar picture of the relationship among the stations. As shown in Figure 12, all the shallow stations except B16 were grouped together at greater than 60% similarity although stations from each side of the bay were more closely associated within a transect than between the two transects (Groups 1A and 1B). All of the slope, two of the channel and the northernmost eastern transect stations grouped together at greater than 60% similarity (Group 2). Channel stations B07, B08 and B10 were similar (>50%; Group 3) but markedly different than other stations (less than 40% similarity).

Numerically dominant species composition of the four apparent station groups illustrates why the stations were clustered (Table 12). In group 1A, encompassing the shallow stations on the western tidal flat, the infaunal community was dominated numerically by the polychaetes *Streblospio benedicti*, *Heteromastus filiformis, Tharyx acutus*, *Scoletoma tenuis, Scolelepis texana,* and *Leitocoloplos robustus*. Other dominants included oligochaetes, the amphipods *Ampelisca abdita* and *Microdeutopus gryllotalpa* and the gastropod *Tritia obsoleta*. Many of the same species dominated Group 1B, stations on the eastern shallows, but several species of amphipods were more prevalent and oligochaetes less prevalent on the eastern transect. Polychaetes predominated in Group 2. Although many of the dominant species were the same as in Groups 1A and 1B, the abundance of the polychaete *Aricidea* (*Acmira*) *catherinae*, a species present only in low numbers in the shallows, was higher than other species. The occurrence of cirratulid polychaetes among the dominants was also distinct. Community structure in Group 3, three channel stations, was unique in being dominated by the tanaid *Tanaissus* sp. A. In addition, two amphipods (*Acanthohaustorius millsi* and *Rhepoxynius hudsoni*) that were only rare in Group 2, were among the dominants.

Comparison of Community Structure between Baseline and Post-Construction Periods

Bray-Curtis similarity comparisons of baseline and post-construction collections shows that the infaunal community at a specific station was similar between surveys at the majority of the stations along transects 1 through 3 (Figure 13). Exceptions were Station B03, B06, B10 and B15. On Transect 4, Stations B17 through B20 exhibited spatial but not temporal similarity.

Numerical classification split the infaunal communities into two major groups. Because the within-group similarity of each major group was less than 60%, the level accepted as discriminating ecologically significant groupings, it was important to examine the results for groupings of higher similarity. By using 60% similarity as the discriminating factor this analysis resulted in eight distinct subgroups. Several groups included only one station/survey collection: B10 2020, B15 2019, B06 2019, and B03 2019. The 2020 collection at B10 was associated with Group 1 and the rest were associated with Group 2. Group 1A included both surveys for Stations B07 and B08. Group 2A included both years for Stations B09, B11-B14 and B16; 2019 collection from Stations B10; and 2020 collections from B06 and B15. Group 2B included the 2020 collections from Stations B17 through B20; Group 2C included the 2019 collections from those stations as well as the 2020 collection from B03 and the collections from both years for Stations B01, B02 and B04. The between group similarity of Groups 2B and 2C was slightly below 60%. The 2019 collection from B03 was most closely associated with Groups 2B and 2C with which it was less than 60% similar. Based on this distribution it appears that stations (B06-B10) along transect 2 in the channel exhibited more spatial and temporal variability than other transects.

Dominant taxa occurring in each of the cluster groups are presented in Table 13. Of the 29 taxa that were numerical dominants in any group, more than half (15) were present in 6 or more groups although not necessarily as a dominant in each. This wide spatial distribution demonstrates Station B10 2020 was associated with Group 1A because of the relatively high numbers of the arthropod *Tanaissus* sp. A as well as the numerous species they had in common. The differences in the abundance of the polychaete *Aricidea* (*Acmira*) *catherinae* (the numerical dominant at B10 in 2020) and the subdominant species likely caused the distinction between the groups. Abundance of these two species overwhelmed the community at B10 (2020) whereas Group 1A included two polychaete species, oligochaetes, and the amphipod *Acanthohaustorius millsi* as subdominants.

Linked to other Group 2 collections at about a 40% similarity, the 2019 collection from B15 was unique in being dominated by two amphipods (*Melita nitida* and *Microdeutopus gryllotalpa*) and the polychaete *Polydora cornuta*, none of which was a numerical dominant in other collection groups. The 2019 collection from B06 was affiliated with Group 2A at just under 60% similarity. These two groups shared several numerical dominants, the polychaetes *Aricidea* (*Acmira*) *catherinae*, *Scolelepis* (*Parascololelepis*) *texana* and *Tharyx acutus*. The higher numbers of *T. acutus* in the 2019 B06 collection and of amphipods in the Group 2A mean likely account for the differentiation between groups in the cluster analysis.

Groups 2B and 2C linked with the 2019 collection from B03 at about 55% similarity. The single collection shared several dominant polychaete species (*Heteromastus filiformis*, *Pygospio elegans*, *Streblospio benedicti* and *Tharyx acutus*) with Groups 2B and 2C but had few arthropods. Group 2B was dominated by *S. benedicti* and the amphipod *Ampelisca abdita* with the amphipod *Grandidierella japonica* and the polychaetes *T. acutus* and *Scolelepis (Parascolelepis) texana* as subdominants. Group 2C was dominated by *S. benedicti, T. acutus* and oligochaetes with subdominants of *H. filiformis,* the polychaete *Scoletoma tenuis* and *A. abdita*.

3.3.3 Secondary Biological Factors

Opportunistic Species

Opportunistic species are important early recruits, or pioneers, to disturbed habitats. In the marine and estuarine benthic infaunal community these species typically have high fecundity, frequent reproduction, and short lives. They reside at the surface and are often surface deposit feeders. In New England estuaries, opportunistic species are often polychaetes, in particular *Polydora cornuta*, *Streblospio benedicti* and *Capitella capitata*. Numerical domination of the community by these species can be an indication of either recent or frequent disturbance and that the habitat is in early stages of colonization. When they are found in combination with deeper dwelling or longer-lived species, or species with varied feeding habits, it is more likely that they are simply a component of a dynamic but healthy community.

As evident in Table 14, opportunistic polychaetes were present throughout the survey area during both baseline and post-construction surveys except Station B8 post-construction. In particular, *Streblospio benedicti* occurred ubiquitously in both baseline and post-construction collections and was typically responsible for the majority of the opportunist abundance. Relative abundances of opportunists was highest along the shallow transects during both surveys, not unexpected given the higher stresses (potential drying; wider temperature fluctuations) associated with greater exposure in these areas compared to the deeper portions of the bay.

Relative abundances of opportunists tended to be lower in the post-construction than the baseline collections with the exception of impact station B3 on the western tidal flat. Opportunists increased from 14.2% to 23.0% at this station.

Dominant Taxa

Consistency of dominant taxa along a transect provides insight into ecological function of the infaunal community. Table 15 lists relative abundances of taxa making up at least 10% of the total abundances at each station. Across Transect 1, there were three or four dominants at each station. Of these, three taxa (*Streblospio benedicti,* Oligochaeta and *Ampelisca abdita*) were dominants at all stations. *Heteromastus filiformis* was dominant at two stations and present at the remaining three stations. The numerical dominants contributed 50–77% of the total abundance at the stations on Transect 1 following construction compared to 70–77% in the baseline collections. Proportion of dominants was lowest at Station B05 in both surveys.

The channel transect (2) exhibited greater variability among stations in terms of dominant taxa. Although two taxa (*Aricidea (Acmira) catherinae* and Oligochaeta) occurred at all stations, neither was a numerical dominant at every station. *Streblospio benedicti* was a dominant at most stations during baseline collections but not in the post-construction collections. *Scolelepsis (Parascolelepis) texana* continued to be a dominant at two stations. Three species (*Tharyx acutus, Tanaissus* sp., and *Acanthohaustorius millsi*) were each numerical dominants in the post-construction collections but not in the baseline collections. Proportion of dominants in post-construction collections ranged from 69 to 74% compared to 45 to 74% in baseline collections. Proportion of dominants was lowest at Station B09 during baseline and at B10 in post-construction.

Channel slope transect (3) supported six taxa that were a dominant at one or more stations and occurred at all stations. These taxa included Oligochaeta (dominant at all stations); *Aricidea catherinae* and *Scolelepis (Parascolelepis) texana* (dominant at four stations); Cirratulidae (three stations); and *Scoletoma tenuis* and *Grandidierella japonica* (one station). Proportion of dominants in post-construction collections ranged from 58 to 63% (lowest at Station B15) compared to 43 to 71% in baseline collections (lowest at Station B14).

Transect 4 exhibited similar dominants to transect 1 during both baseline and post-construction collections. Proportion of dominants along Transect 4 ranged from 52 to 76% in baseline collections and from 35 to 60% in post-construction samples. The lowest proportion of dominants occurred at Station B17 during the baseline and at B19 in post-construction samples.

Feeding Guilds

Feeding strategies are known for some benthic organisms in the project area although many species may utilize more than one strategy (e.g., the amphipod *Ampelisca abdita* can use both surface deposit feeding and filter feeding). Primary feeding types for the dominant taxa are listed on Table 15. The benthic community in the majority of the collections were dominated by surface deposit feeders, generally an indication of exposure to frequent stresses. Subsurface feeders were prevalent at Stations B03, B08, B10 and B11 in baseline collections, suggesting a more stable benthic community than at other stations. Stations B07 and B08 were unique in having *Tanaissus*, a filter-feeding carnivore dominating and Station B15 was unique in have the herbivorous amphipods dominating.

Feeding patterns were somewhat different in the infaunal communities identified in the post-construction collections. While surface deposit feeders were numerically important at most stations, the proportion of subsurface deposit feeders increased by at least 10% at nearly half of the stations (B01, B04, B06, B07, B09, B12, B13, B14, and B15). This change was attributable to an increase in the proportion of oligochaetes for Stations B01, B04, B09, B12, B14, and B15.

3.4 Discussion

In receiving approval from NHDES to install the SRP cables across Little Bay, Eversource assumed responsibility for adhering to state regulations governing Biological and Aquatic Community Integrity in Env-Wq 1703.19. This states:

> *(a) All surface waters shall support and maintain a balanced, integrated, and adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of similar natural habitats of a region. (b) Differences from naturally-occurring conditions shall be limited to non-detrimental differences in community structure and function.*

Eversource's benthic monitoring program was designed to demonstrate compliance with this regulation. Results of the post-construction monitoring show that the benthic infaunal resources within the area predicted to be impacted from the installation, either directly or as a result of sedimentation are similar to the reference locations in most characteristics examined.

As shown in the baseline collections from Little Bay, the benthic infaunal community in the vicinity of the SRP cable route is a complex assemblage of numerous species that occupy different portions of the substrate (e.g., surface and subsurface dwellers), have differing motility and utilize multiple feeding strategies (Normandeau 2020c). It is a basic ecological concept that higher species diversity and fairly even distribution of abundance among species tends to indicate greater stability and resilience to a benthic community. This means that there is better ability to recover from a short-term stressor than in a community made up predominantly of a few species. All stations supported communities of 15–31 taxa in the baseline collections and no individual species accounting for more than 30% of the assemblage which point to relatively high species diversity. Baseline collections also demonstrated that many species are widespread through the project area indicating that there are proximal sources for recruitment to disturbed sediments. These observations provided confidence that the SRP project area would indeed recover from disturbance. One important finding of the baseline survey was that the shallow transects on the west and east tidal flats exhibited similar community structure as did the channel/channel slope transects. Variability along the transects was higher among the channel/slope stations than among the shallow stations. These findings are not particularly surprising given the differences in sediment grain size, current speeds, and exposure between the shallow and the deep transects.

In general, the multiple measures used to assess the community structure and function indicated that where there were differences between the baseline and post-construction conditions, these differences tended to occur at both reference and impact stations along a given transect (Table 16).

Transect 1: Western Tidal Flat

Disturbance was anticipated on the western tidal flat (Transect 1) because the predominantly fine-grained sediment were predicted to be easily mobilized. There was little evidence of this disturbance in either median grain size or TOC levels. The only station exhibiting a substantial change in median grain size was the southern reference station B05 where sediments became finer and changed in classification from sand to silt. TOC did increase at each station, but this was consistent at both control and impact stations and did not exceed the 3% level that could suggest an ecological effect.

Benthic community structure along Transect 1 was similar between the baseline and the post-construction collections at all stations except for impact Station B03. When considering only the post-construction collections, however, Station B03 was similar to post-construction reference Stations B01 and B05 as well as all other post-construction and baseline collections. This observation was also supported by the fact that ANOVA testing of abundance and species richness of the post-construction collections found no significant differences among stations. Both parameters were higher in post-construction than baseline samples and consequently diversity was higher as well. Evenness was similar to baseline levels at around 70%. These measures suggest a well-balanced community in which a number of species achieved relatively high abundance, but no single species dominated. Only at Station B03 was there an increase in the proportion of opportunistic species and in this case, opportunist (*Streblospio benedicti*) abundance increased from 181 individuals/0.04 m^2 to 253/0.04 m^2. Three other stations (B01, B04 and B05) actually had higher abundances of *S. benedicti* in the baseline collections, suggesting the counts at B03 should not be of concern. All the stations along Transect 1 supported the same top dominants and there was no change in the proportion of surface deposit feeders in the post-construction samples.

One species that showed higher abundances in the post-construction than baseline collections was the tube-dwelling and mat-forming amphipod *Ampelisca abdita*. By forming mats, *A. abdita* has been found to stabilize sediments and its presence has been associated with a deepening of oxygenated sediments (Rutecki et al. 2020), an indication of good sediment quality. In addition, this species is a favored food resource for juvenile winter flounder (Stehlik and Meise 2000). Abundances of this species can fluctuate widely between years and spatially; Rutecki et al. (2020) reported that interannual differences in abundances in Boston Harbor can be associated with storm activity. Thus, while its presence is an indicator of good habitat conditions, its absence may not be an indicator of poor habitat.

Transect 2: Channel

Neither grain size nor TOC changed substantially at any station on Transect 2. The sandy sediments in the channel contained very low TOC concentrations and reflect the relatively high currents in the channel (RPS 2016, 2017). Bathymetric surveys indicated that there are persistent but dynamic sand waves in the channel that could also disturb the benthic community.

In terms of benthic community structure in baseline collections, impact Stations B07 and B08 were similar to one another but distinctly different from the other stations on the transect. That difference continued to occur in the post-construction samples. This is likely related to the slightly coarser grain size at these stations (and reference Station B10) than at Stations B06 and

B09 which was reported in both surveys. This consistency in grain size between years suggests that Stations B07 and B08 are likely to continue to differ from the rest of the transect and any evaluation of resource condition would best be done by comparing to the same stations in the baseline period. Given that both stations were dominated by the arthropod *Tanaissus* sp. A in both years and this species was not common at most other stations, this might be a good indicator of recovery for these two stations. Both relative and absolute abundances of *Tanaissus* were higher in post-construction than baseline samples at both stations. Tanaids are tube dwelling organisms that brood their offspring in the tube. This behavior suggests that juveniles would not disperse very far from the source, hence that the baseline population was not disrupted substantially by cable installation.

At Station B09, the other impact station along this transect, abundance and species richness were higher following cable installation than during the baseline survey. Diversity and evenness remained about the same. The proportion of surface deposit feeders nearly doubled at this station after construction resulting in a quadrupling of the abundance of this feeding guild. As this change was the result of increases in numbers of species not considered opportunistic, then it does not appear to be a result of substrate disturbance. Community structure was similar to the reference stations (B06 and B10) in both baseline and post-construction surveys based on Bray-Curtis numerical classification. As the reference stations also showed similarity between the two surveys, there is no evidence suggesting Station B09 was experiencing lingering impacts from cable installation.

Transect 3: Channel Slope

Located along the eastern slope of the channel, Transect 3 stations are also subject to higher currents than the shallow transects. The proportion of fine-grained sediments remained low with the exception of reference stations B15 where fines went from 17% to 24% and median grain size from a phi of 1.5 (medium sand) to 2.5 (fine sand). This station also exhibited the highest TOC values observed in both surveys, changing from 1.4% to 3.4%. The post-construction TOC value could indicate a change in ecological condition for benthic infauna (Hyland et al. 2005) at reference Station B15. TOC at the other stations remained below 1%.

Biologically, total abundance, species richness and diversity in the post-construction samples were similar between the reference and impact stations. Evenness at impact stations B12 and B13 was lower than both reference stations in post-construction collections but only lower than B11 in baseline collections. This is because evenness reference station B15 increased between the periods from 0.6 to 0.7, more a reflection of changes at B15 than at the impact stations. Numerical classification indicated that community structure at all impact stations along this transect was similar to the reference stations for both survey periods. There were no substantial changes in the proportion of opportunistic species or in surface deposit feeders. In terms of dominant taxa, the proportion of the subsurface deposit feeding polychaete *Aricidea (Acmira) catherinae* did increase between surveys although this type of change is usually considered to indicate an increase in community stability. Differences between the impact stations and reference Station B15 may be related to differences in physical exposures. B15 is located directly west Welsh Cove whereas the other stations are located off a relatively straight shoreline. In addition, B15 is the closest station to Furber Strait where the bay narrows down, suggesting that current energy may differ between this site and other stations. Thus, comparisons to the northern reference station, B11, may be more useful in understanding post-construction characteristics.

Transect 4: Eastern Shallows

None of the stations along the easternmost transect (Transect 4) exhibited substantial changes in sediment conditions between the baseline and the post-construction surveys. Percent fines increased at all stations, but this did not result in a change in median phi size from sand to silt. TOC remained below 1% at all stations.

Both abundance and species richness were similar among stations following cable installation. Diversity increased at all stations except impact Station B17 compared to baseline levels. Post-construction diversity at B17 was lower than at both reference stations. This spatial pattern was also apparent in the evenness measure.

Numerical classification showed that reference Station B16 differed from the other stations on the transect and was biologically more similar to the stations on transect 3. Stations B17–B20 were similar to one another within each year but differed between surveys at a between-group similarity of slightly below 60%, the similarity level identified as denoting distinct species groupings (Table 7). None of the impact stations along this transect exhibited substantial increases in opportunistic species or surface deposit feeders. As was seen along transect 1, the amphipod *Ampelisca abdita* was dominant at the impact stations following cable installation. The reference stations also experienced an increase in amphipods in the post-construction stations. The predominant amphipod species there was *Grandidierella japonica*, an introduced species originating in Asia (Trott et al. 2020). *G. japonica* was first reported in Long Island Sound in 2013 and in Casco Bay in 2018 and, based on its reproductive habitats is most likely to have been spread via fouling on ships. It occurred in all of the stations along transects 3 and 4 and at least two stations on both transects 1 and 2 in the baseline collection (but not the 2014 survey). Its presence following construction, therefore, is not attributable to the project.

4.0 Conclusions

4.1 Bathymetry

Comparison of the 2019 pre-construction and the March and September 2020 post-construction bathymetric surveys showed that the cable installation created shallow trenches and associated ridges on the tidal flats and channel sideslopes of Little Bay. While many construction-related features remain visible in the aerial imagery, the September 2020 bathymetric mapping indicates that almost 96% of the area is within 0.33 ft of the pre-construction elevations a year after construction. In March 2020, 3 months after construction, trench depths on the tidal flats and channel sideslopes ranged from 0.33 to occasional holes over 2 ft deep. The ridges adjacent to the trenches were typically between 0.33 up to 1 ft high. In the channel bottom, the hydrologic forces maintaining the sand waves eliminated most evidence of the jet plow burial. In the 6-month period between the March 2020 and September 2020 bathymetric surveys, the trenches in some areas had partially infilled, and the ridges had partially leveled. On the channel bottom, the sand waves have almost fully obscured the cable route. It is expected that the effects of wind, waves, currents, and ice scour will continue to rework sediments to reduce and eliminate the remaining elevation changes created by the cable installation.

The exceptions are the concrete mattresses which were designed to be permanent installations protecting the cable sections where ledge prevented burial to full depth. The mattresses are settling in some locations, and accreting sediments in the mattress crevices. They are functioning as hard substrates as macroalgae colonize the surfaces and are providing food and shelter for a variety of invertebrates and fish.

4.2 Benthic Invertebrates

Eversource's Benthic Resource Monitoring Plan described several criteria for determining whether further examination of the benthic resources would be required after the 2020 post-construction monitoring. Specifically:

- 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.
- 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.
- 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).

Comparisons of data from the baseline and post-construction monitoring surveys indicate that that the benthic infaunal community within the area predicted to be affected by cable installation was similar to either reference stations, baseline conditions or both. Nothing in the results suggests that the habitat conditions or resources were reduced in quality and that differences were minor and likely attributable to natural variability. Transect 4 perhaps exhibited the greatest differences as indicated by the fact that numerical classification separated the 2020 collections from the 2019 collections at most stations. Because impact stations B17–B19 were similar to reference station B20 in both surveys, however, this separation appears to be indicative of natural variability rather than a project impact. Therefore, the criteria for determining the need for further monitoring have been satisfied and no additional bathymetric or benthic community monitoring is recommended.

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Figures

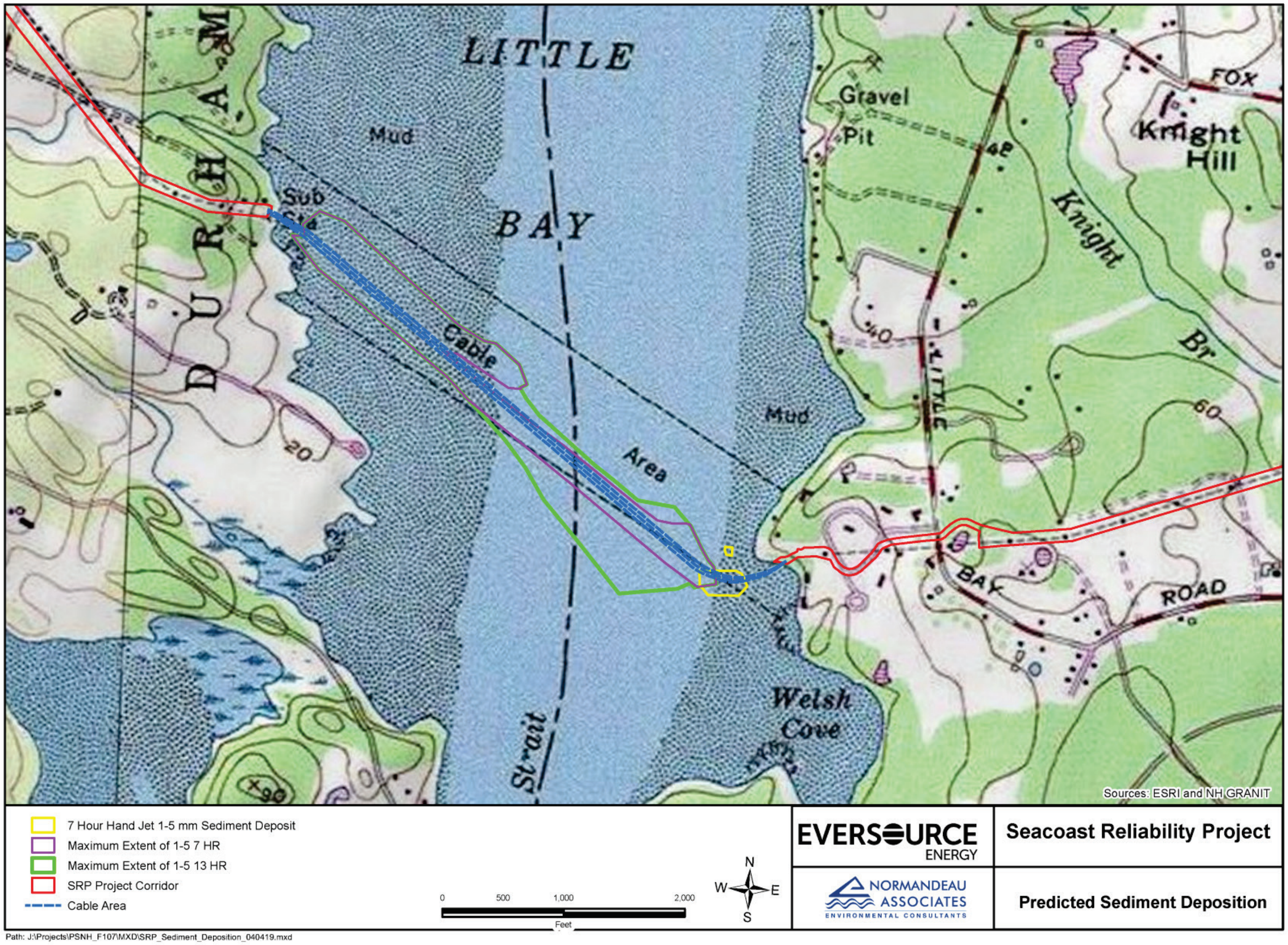

Figure 1. Area predicted to experience redeposition of sediments suspended during jet plowing or hand jetting.

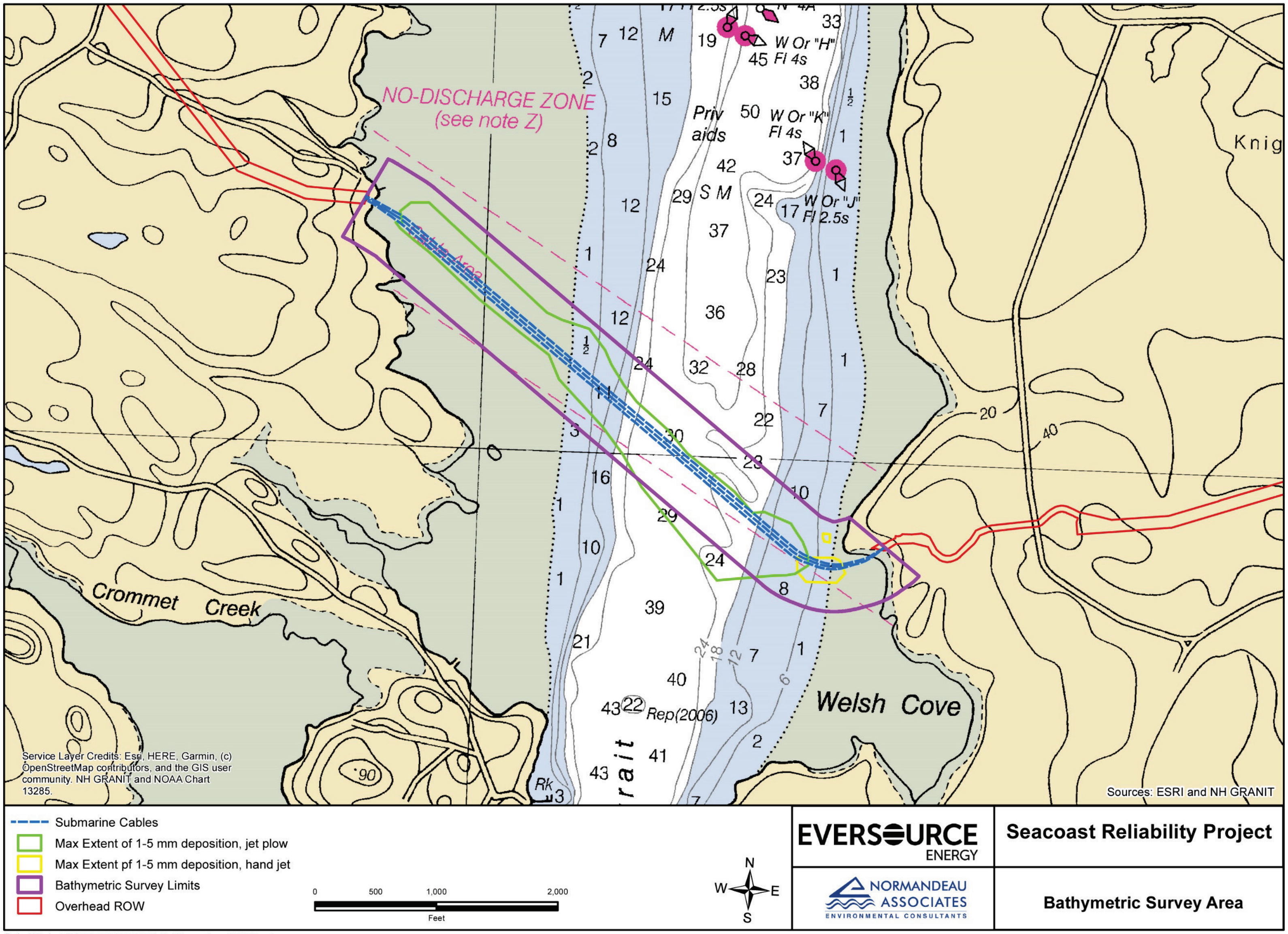

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Figure 2. Approximate extent of bathymetric survey coverage.

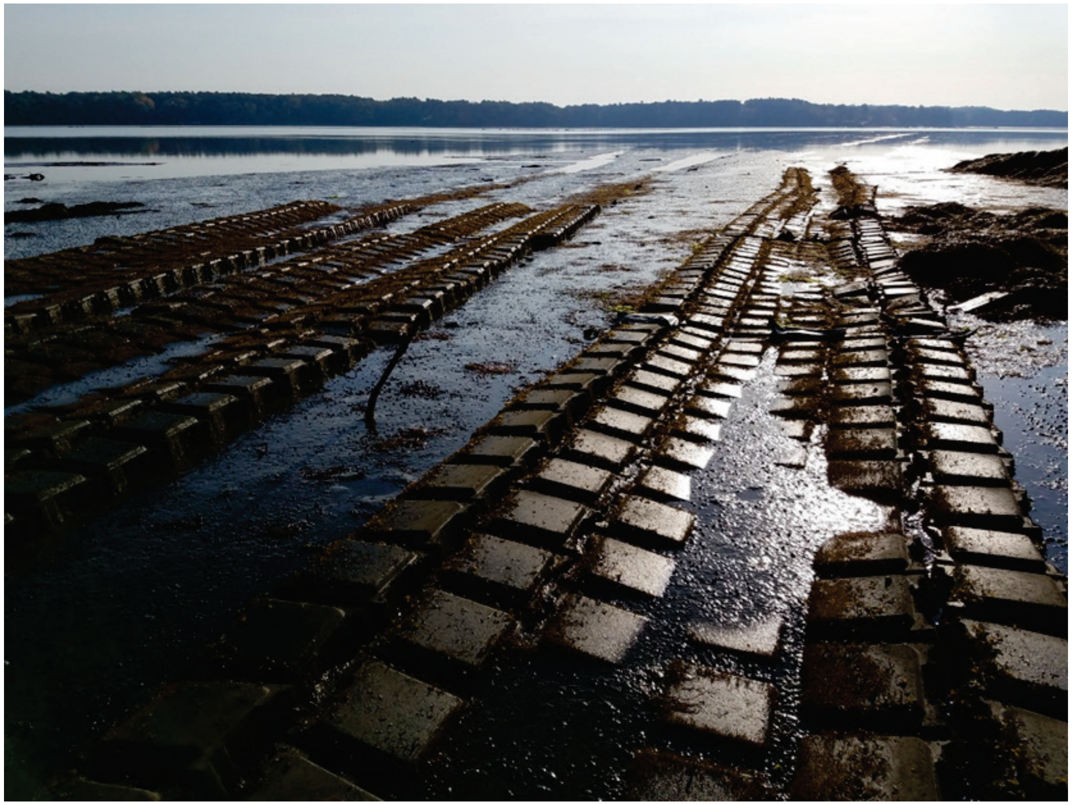

Figure 3. **SRP western tidal flats with concrete mattresses at spring low tide on October 19, 2020. Note the shallow trenches of the buried cables visible beyond the mattresses.**

Figure 4. **SRP concrete mattresses, with sediment, algae and snails on blocks, September 21, 2020.**

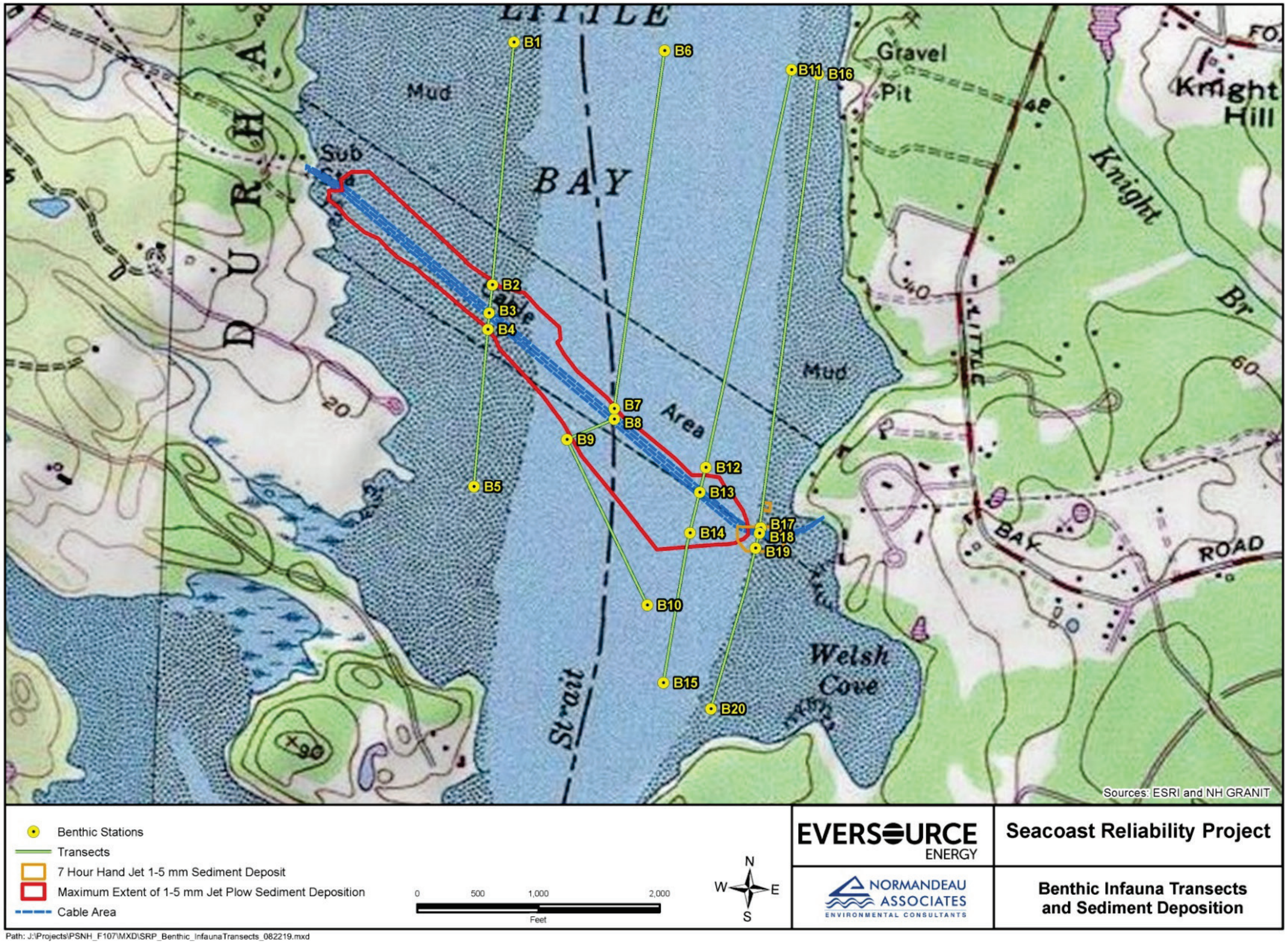

Figure 5. Location of benthic infauna monitoring stations relative to predicted deposition.

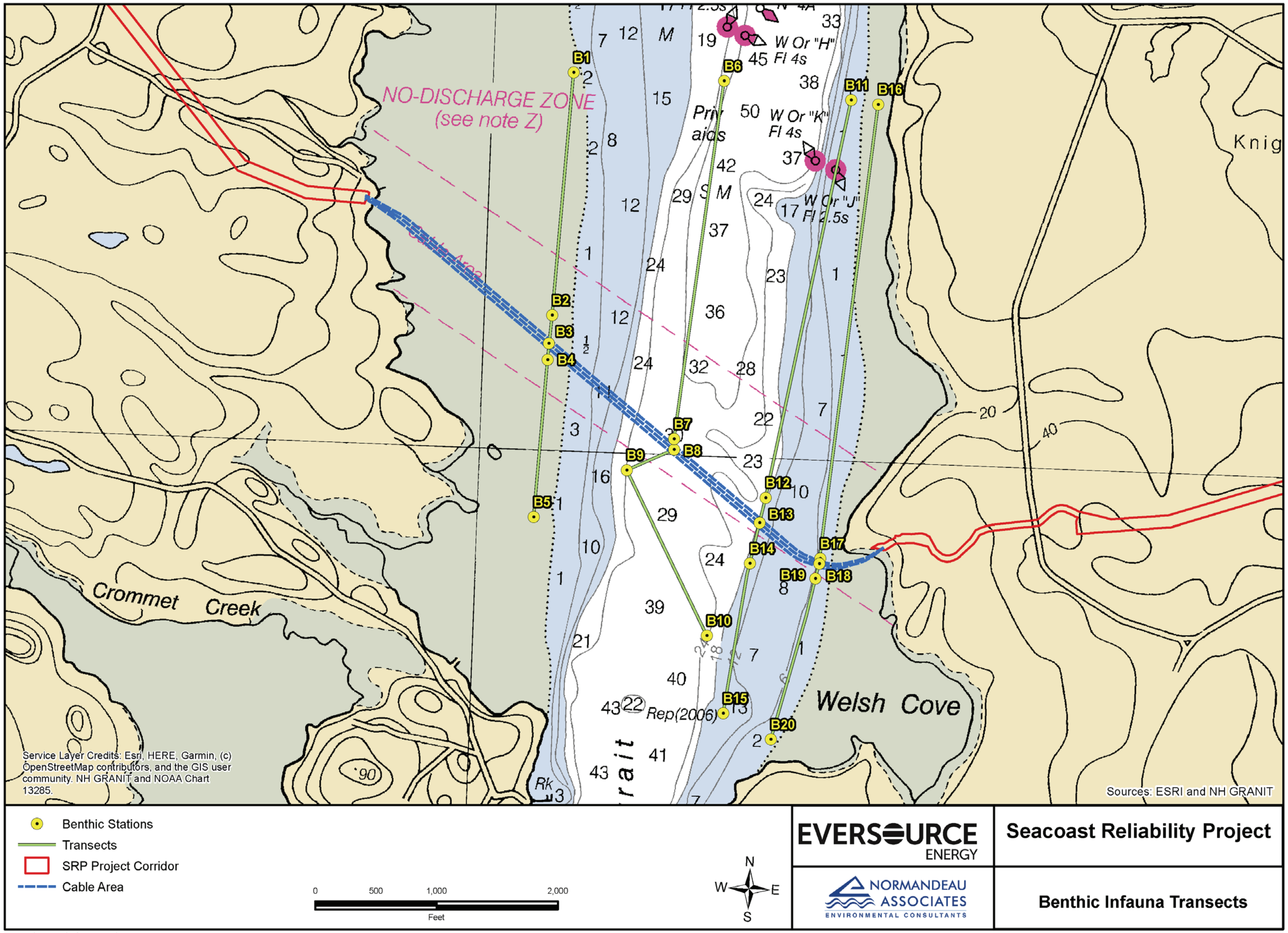

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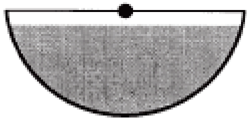
Figure 6. Location of benthic infauna monitoring stations relative to existing bathymetry.



Acceptable grab
At least 7 cm deep with even surface

Unacceptable grab
Sloping surface

Unacceptable grab
Insufficient volume

Unacceptable grab
Wash-out

Unacceptable grab
Overfilled

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

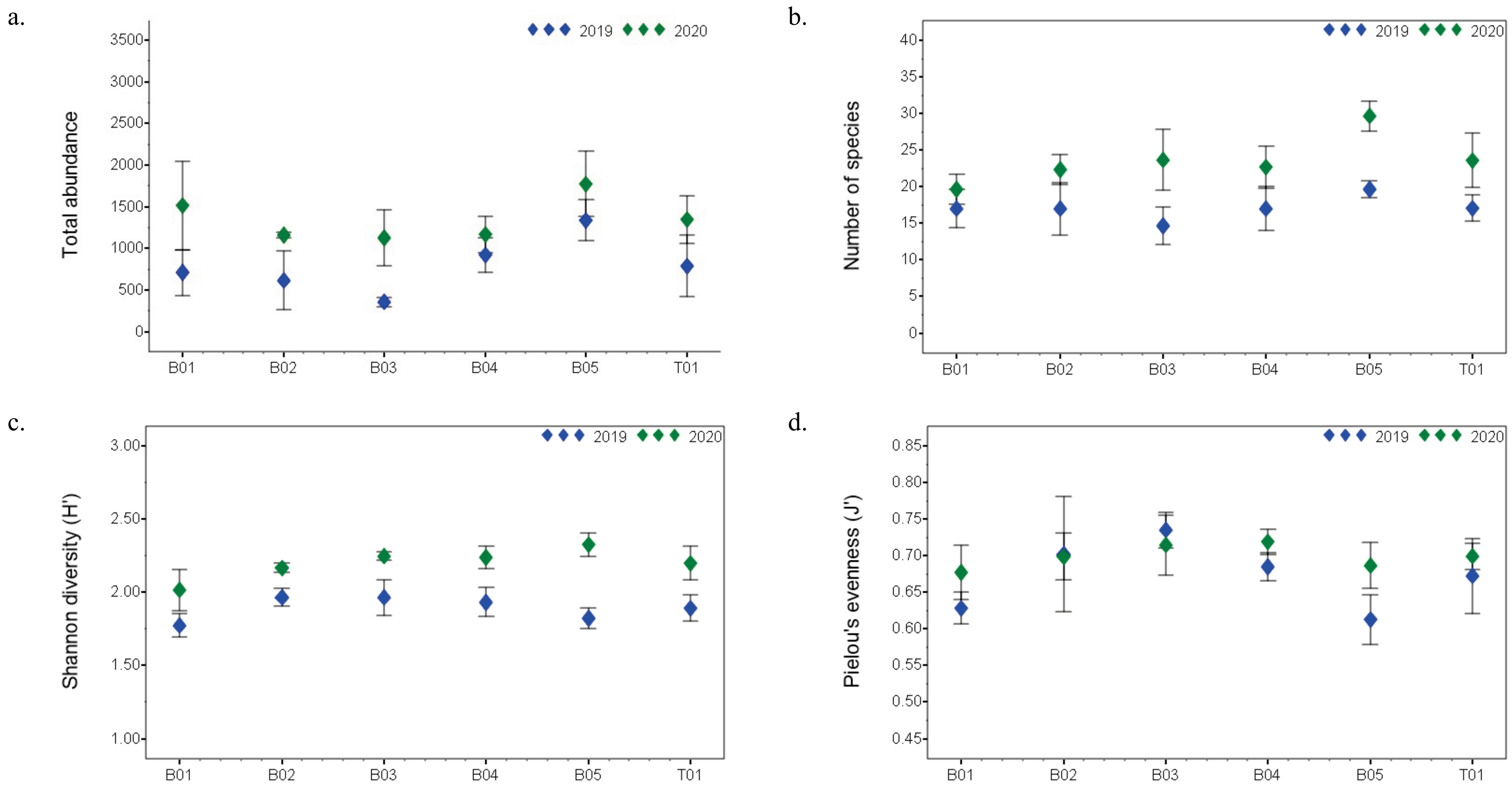


Figure 8. Biological parameters for Transect 1, Western Tidal Flat, during baseline (2019) and post-construction (2020) surveys.

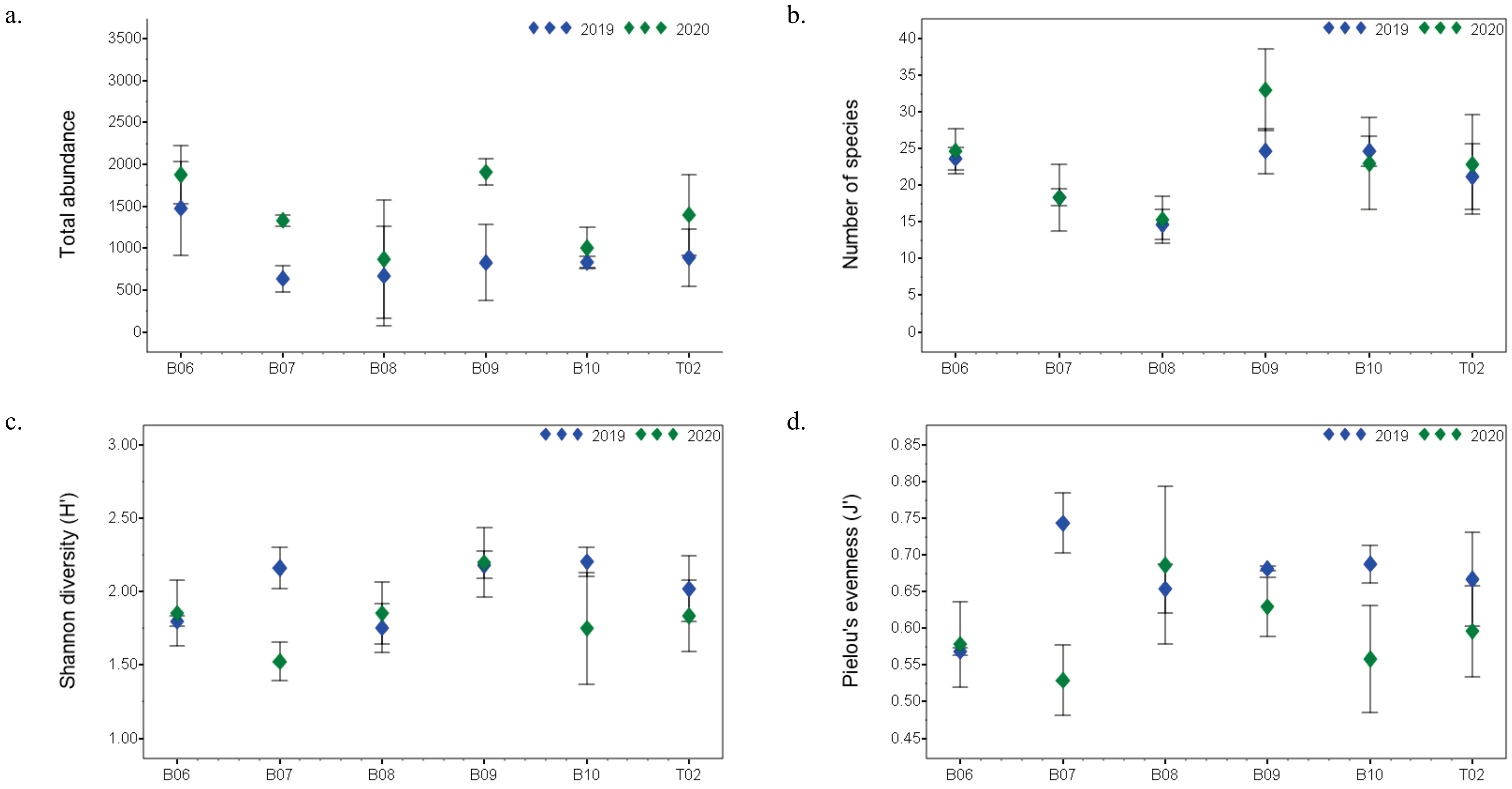


Figure 9. Biological parameters for Transect 2, Channel, during baseline (2019) and post-construction (2020) surveys.

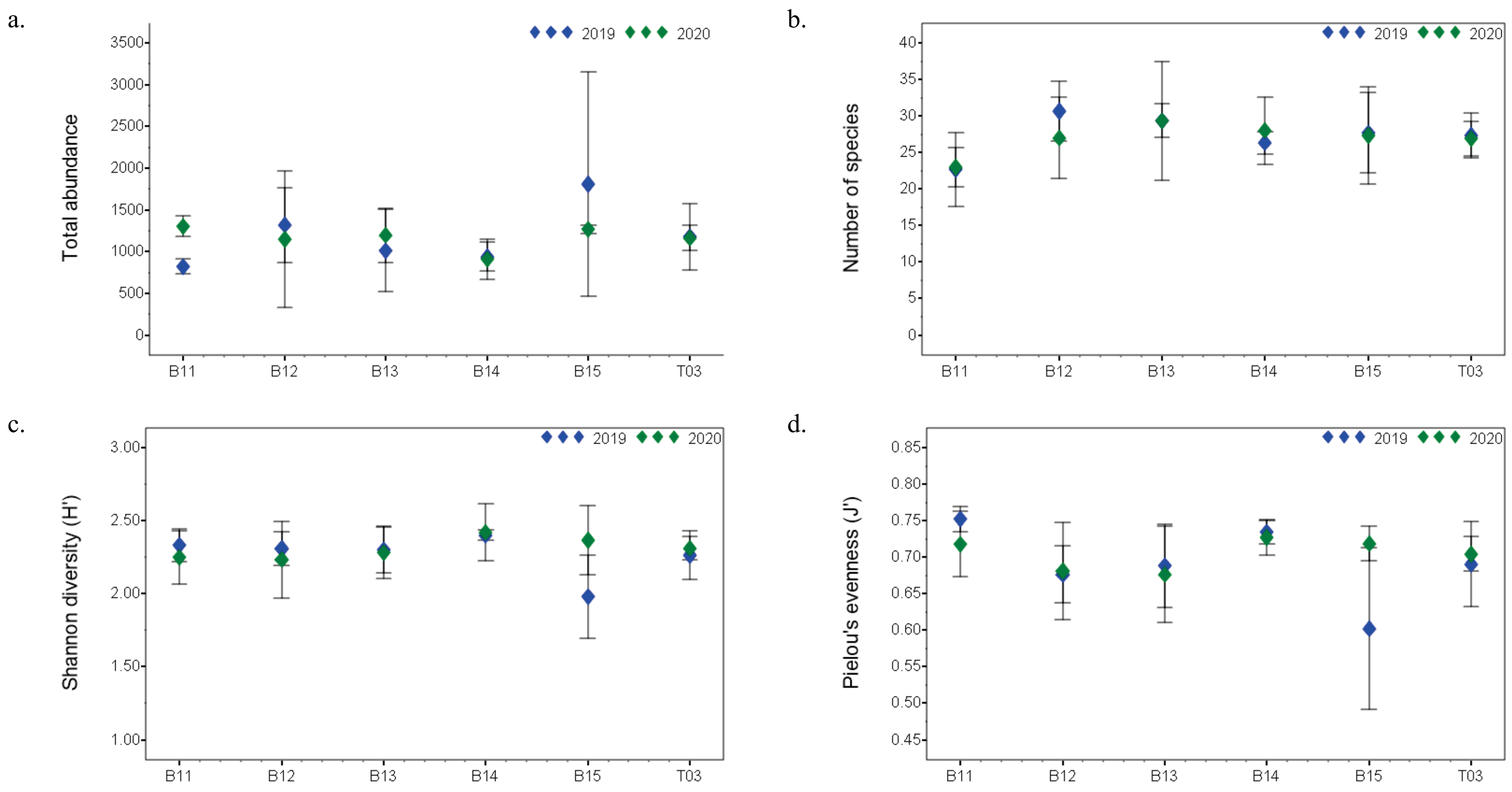


Figure 10. Biological parameters for Transect 3, Channel slope, during baseline (2019) and post-construction (2020) surveys.

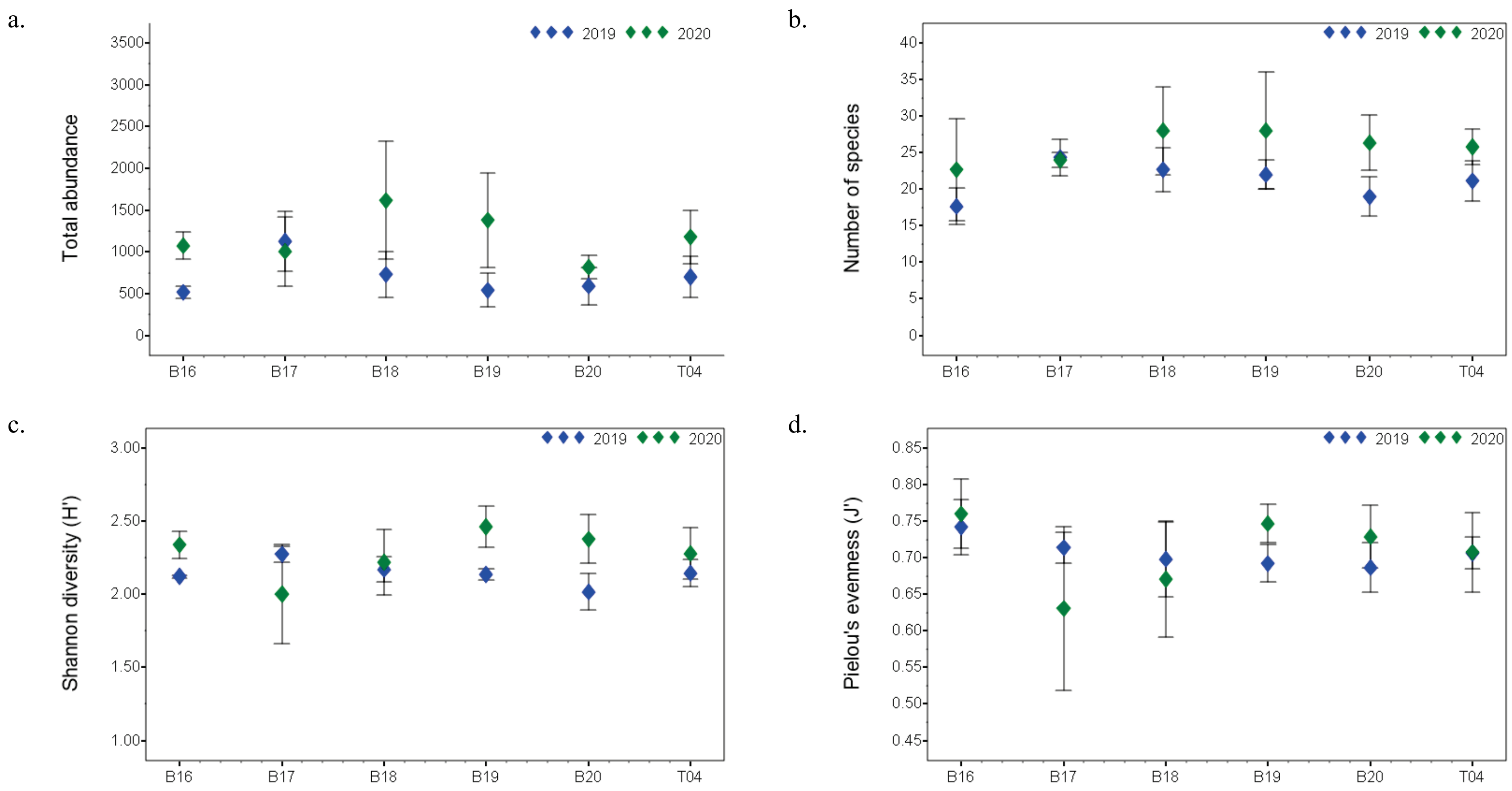


Figure 11. **Biological parameters for Transect 4, Eastern Shallow Subtidal, during baseline (2019) and post-construction surveys.**

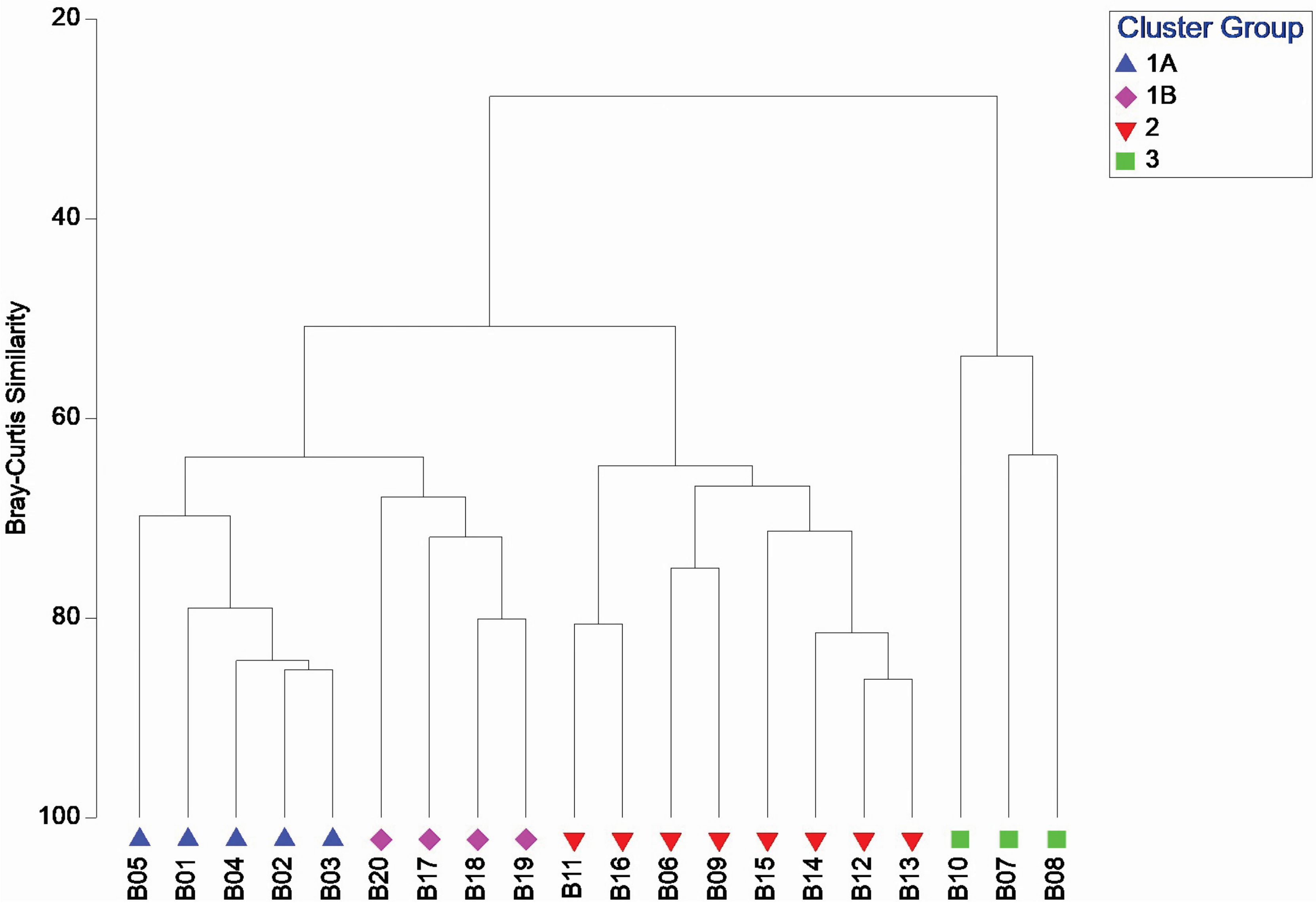


Figure 12. Dendrogram formed from numerical classification of mean of replicates collected along transects in the SRP project area during post-construction survey, August 2020.

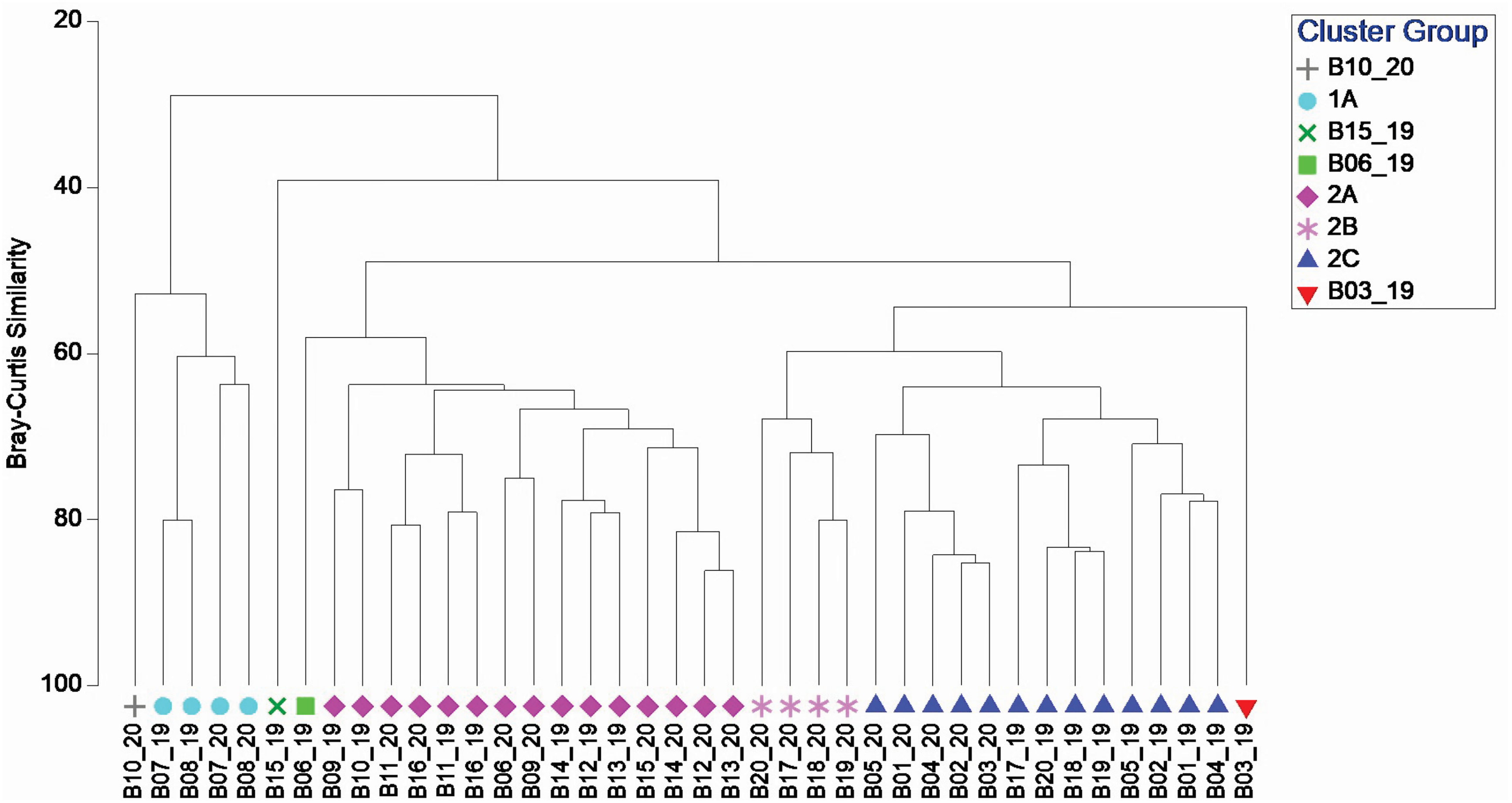


Figure 13. Dendrogram formed from numerical classification of mean of replicates collected along transects in the SRP project area during baseline (July-August 2019) and post-construction (August 2020) surveys.

Tables

Table 1. Multibeam Performance Test Results for Pre-Construction and Post-Construction Surveys

Performance Test Date	Mean Difference (Reference Surface – Check Line)	Maximum Outlier (Between Reference and Check Line)	Depth Standard Deviation (1-σ)	Depth Accuracy at 95% Confidence Level
09-02-2019	0.02 ft	0.38 ft	0.06 ft	0.12 ft
03-09-2020	-0.01 ft	0.37 ft	0.05 ft	0.10 ft

Table 2. Elevation Differences between 2019 Pre-construction and March 2020 Post-construction Conditions

Data represent Area (square ft) and Percent for the Construction-Dominated (East and West Sides) and Sand Wave-Dominated Sections of the Submarine Cable Crossing for the Full Corridor and the Narrow Corridor.

Depth category (ft)	Construction-dominated Sections (<25' Contour)		Sand wave-dominated Section (>25’ contour)	
	Area (square ft)	% of total corridor area	Area (square ft)	% of total corridor area
Full Corridor (230 m [740 ft] wide)				
>2.00	88	0.0%	940	0.1%
+1.01–2.00	253	0.0%	14,794	1.3%
+0.68–1.00	4,666	0.1%	24,492	2.1%
+0.34–0.67	51,944	1.4%	80,997	7.1%
+0.33–(-0.33)	3,677,335	97.0%	905,442	79.4%
(-0.34)–(-0.67)	41,360	1.1%	75,542	6.6%
(-0.68)–(-1.00)	9,742	0.3%	23,987	2.1%
(-1.01)–(-2.00)	3,661	0.1%	13,576	1.2%
>(-2.00)	65	0.0%	1,150	0.1%
Total	**3,789,114**	100.0%	**1,140,920**	**100%**
Narrow Corridor (94 m [300 ft] wide)				
>2.00	6	0.0%	170	0.0%
+1.01–2.00	87	0.0%	6,734	1.3%
+0.68–1.00	2,685	0.2%	12,672	2.4%
+0.34–0.67	35,241	2.6%	41,291	7.9%
+0.33–(-0.33)	1,258,067	94.2%	403,043	77.0%
(-0.34)–(-0.67)	30,954	2.3%	38,620	7.4%
(-0.68)–(-1.00)	6,646	0.5%	13,077	2.5%
(-1.01)–(-2.00)	2,088	0.2%	7,457	1.4%
>(-2.00)	54	0.0%	612	0.1%
Total	**1,335,828**	**100.0%**	**523,676**	**100.0%**

Table 3. Difference between March and September 2020 Post-Construction Conditions for the Narrow Corridor

Data represent areas (square ft) and Percent of Elevation Differences for the Construction-Dominated (East and West Sides) and Sand Wave-Dominated Sections of the Submarine Cable Crossing.

Depth category (ft)	Construction-dominated Sections (<25' Contour)		Sand wave-dominated Section (>25’ contour)	
	Area (square ft)	% of total corridor area	Area (square ft)	% of total corridor area
Narrow Corridor (94 m [300 ft] wide)				
>2.00	0	0.0%	336	0.1%
+1.01–2.00	38	0.0%	9,700	1.9%
+0.68–1.00	730	0.1%	15,537	3.0%
+0.34–0.67	4,325	0.3%	37,124	7.1%
+0.33–(-0.33)	1,328,044	99.4%	396,466	75.7%
(-0.34)–(-0.67)	2,617	0.2%	41,402	7.9%
(-0.68)–(-1.00)	13	0.0%	15,122	2.9%
(-1.01)–(-2.00)	15	0.0%	7,633	1.5%
>(-2.00)	10	0.0%	356	0.1%
Total	**1,335,792**	**100.0%**	**523,676**	**100.0%**

Table 4. Difference between 2019 Pre-Construction and September 2020 Post-Construction Conditions for the Narrow Corridor

Data represent areas (square ft) and Percent of Elevation Differences for the Construction-Dominated (East and West Sides) and Sand Wave-Dominated Sections of the Submarine Cable Crossing.

Depth category (ft)	Construction-dominated Sections (<25' Contour)		Sand wave-dominated Section (>25’ contour)	
	Area (square ft)	% of total corridor area	Area (square ft)	% of total corridor area
Narrow Corridor (94 m [300 ft] wide)				
>2.00	0	0.0%	1,691	0.3%
+1.01–2.00	178	0.0%	18,378	3.5%
+0.68–1.00	2,718	0.2%	23,395	4.5%
+0.34–0.67	6,608	0.5%	50,114	9.6%
+0.33–(-0.33)	1,281,156	95.9%	339,537	64.8%
(-0.34)–(-0.67)	39,695	3.0%	48,893	9.3%
(-0.68)–(-1.00)	3,958	0.3%	21,656	4.1%
(-1.01)–(-2.00)	1,510	0.1%	18,715	3.6%
>(-2.00)	5	0.0%	1,297	0.2%
Total	**1,335,828**	**100.0%**	**523,676**	**100.0%**

Table 5. Coordinates of Benthic Infauna Monitoring Stations

Transect	Purpose	Station	Latitude	Longitude	Transect	Purpose	Station	Latitude	Longitude
Intertidal (West)	Reference	B01	43.10856	-70.8642	Slope	Reference	B11	43.10817	-70.85577
	Impact	B02	43.10305	-70.8646		Impact	B12	43.09911	-70.8578
		B03	43.10241	-70.8646			B13	43.09854	-70.8579
		B04	43.10204	-70.8647			B14	43.09762	-70.8582
	Reference	B05	43.09848	-70.8649		Reference	B15	43.09421	-70.8588
Channel	Reference	B06	43.10850	-70.8595	Shallow Subtidal	Reference	B16	43.10817	-70.8553
	Impact	B07	43.10036	-70.8607		Impact	B17	43.09779	-70.856
		B08	43.10012	-70.8606			B18	43.09767	-70.856
		B09	43.0986	-70.8623			B19	43.09733	-70.8561
	Reference	B10	43.09563	-70.85902		Reference	B20	43.09366	-70.8573

Table 6. 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]
B01	Tidal flat reference	3	1	3	1
B02	Tidal flat deposition	3	1	3	1
B03	Tidal flat jet plow	3	1	3	1
B04	Tidal flat deposition	3	1	3	1
B05	Tidal flat reference	3	1	3	1
B06	Channel reference	3	1	3	1
B07	Channel deposition	3	1	3	1
B08	Channel jet plow	3	1	3	1
B09	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

Table 7. 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)
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 stations within 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

(continued)

Table 7. Continued.

Parameter	Rationale for Including	Criterion for Acceptance (Comparison of BACI and Impact to Non-impact Stations within same depth zone)
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

Table 8. 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 which reflect the more stable component of the community (Nestler et al. 2013).
Similarity of Dominant Species	Benthic infauna 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).

Table 9. Sediment grain size (percent) and total organic carbon (percent) at benthic infaunal stations during post-construction monitoring, August 2020, compared to baseline conditions in July-August 2019.

		Station																			
		Western Tidal Flat (T1)					Channel (T2)					Channel Slope (T3)					Eastern Shallow Subtidal (T4)				
Parameter		**B01**	**B02**	**B03**	**B04**	**B05**	**B06**	**B07**	**B08**	**B09**	**B10**	**B11**	**B12**	**B13**	**B14**	**B15**	**B16**	**B17**	**B18**	**B19**	**B20**
2020 Post-construction Conditions																					
Gravel	**Coarse**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2
	Med.	0	0	0	0	0	0	0	0	0	0	0	5	0	0	2	0	0	0	0	8
	Fine	0	0	0	0	0	0	0	0	0	1	0	3	1	0	0	0	0	7	3	5
	V. Fine	0	0	0	0	1	0	0	0	0	1	1	1	0	1	2	1	0	2	2	3
Sand	**Very Coarse**	0	0	1	1	0	1	1	1	1	0	1	0	0	0	0	1	0	1	1	2
	Coarse	0	1	0	0	1	0	3	17	0	5	8	1	1	1	1	7	1	3	3	2
	Med.	1	0	1	1	0	1	66	69	4	66	18	6	45	11	3	19	3	13	7	8
	Fine	0	2	1	1	2	36	22	4	67	21	53	73	43	71	35	48	16	31	19	19
	V. Fine	20	33	41	36	35	49	1	1	21	3	13	7	3	8	29	14	49	29	29	33
Silt		64	54	47	50	50	13	7	6	7	1	6	3	6	7	24	9	29	13	29	16
Clay		15	10	9	11	11	0	0	2	0	2	0	1	1	1	3	1	2	1	7	3
% Fines		***79***	***64***	***56***	***61***	***61***	***13***	***7***	***8***	***7***	***3***	***6***	***4***	***7***	***8***	***27***	***10***	***31***	***14***	***36***	***19***
Median Phi Size[a]		***6***	***6***	***6***	***6***	***6***	***2.5***	***2***	***1.5***	***2***	***1.5***	***2***	***2***	***1.5***	***2***	***2.5***	***2***	***3.5***	***2.5***	***3.5***	***2.5***
Total Organic Carbon		1.51	1.16	1.025	1.25	1.175	1.065	0.105	0.12	0.825	0.165	0.21	0.195	0.51	0.435	3.36	0.2	0.43	0.285	0.975	0.395
2019 Baseline Conditions																					
% Fines		***78***	***51***	***56***	***54***	***43***	***9***	***2***	***4***	***10***	***5***	***4***	***7***	***6***	***4***	***17***	***7***	***25***	***22***	***35***	***33***
Median Phi Size[a]		6	6	6	6	3.5	2.5	1.5	1.5	2.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	3.5	3.5	3.5	3.5
Total Organic Carbon		0.865	0.565	0.64	0.57	0.59	0.40	<0.2	<0.2	0.315	<0.2	<0.2	<0.2	0.1	0.235	1.38	<0.2	0.275	0.265	0.44	0.325

[a] Phi categories:
clay = 8 to 10
silt = 4 to 8
very fine sand = 3 to 4
fine sand = 2 to 3
medium sand = 1 to 2
coarse sand = 0 to 1
very coarse sand = -1 to 0
very fine gravel = -1 to -2
fine gravel = -2 to -3
medium gravel = -4 to -3
coarse gravel = -4 to -5

Table 10. Species Richness, Abundance (no./0.04 m^2), Shannon Weiner Diversity (H′) and Pielou's Evenness (J′) of Replicate Samples Collected during Post-Construction Survey August 2020

Station	#Species	Abundance	H'(Loge)	J'
B01	19.7	1516	2.02	0.68
B02	22.3	1160	2.17	0.70
B03	23.7	1126	2.25	0.71
B04	22.7	1167	2.24	0.72
B05	29.7	1772	2.33	0.69
Transect 1 mean	***23.6***	***1348***	***2.20***	***0.70***
B06	24.7	1876	1.85	0.58
B07	18.3	1331	1.52	0.53
B08	15.3	870	1.85	0.69
B09	33.0	1907	2.20	0.63
B10	23.0	1002	1.75	0.56
Transect 2 mean	***22.9***	***1397***	***1.84***	***0.60***
B11	23.0	1302	2.25	0.72
B12	27.0	1148	2.23	0.68
B13	29.3	1196	2.28	0.68
B14	28.0	910	2.42	0.73
B15	27.3	1266	2.37	0.72
Transect 3 mean	***26.9***	***1164***	***2.31***	***0.70***
B16	22.7	1074	2.34	0.76
B17	24.0	1004	2.00	0.63
B18	28.0	1616	2.22	0.67
B19	28.0	1378	2.46	0.75
B20	26.3	817	2.38	0.73
Transect 4 mean	***25.8***	***1178***	***2.28***	***0.71***

Table 11. Results of One-Way ANOVA Comparing Abundance and Species Richness at Stations within Transects in Post-Construction and Baseline Surveys

Parameter	Survey	Transect	F[a]	Pr>F	Range test[b]
Abundance	Post-construction	T1	2.05	0.1632	
		T2	4.92	0.0188*	B09 B06 B07 B10 B08
		T3	0.42	0.7891	
		T4	1.46	0.2857	
	Baseline	T1	6.62	0.0072*	B05 B04 B01 B02 B03
		T2	1.94	0.1801	
		T3	1.03	0.4376	
		T4	3.12	0.0656*	B17 B18 B20 B19 B16
Species Richness	Post-construction	T1	5.31	0.0148*	B05 B03 B04 B02 B01
		T2	6.25	0.0087*	B09 B06 B10 B07 B08
		T3	0.78	0.5644	
		T4	0.52	0.7206	
	Baseline	T1	1.28	0.3402	
		T2	14.02	0.0004*	B10 B09 B06 B07 B08
		T3	1.02	0.4424	
		T4	3.40	0.0531*	B17 B18 B19 B20 B16

*significant difference at $p<0.1$

[a] F = variation between sample means / variation within the samples

[b] stations listed in descending order. Underlined stations statistically similar based on Tukey's Test.

Table 12. Abundance (No./0.04m^2) of Dominant Taxa (Top Ten in Any Group) in Groups Formed by Numerical Classification of Mean Abundances at Stations in the SRP Project Area in Post-Construction Collections

MAJOR TAXON	SPECIES	Group 1A	Group 1B	Group 2	Group 3
Polychaeta	Aricidea (acmira) catherinae	-	9.5	239.6	258.1
	Scolelepis (parascolelepis) texana	23.2	71.1	133.4	18.4
	Cirratulidae	4.4	2.0	38.4	0.7
	Heteromastus filiformis	79.6	32.7	4.5	0.7
	Hypereteone heteropoda	20.3	28.1	13.6	0.7
	Leitoscoloplos robustus	21.6	12.8	2.8	0.2
	Paraonis fulgens	-	-	0.2	32.7
	Pygospio elegans	3.5	5.0	2.9	17.0
	Scoletoma tenuis	53.9	54.3	24.8	0.7
	Streblospio benedicti	284.5	250.9	57.9	2.9
	Streptosyllis varians	-	-	-	25.3
	Tharyx acutus	62.4	54.0	146.0	4.9
Oligochaeta	Oligochaeta	203.2	49.5	179.4	57.8
Gastropoda	Tritia obsoleta	28.9	1.3	3.6	0.4
Bivalvia	Ameritella agilis	4.7	6.5	17.3	25.6
Arthropoda	Acanthohaustorius millsi	-	-	0.1	57.3
	Ampelisca abdita	148.5	257.6	4.3	2.2
	Grandidierella japonica	18.9	80.8	71.0	6.2
	Melita nitida	10.2	14.7	17.4	0.7
	Microdeutopus gryllotalpa	49.9	42.0	28.7	0.7
	Rhepoxynius hudsoni	-	-	0.3	32.2
	Tanaissus sp. a nai	-	0.3	0.6	373.2

Table 13. Abundance (No./0.04 m^2) of Dominant Taxa (Top Ten Taxa within any Group) within Groups Formed by Numerical Classification of Mean Abundances at Stations in the SRP Project Area Comparing Baseline and Post-Construction Collections

MAJOR TAXON	SPECIES	Group 1		Group 2					
		B10-20	Group 1A	B15-19	B06-19	Group 2A	Group 2B	Group 2C	B03-19
Polychaeta	*Aricidea (Acmira) catherinae*	464.0	87.9	84.7	150.0	176.3	9.5	1.7	0.7
	Scolelepis (Parascolelepis) texana	50.0	18.0	9.3	168.0	126.2	71.1	26.6	6.0
	Cirratulidae	2.0	0.2		34.7	31.3	2.0	8.9	2.7
	Fabricia stellaris		0.5	41.3	0.7	0.3	1.3		
	Heteromastus filiformis	0.7	0.3	7.3	5.3	8.3	32.7	95.2	60.0
	Hypereteone heteropoda	0.7	2.2	28.0	38.7	19.6	28.1	20.3	1.3
	Leitoscoloplos robustus		0.2	0.7	26.7	2.8	12.8	16.6	8.0
	Neanthes arenaceodentata	12.0	0.7	0.7	8.7	7.1	4.0		
	Paraonis fulgens	24.7	21.3			3.6			
	Polycirrus sp.	0.7	0.2	29.3		2.5			
	Polydora cornuta	4.0		219.3		10.5	5.3	5.0	0.7
	Pygospio elegans	4.0	67.4	1.3	10.7	9.5	5.0	8.4	-
	Scoletoma tenuis		0.5	20.0	14.0	17.2	54.3	77.9	105.3
	Spio filicornis	0.7	2.3	8.0	54.7	12.7	14.3	5.4	5.3
	Streblospio benedicti	4.7	23.7	36.7	171.3	76.8	250.9	262.4	52.0
	Streptosyllis varians	3.3	21.8			0.1			
	Tharyx acutus	14.0	0.5	40.7	690.7	157.5	54.0	115.2	58.7
Oligochaeta	Oligochaeta	3.3	82.7	29.3	22.7	156.2	49.5	112.1	-
Gastropoda	*Haminella solitaria*							0.9	11.3
	Tritia obsoleta	1.3				2.1	1.3	17.6	25.3
Bivalvia	*Ameritella agilis*	29.3	17.7	0.7	32.0	13.6	6.5	3.1	1.3
	Mulinia lateralis						1.3	5.4	10.0
Arthropoda	*Acanthohaustorius millsi*	34.0	77.7			1.0			
	Ampelisca abdita	6.0	0.2		2.0	2.8	257.6	59.7	0.7
	Grandidierella japonica	18.7		25.0	4.7	56.0	80.8	9.7	
	Melita nitida	2.0		579.0		18.1	14.7	4.2	
	Microdeutopus gryllotalpa	2.0		555.3	1.3	25.7	42.0	19.9	
	Rhepoxynius hudsoni	47.3	20.7			0.8			
	Tanaissus sp. a nai	210.3	325.6			7.7	0.3	0.1	

Table 14. Occurrence of Opportunistic Species in Baseline and Post-Construction Monitoring Samples

Transect	Station	Relative Abundance (% of mean no./0.04 m^2) of all Opportunists[a]	
		Baseline (2019)	Post-construction (2020)
Western Tidal Flat (Transect 1)	B01	27.3 (PC, SB)	17.9 (PC, SB)
	B02	27.9 (SB)	28.2 (PC, SB)
	B03	14.2 (PC, SB)	23.0 (PC, SB)
	B04	28.0 (PC, SB)	22.0 (PC, SB)
	B05	29.7 (PC, SB, CC)	19.1 (PC, SB)
	Trans Mean	25.4	22.0
	Ref Sta Mean	28.5	18.5
	Impact Sta Mean	23.4	24.4
Channel (Transect 2)	B06	11.4 (SB)	2.9 (PC, SB, CC)
	B07	10.2 (SB)	0.4 (SB, CC)
	B08	3.5 (SB)	0.0
	B09	9.9 (PC, SB, CC)	5.5 (PC, SB, CC)
	B10	5.1 (PC, SB, CC)	1.7 (PC, SB, CC)
	Trans Mean	8.0	2.1
	Ref Sta Mean	8.3	2.3
	Impact Sta Mean	7.9	2.0
Slope (Transect 3)	B11	13.0 (PC, SB, CC)	4.1 (PC, SB, CC)
	B12	16.3 (PC, SB, CC)	4.7 (PC, SB, CC)
	B13	16.0 (PC, SB, CC)	4.6 (PC, SB, CC)
	B14	14.8 (PC, SB, CC)	9.8 (PC, SB, CC)
	B15	14.8 (PC, SB, CC)	6.3 (PC, SB)
	Trans Mean	15.0	5.9
	Ref Sta Mean	13.9	5.2
	Impact Sta Mean	15.7	6.4
Eastern Shallow Subtidal (Transect 4)	B16	14.9 (PC, SB, CC)	5.4 (PC, SB)
	B17	31.1 (PC, SB,CC)	18.7 (PC, SB)
	B18	32.6 (PC, SB, CC)	24.1(PC, SB)
	B19	30.5 (PC,SB)	21.2 (PC, SB)
	B20	34.0 (PC, SB)	18.4 (PC, SB)
	Trans Mean	28.6	17.6
	Ref Sta Mean	24.5	11.9
	Impact Sta Mean	31.4	21.3

[a] PC = *Polydora cornuta*; SB = *Streblospio benedicti*; CC = *Capitella capitata* complex

Table 15. Relative Abundance and Feeding Type of Dominant Taxa by Station during Post-Construction Monitoring Collections (August 2020) along the SRP Survey Area Compared to Baseline (July-August 2019) Conditions

Taxon	Feeding type	Relative abundance (% of mean no. of individuals per 0.04 m^2)																			
		B01	B02	B03	B04	B05	B06	B07	B08	B09	B10	B11	B12	B13	B14	B15	B16	B17	B18	B19	B20
Scoletoma tenuis	C (s)	*	*	*	*	*	*	*		*		*	*	*	*	11.2	*	*	*	*	11.1
Aricidea (Acmira) catherinae	SSD						33.3	22.0	*	30.2	46.3	13.2	18.4	28.3	18.9	*	*	*	*	*	*
Streblospio benedicti	SD	21.4	34.9	28.1	27.6	22.0	*	*		*	*	*	*	*	*	*	*	20.1	25.5	23.6	19.6
Scolelepis (Parascolelepis) texana	SD	*	*	*	*	*	12.3	*		15.2	*	11.0	*	13.8	12.1	11.4	11.8	*	*	*	*
Cirratulidae	SD		*	*	*	*	*			*	*	*	*	*	*	*	12.7	*	*	*	*
Tharyx acutus	SD	11.0	*	*	*	*	27.3		*	13.4	*	16.4	10.7	*	13.4	*	*	*	*	*	*
Heteromastus filiformis	SSD	*	*	11.2	11.8	*	*	*		*	*	*	*			*	*	*	*	*	*
Oligochaeta	SSD	32.7	12.3	15.2	11.9	15.8	*	*	19.4	15.4	*	19.5	30.1	16.8	18.5	22.8	14.4	*	*	*	*
Tanaissus sp. A	C/F							51.1	36.7	*	22.8	*		*	*		*	*			
Ampelisca abdita	SD/F	11.7	14.8	13.4	15.8	12.5	*			*	*	*	*	*	*	*		39.8	29.3	11.4	*
Acanthohaustorius millsi	SSD							*	13.1	*	*										
Grandidierella japonica	H	*	*	*	*	*	*			*	*	*	*	*	*	12.9	14.6	*	*	*	25.2
Post-Construction Monitoring Summary																					
Total %		**76.8**	**62.0**	**67.9**	**67.1**	**50.3**	**72.9**	**73.1**	**69.2**	**74.2**	**69.1**	**60.1**	**59.2**	**58.9**	**62.9**	**58.3**	**53.5**	**59.9**	**54.8**	**35.0**	**55.9**
% by feeding type	**C(s)**															11.2					11.1
	SSD	32.7	12.3	26.4	23.7	15.8	33.3	22	32.5	45.6	46.3	32.7	48.5	45.1	37.4	22.8	14.4				
	SD/F	11.7	14.8	13.4	15.8	12.5												39.8	29.3	11.4	
	SD	32.4	34.9	28.1	27.6	22	39.6			28.6		27.4	10.7	13.8	25.5	11.4	24.5	20.1	25.5	23.6	19.6
	C/F							51.1	36.7		22.8										
	H															12.9	14.6				25.2
Baseline Summary																					
Total %		**76.6**	**77.1**	**72.4**	**75.4**	**69.7**	**67.3**	**56.4**	**74.2**	**45.3**	**63.6**	**53.0**	**65.9**	**55.8**	**43.5**	**71.4**	**71.3**	**52.3**	**56.1**	**70.5**	**76.1**
% by feeding type	**C(s)**	16.2	20.8	27.6	13.7														12.6	9.9	14.1
	SSD	10.5	12.3	15.7	20.7	14.5	10	11.9	29.7	16.5	36.5	25.2	13.8	21.4	12		16.2		11.6	15.8	15.9
	SD/F															11.6					
	SD	49.9	44.1	29	40.9	55.3	68.5	10.2		15.5	27.1	39.8	52.2	34.4	35		55	52.3	44.5	44.7	46
	C/F							26.6	31	13.3											
	H															59.8					

*present but <10%

Feeding types: C(s) = subsurface carnivore; SSD = subsurface deposit feeder; SD/F = surface deposit feeder; F = filter feeder; H = herbivore (grazer)

In % by feeding type = shading reflects feeding type represents 25% or more of the community abundance

Table 16. Summary of Evaluation of Potential Effects of Installation of SRP Cables across Little Bay

		Transect 1 (B01-B05)	Transect 2 (B06-B10)	Transect 3 (B11-B15)	Transect 4 (B16-B20)
Physicochemical Parameters					
Median Grain Size	Did any stations change from silt to sand or sand to silt?	Ref Station B05 (sand to silt)	No	No	No
TOC	Did TOC exceed 3%?	No	No	Ref Station B15	No
Primary Biological Parameters					
Abundance	Were impact stations similar to reference stations in post-construction samples?	Yes	Yes	Yes	Yes
Species Richness	Were impact stations similar to reference stations in post-construction samples?	Yes	Yes	Yes	Yes
Diversity	Were post-construction results similar to baseline results?	Post-construction higher	Post-construction similar or lower	Variable; but generally similar	Most stations higher
	Were impact stations similar to reference stations in post-construction samples?	Impact stations within range of reference stations	Impact station B07 low; others equal to or higher than reference stations	Impact stations within range of reference stations, except B09 higher	Impact station B17 lower; B19 higher than reference station range
Evenness	Were post-construction results similar to baseline results?	Within range of baseline	Slightly lower than baseline	Similar to baseline range; B15 higher in post-construction	Similar to baseline range except B17 low
	Were impact stations similar to reference stations in post-construction samples?	All impact stations higher than reference stations	B07 lower than reference stations; B08 and B09 higher than reference stations	B12 and B13 lower than reference stations	B17 and B18 lower than reference stations
Community Structure	Were impact stations similar to reference stations in post-construction collections?	Yes	B09 yes; B07 & B08 no	Yes	Yes
	Were post-construction impact collections similar to baseline collections?	Yes except B03	Yes	Yes	No

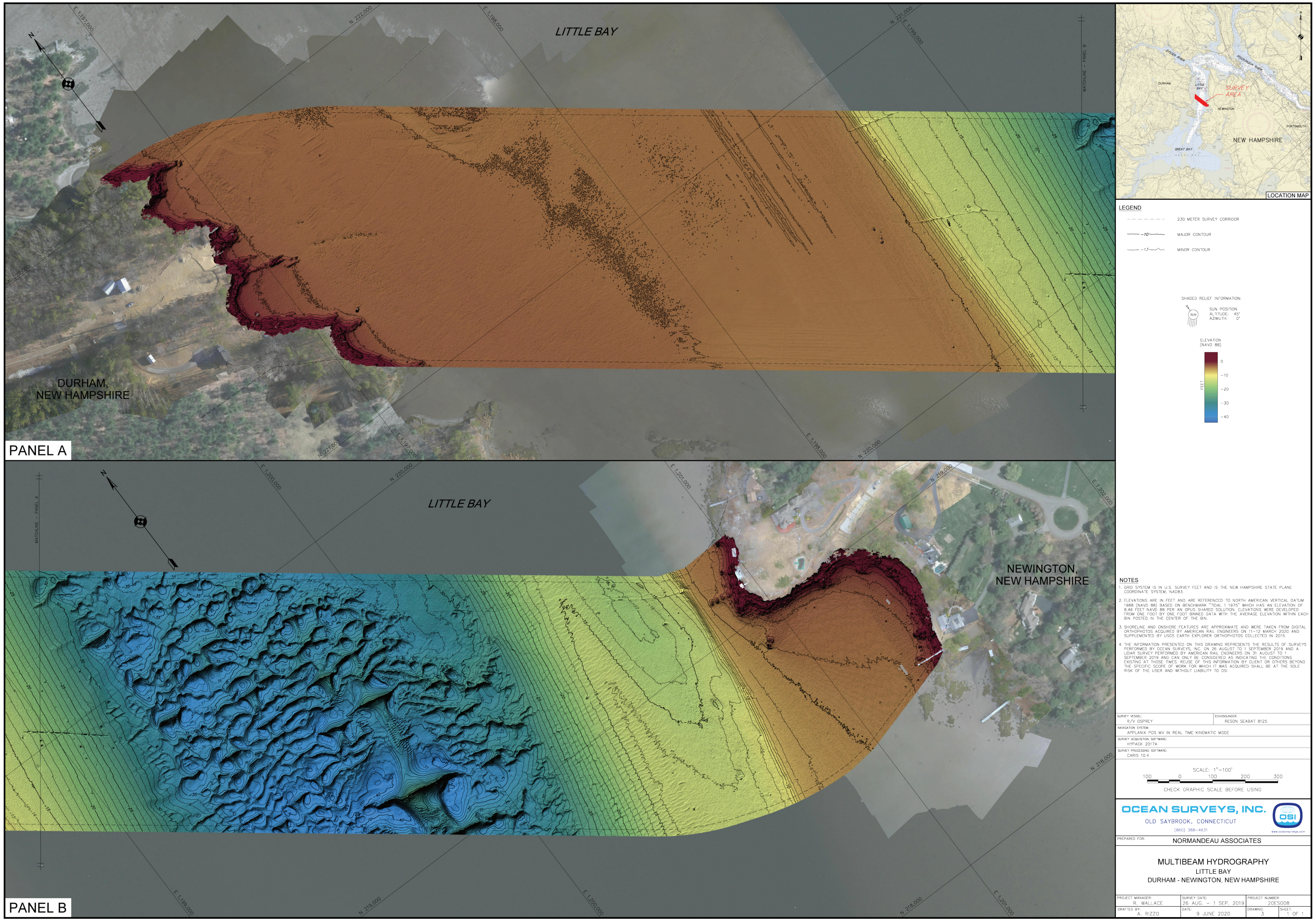
(continued)

Table 16. Continued.

		Transect 1 (B01-B05)	Transect 2 (B06-B10)	Transect 3 (B11-B15)	Transect 4 (B16-B20)
Secondary Biological Parameters					
Opportunistic Species	Did proportion of opportunists at impact stations increase after construction?	No except for B03	No	No	No
Dominant Taxa	Are dominant taxa the same at impact and reference stations after construction?	Three most abundant taxa same at all stations	B07 & B08 share unique dominant with ref B10; B09 share dominant taxa with ref B06	All impact stations more similar to ref B11 than B15	All impact stations more similar to ref B20 than B16
	Have dominant taxa changed from baseline?	Increase in *Ampelisca*	Increase in *Aricidea* & *Tanaissus*	Increase in *Aricidea*	Increase in *Ampelisca*
Feeding Guild	Did proportion of surface deposit feeders at impact stations increase after construction?	No	No except for B09	No	No

Appendix A:

Pre-construction, Post-construction, and Difference Bathymetric Maps



NOTES

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3. SHORELINE AND ONSHORE FEATURES ARE APPROXIMATE AND WERE TAKEN FROM DIGITAL ORTHOPHOTOS ACQUIRED BY AMERICAN RAIL ENGINEERS ON 11–12 MARCH 2020 AND SUPPLEMENTED BY USGS EARTH EXPLORER ORTHOPHOTOS COLLECTED IN 2015.
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ECHOSOUNDER: RESON SEABAT 8125
NAVIGATION SYSTEM: APPLANIX POS MV IN REAL TIME KINEMATIC MODE
SURVEY ACQUISITION SOFTWARE: HYPACK 2017A
SURVEY PROCESSING SOFTWARE: CARIS 10.4

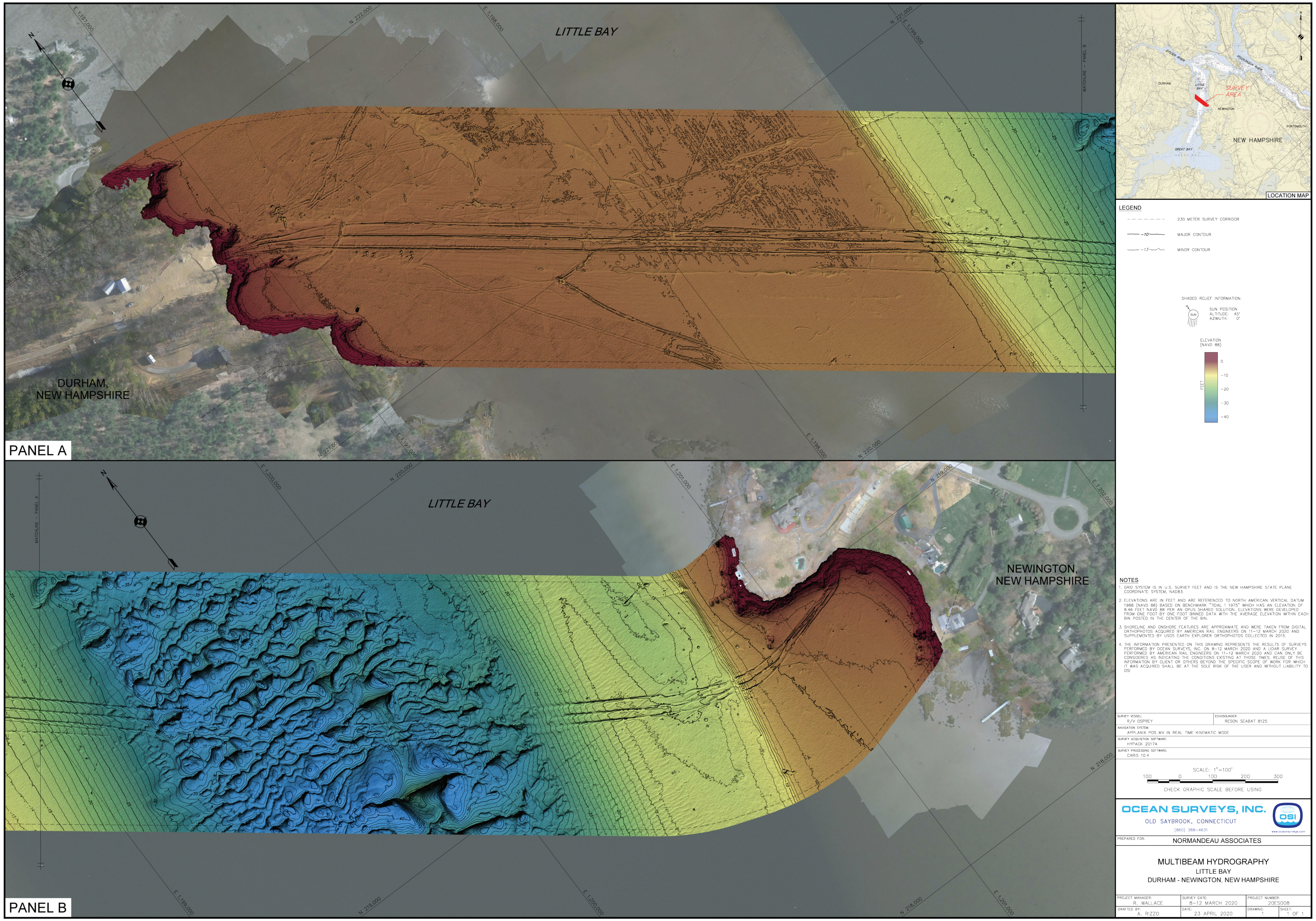
OCEAN SURVEYS, INC.
OLD SAYBROOK, CONNECTICUT
(860) 388-4631
www.oceansurveys.com

PREPARED FOR: NORMANDEAU ASSOCIATES

MULTIBEAM HYDROGRAPHY
LITTLE BAY
DURHAM - NEWINGTON, NEW HAMPSHIRE

PROJECT MANAGER: R. WALLACE
SURVEY DATE: 26 AUG. – 1 SEP. 2019
PROJECT NUMBER: 20ES008
DRAFTED BY: A. RIZZO
DATE: 9 JUNE 2020
DRAWING: 3
SHEET: 1 OF 1

Figure A–1. SRP 2019 Pre-construction bathymetric map.



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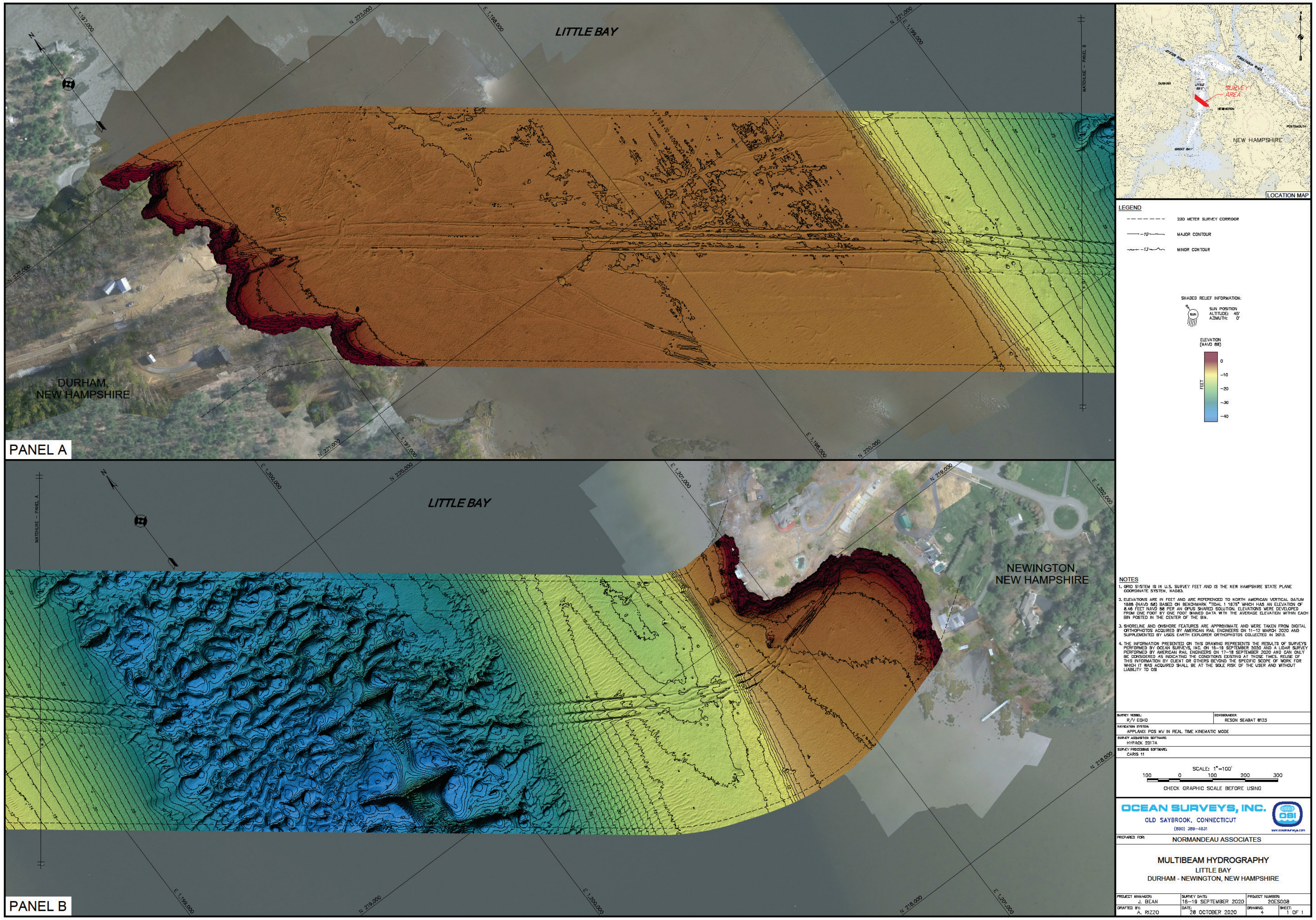
MULTIBEAM HYDROGRAPHY
LITTLE BAY
DURHAM - NEWINGTON, NEW HAMPSHIRE

PROJECT MANAGER: R. WALLACE
SURVEY DATE: 8–12 MARCH 2020
PROJECT NUMBER: 20ES008
DRAFTED BY: A. RIZZO
DATE: 23 APRIL 2020
DRAWING: 1
SHEET: 1 OF 1

Figure A–2. SRP March 2020 Post-construction bathymetric map.



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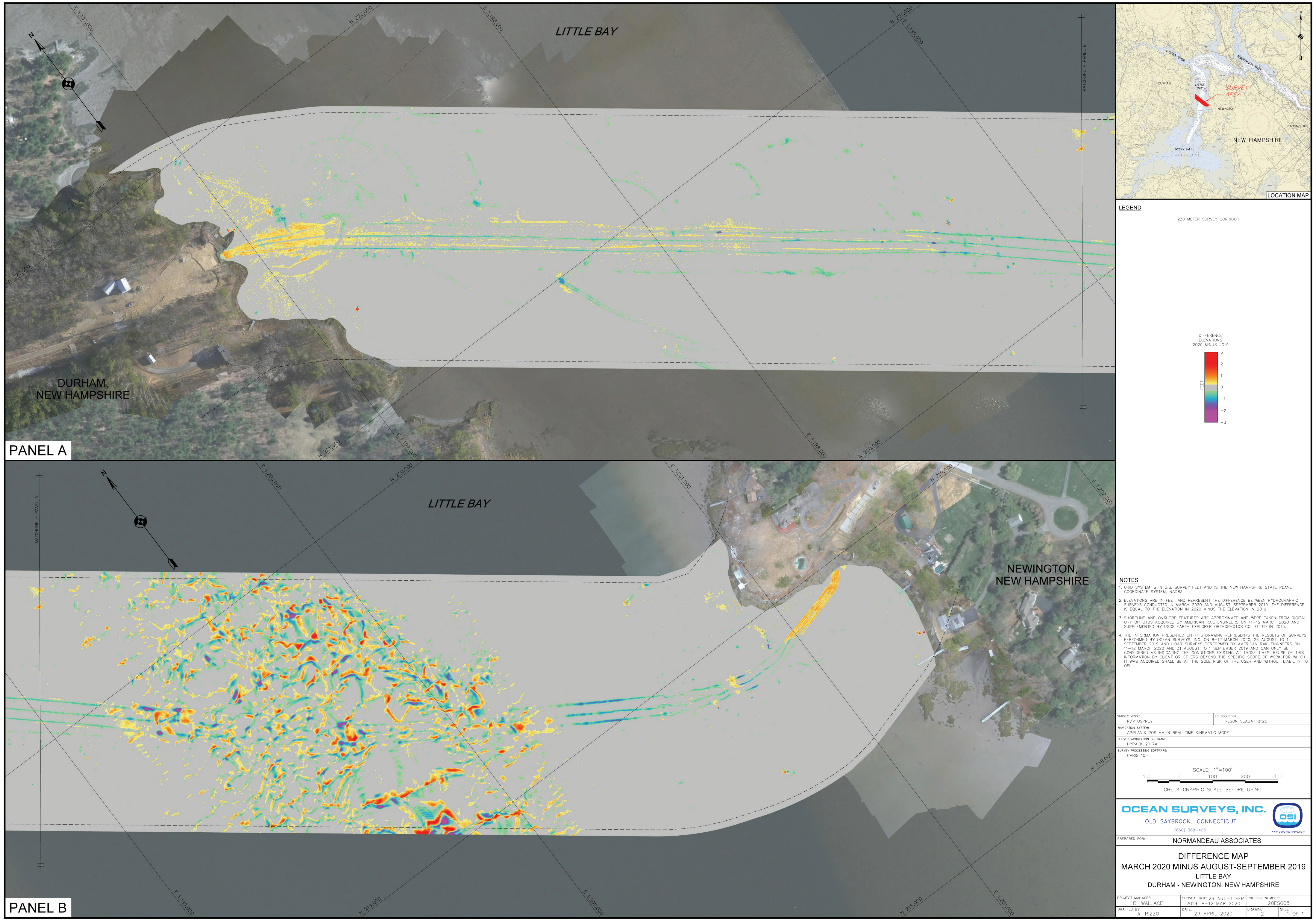
NAVIGATION SYSTEM: APPLANIX POS MV IN REAL TIME KINEMATIC MODE
SURVEY ACQUISITION SOFTWARE: HYPACK 2017A
SURVEY PROCESSING SOFTWARE: CARIS 11

PREPARED FOR: NORMANDEAU ASSOCIATES

MULTIBEAM HYDROGRAPHY
LITTLE BAY
DURHAM - NEWINGTON, NEW HAMPSHIRE

PROJECT MANAGER: J. BEAN
SURVEY DATE: 16–19 SEPTEMBER 2020
PROJECT NUMBER: 20ES008
DRAFTED BY: A. RIZZO
DATE: 28 OCTOBER 2020
DRAWING: 4
SHEET: 1 OF 1

Figure A–3. SRP September 2020 Post-construction bathymetric map.



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3. SHORELINE AND ONSHORE FEATURES ARE APPROXIMATE AND WERE TAKEN FROM DIGITAL ORTHOPHOTOS ACQUIRED BY AMERICAN RAIL ENGINEERS ON 11–12 MARCH 2020 AND SUPPLEMENTED BY USGS EARTH EXPLORER ORTHOPHOTOS COLLECTED IN 2015.
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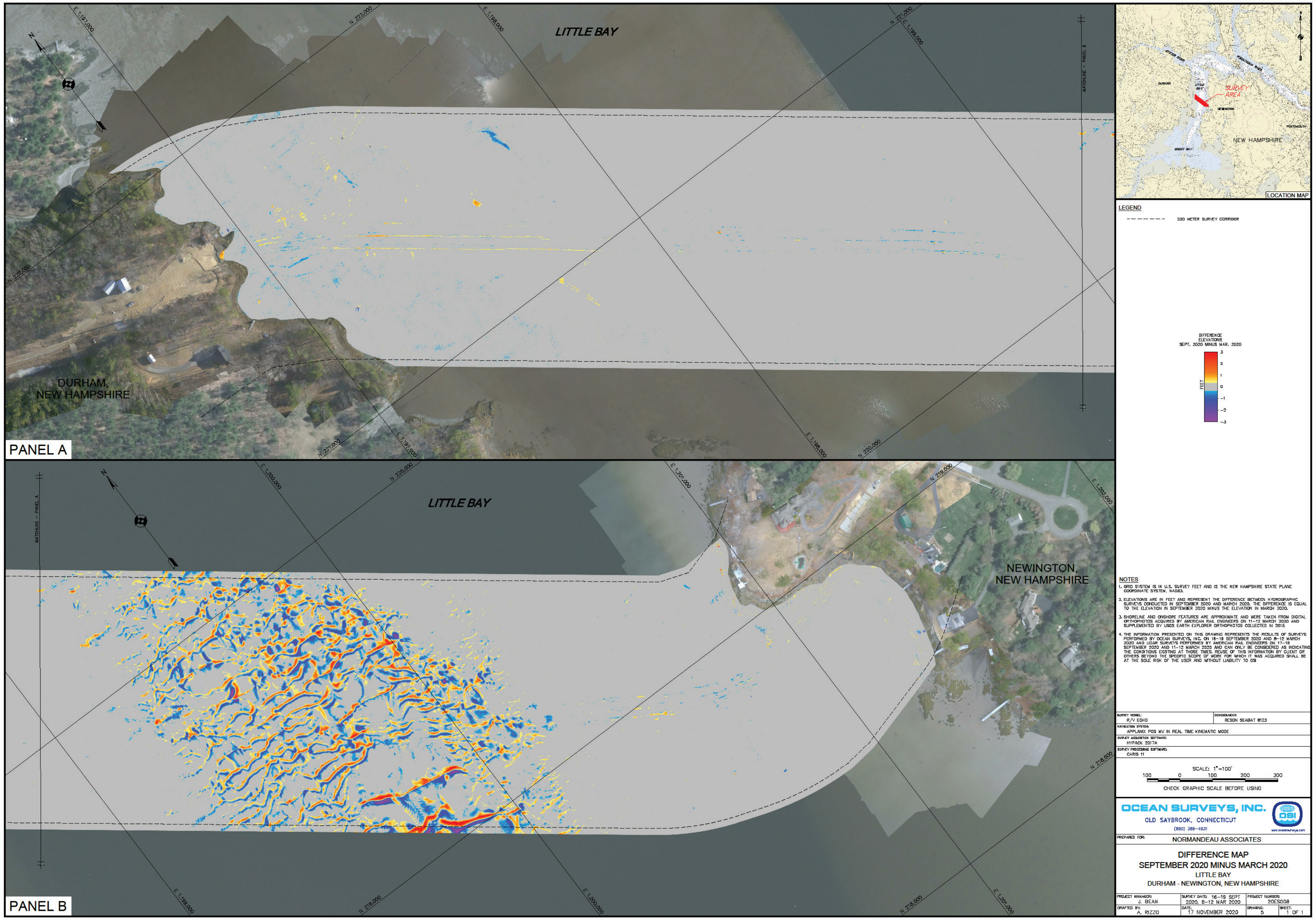
SURVEY ACQUISITION SOFTWARE: HYPACK 2017A
SURVEY PROCESSING SOFTWARE: CARIS 10.4

PREPARED FOR: NORMANDEAU ASSOCIATES

DIFFERENCE MAP
MARCH 2020 MINUS AUGUST-SEPTEMBER 2019
LITTLE BAY
DURHAM - NEWINGTON, NEW HAMPSHIRE

PROJECT MANAGER: R. WALLACE
SURVEY DATE: 26 AUG–1 SEP 2019, 8–12 MAR 2020
PROJECT NUMBER: 20ES008
DRAFTED BY: A. RIZZO
DATE: 23 APRIL 2020
DRAWING: 2
SHEET: 1 OF 1

Figure A–4. SRP bathymetric difference map between 2019 pre-construction and March 2020 post-construction surveys.



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3. SHORELINE AND ONSHORE FEATURES ARE APPROXIMATE AND WERE TAKEN FROM DIGITAL ORTHOPHOTOS ACQUIRED BY AMERICAN RAIL ENGINEERS ON 11–12 MARCH 2020 AND SUPPLEMENTED BY USGS EARTH EXPLORER ORTHOPHOTOS COLLECTED IN 2015.
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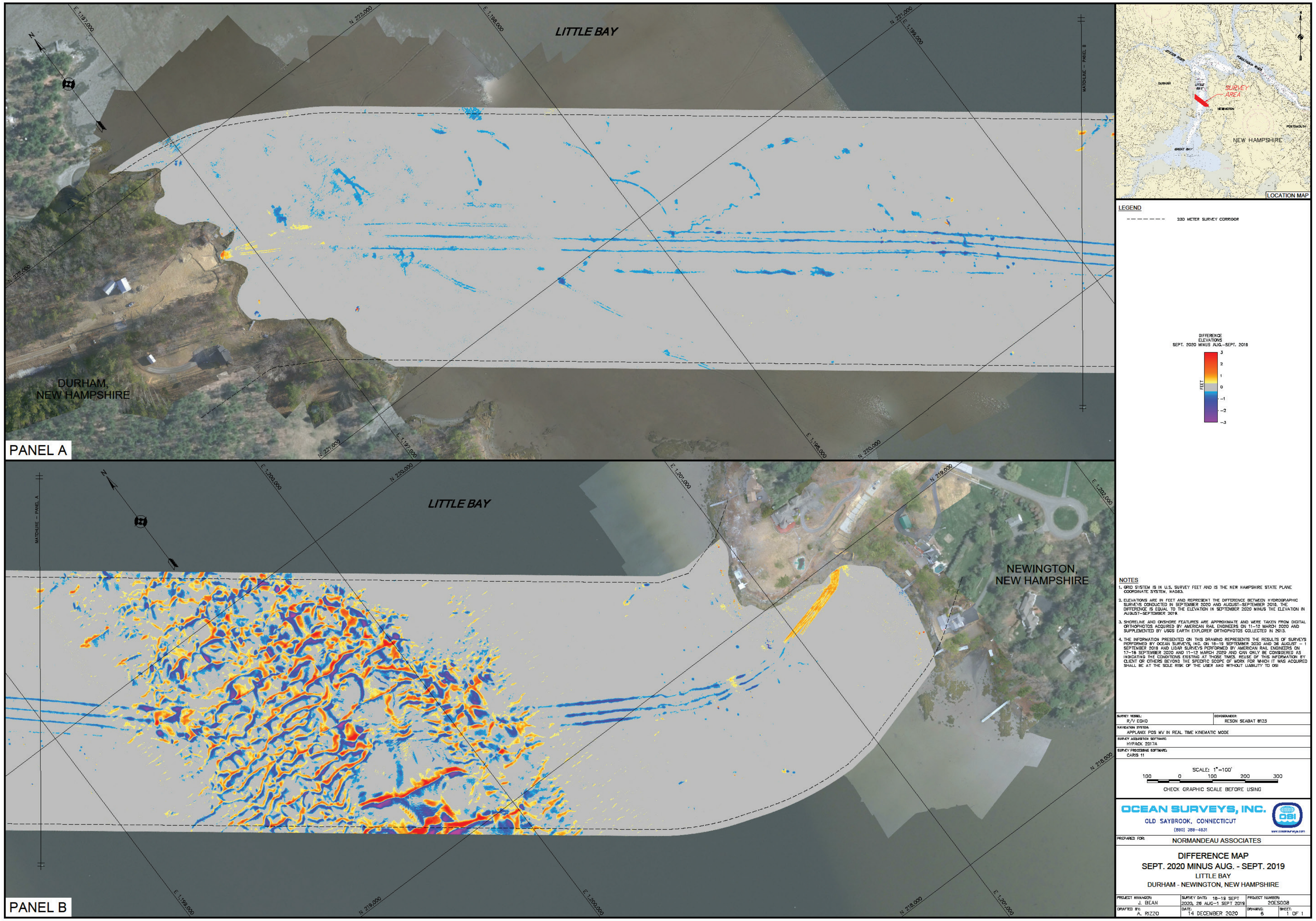
NAVIGATION SYSTEM: APPLANIX POS MV IN REAL TIME KINEMATIC MODE
SURVEY ACQUISITION SOFTWARE: HYPACK 2017A
SURVEY PROCESSING SOFTWARE: CARIS 11

PREPARED FOR: NORMANDEAU ASSOCIATES

DIFFERENCE MAP
SEPTEMBER 2020 MINUS MARCH 2020
LITTLE BAY
DURHAM - NEWINGTON, NEW HAMPSHIRE

PROJECT MANAGER: J. BEAN
SURVEY DATE: 16–19 SEPT 2020, 8–12 MAR 2020
PROJECT NUMBER: 20ES008
DRAFTED BY: A. RIZZO
DATE: 17 NOVEMBER 2020
DRAWING: 5
SHEET: 1 OF 1

Figure A–5. SRP bathymetric difference map between March and September 2020 post-construction surveys.



NOTES

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2. ELEVATIONS ARE IN FEET AND REPRESENT THE DIFFERENCE BETWEEN HYDROGRAPHIC SURVEYS CONDUCTED IN SEPTEMBER 2020 AND AUGUST–SEPTEMBER 2019. THE DIFFERENCE IS EQUAL TO THE ELEVATION IN SEPTEMBER 2020 MINUS THE ELEVATION IN AUGUST–SEPTEMBER 2019.
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SURVEY ACQUISITION SOFTWARE: HYPACK 2017A
SURVEY PROCESSING SOFTWARE: CARIS 11

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DIFFERENCE MAP
SEPT. 2020 MINUS AUG. - SEPT. 2019
LITTLE BAY
DURHAM - NEWINGTON, NEW HAMPSHIRE

PROJECT MANAGER: J. BEAN
SURVEY DATE: 18–19 SEPT 2020, 26 AUG–1 SEPT 2019
PROJECT NUMBER: 20ES008
DRAFTED BY: A. RIZZO
DATE: 14 DECEMBER 2020
DRAWING: 6
SHEET: 1 OF 1

Figure A–6. SRP bathymetric difference map between 2019 pre-construction and September 2020 post-construction surveys.

Appendix B:

Elevational Difference Tables for Bathymetry

Table B–1. Areas (square ft) of Elevational Differences between Each Section of the Submarine Cable Crossing for the Full Survey Corridor and the Narrow Corridor for the 2019 Pre-construction and 2020 March Post-construction Surveys.

Depth category (ft)	West side (<25' contour) (square ft)	Sand waves (>25' contour) (square ft)	East side (<25' contour) (square ft)
Full Corridor (230 m [700 ft] wide)			
>2.00	44	940	22
+1.01–2.00	103	14,794	75
+0.68–1.00	1,026	24,492	1,820
+0.34–0.67	39,748	80,997	6,098
+0.33–(-0.33)	2,082,733	905,442	797,301
(-0.34)–(-0.67)	27,794	75,542	6,783
(-0.68)–(-1.00)	4,042	23,987	2,850
(-1.01)–(-2.00)	651	13,576	1,505
>(-2.00)	43	1,150	11
Total	**2,156,184**	**1,140,920**	**816,465**
Narrow Corridor (94 m [300 ft] wide)			
>2.00	5	170	1
+1.01–2.00	70	6,734	17
+0.68–1.00	984	12,672	1,701
+0.34–0.67	29,703	41,291	5,538
+0.33–(-0.33)	919,429	403,043	338,638
(-0.34)–(-0.67)	24,700	38,620	6,254
(-0.68)–(-1.00)	3,859	13,077	2,787
(-1.01)–(-2.00)	616	7,457	1,472
>(-2.00)	44	612	10
Total	**979,410**	**523,676**	**356,418**

Table B–2. Areas (square ft) of Elevational Differences between Each Section of the Submarine Cable Crossing for the Narrow Survey Corridor for the 2020 March and September Post-construction Surveys.

Depth category (ft)	West side (<25' contour) (square ft)	Sand waves (>25' contour) (square ft)	East side (<25' contour) (square ft)
Narrow Corridor (94 m [300 ft] wide)			
>2.00	-	336	-
+1.01–2.00	36	9,700	2
+0.68–1.00	656	15,537	74
+0.34–0.67	3,399	37,124	926
+0.33–(-0.33)	973,429	396,466	354,615
(-0.34)–(-0.67)	1,858	41,402	759
(-0.68)–(-1.00)	7	15,122	6
(-1.01)–(-2.00)	15	7,633	-
>(-2.00)	10	356	-
Total	979,410	523,676	356,382

Table B–3. Areas (square ft) of Elevational Differences between Each Section of the Submarine Cable Crossing for the Narrow Survey Corridor for the 2019 Pre-construction and September 2020 Post-construction Surveys.

Depth category (ft)	West side (<25' contour) (square ft)	Sand waves (>25' contour) (square ft)	East side (<25' contour) (square ft)
Narrow Corridor (94 m [300 ft] wide)			
>2.00	-	1,691	-
+1.01–2.00	137	18,378	41
+0.68–1.00	191	23,395	2,527
+0.34–0.67	1,706	50,114	4,902
+0.33–(-0.33)	943,014	339,537	338,142
(-0.34)–(-0.67)	32,686	48,893	7,009
(-0.68)–(-1.00)	1,379	21,656	2,579
(-1.01)–(-2.00)	297	18,715	1,213
>(-2.00)	-	1,297	5
Total	979,410	523,676	356,418

Appendix C:

Mean Abundance at SRP Benthic Stations during Post-Construction Survey, August 2020

Table C–1. Mean Abundance (No. of Individuals/0.04 m^2 Averaged Over Reps) at SRP Benthic Stations during Post-Construction Survey, August 2020

Taxon	B01	B02	B03	B04	B05	B06	B07	B08	B09	B10	B11	B12	B13	B14	B15	B16	B17	B18	B19	B20
Misc. Phyla																				
Platyhelminthes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Platyhelminthes sp. 5 NAI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.33	0
Platyhelminthes sp. 17 NAI	0	0	0	0	0	0	0	0	0	0	0	0	0.33	0	0	0	0	0	0	0
Platyhelminthes sp. 18 NAI	0	0	0	0	0	0	0	4.67	0	0	0	0	0	0	0	0	0	0	0	0
Stylochus ellipticus	0	0	0	0.67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euplana gracilis	0	0	0	0	0	0	0	0	0	0	0	0	0.33	0	0	0	0	0	0	0
Amphiporus bioculatus	1.33	1.33	0.67	0	2	0	0	0	0.33	0	0	0	0	0	0	0	2.33	2.67	2	1
Amphiporus ochraceus	1.33	0.67	0.67	0.33	3.33	0.33	0	0	1	0	0	0	0	0.67	1	0	0.67	1.33	1.33	0
Tetrastemma candidum	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Nematoda	262.67	220.67	221.67	256.67	202	390	94.33	204.67	258	35.67	332	200	173	62.33	202.33	339.67	79.33	118.67	150	70
Saccoglossus bromophenolosus	0	0.67	0	0	0	0.67	0.67	0	2.67	0	3.67	2.67	2	1.33	0	3	0.33	0	0	0
Molgula sp.	0	0	0	0	0	0	0	0	0.33	0	0	0	0	0	0.33	0.33	0	0.67	0	0
Polychaeta																				
Phyllodocidae	0	0	0.67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eteone longa	0	0	0.67	0	0	0	0	0	0	0	0	0.67	0	0	0	0	0	0	0	0
Hypereteone heteropoda	10.67	20	21.33	20.67	28.67	10	0.67	0.67	18	0.67	14	6	13.33	15.33	22.67	9.33	20.67	36.33	30	25.33
Hypereteone lactea	0	1.33	0	0	0.67	0	0	0.67	0	0	0.67	0	0	0	0	0	0	0	0	0
Eumida sanguinea	0	0	0	0	0	0	0	0	0.67	0	0	0	0	0	0	0	0	0	0	0
Microphthalmus sczelkowii	5.33	19.33	5.33	10.67	12.67	0	3.33	1.33	0	0	0	0	0	0	0	0	0	0	0	0
Microphthalmus aberrans	0	0	0	0	0	0	0	0.67	0	0	0	0	0	0	0	0	0	0	0	0
Oxydromus obscurus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.67	0	0	0	0	0
Syllidae	0	0	0	0	0	0	0	2.67	2.67	0	0	0	0	0	0	0	0	0	0	0
Streptosyllis arenae	0	0	0	0	0	0	0	0.67	0	0	0	0	0	0	0	0	0	0	0	0
Streptosyllis varians	0	0	0	0	0	0	23.33	49.33	0	3.33	0	0	0	0	0	0	0	0	0	0
Streptosyllis verrilli	0	0	0	0	0	0	0	0	0	0	0	0	0	0.67	0	0	0	0	0	0
Salvatoria clavata	0	0	0	0.67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Parexogone hebes	0	0	0	0	0	17.33	0.67	0.67	19.33	0	0	1.33	1.33	0.67	0	0	0	0	0	0
Nereididae	0	0	0	0	0	0	0	0	1.33	0	0	0.67	0	0	0	0	0	0	0	0

(continued)

Table C–1. Continued.

Taxon	B01	B02	B03	B04	B05	B06	B07	B08	B09	B10	B11	B12	B13	B14	B15	B16	B17	B18	B19	B20
Neanthes arenaceodentata	0	0	0	0	0	7.33	1.33	0	8.67	12	6.67	20	26.67	11.33	9.33	1.33	0.67	8	3.33	4
Hediste diversicolor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.67	0
Micronephthys neotena	0.67	1.33	0	0.67	1.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glycera dibranchiata	0	0.67	0	0	0.67	0	0	0	0.67	0	0	0	0	0	0	0	0	0	0	0
Glycera sp.	0	0	0	0	0	0	0.67	0	0	0	0	0	0	0	0	0	0	0	0	0
Lumbrineris hebes	0	0.67	1.33	0	8.67	11.33	0	0	1.33	0	4.67	0	0	0	0.67	4.67	0.67	0	0	0
Scoletoma tenuis	34	54	52	60.67	68.67	6	2	0	16.67	0	20	1.33	0.67	0.67	118	35.33	32.67	48.67	54.67	81.33
Scoletoma sp.	0	0	0	0	0	0	0.67	0	0	0	0	0	0	0.67	0	0	0	0	0	0
Parougia caeca	0	0	0	0	0	0	1.33	0.67	0	0	0	0	0	0	0	0	0	0	0	0
Leitoscoloplos fragilis	3.33	2	6	0.67	23.33	0	0	0	0	0	0	0	0	0.67	0.67	1.33	0	6	6	1.33
Leitoscoloplos robustus	16	24	19.33	44	4.67	4	0	0.67	8.67	0	2	2	1.33	0	4.67	0	4.67	17.33	22	7.33
Leitoscoloplos sp.	12	28	12.67	14	25.67	1.33	0	0	0	0	4	0	0	0	0.67	1.33	15.33	18	25.33	10.67
Aricidea (Acmira) catherinae	0	0	0	0	0	495	284.33	26	497.33	464	133.33	212	296	166.67	90.67	25.67	9.33	14.67	10.67	3.33
Paraonis fulgens	0	0	0	0	0	0	55.33	18	0	24.67	0	0.67	0.67	0	0	0	0	0	0	0
Spionidae	0	0	0	0	0.67	0	0	0	0	0	1.33	0	1.33	1.33	0	0.67	3.33	4.67	3.33	0
Polydora cornuta	1.33	2	2.67	4	2.67	3.33	0	0	6.67	4	8.67	3.33	4	4	4	2	2.67	8	6.33	4
Spio filicornis	0	0	1.33	4.67	4.67	20.67	0	0.67	30	0.67	0	19.33	16.67	22	30	0	3.33	33.33	20.67	0
Spio setosa	0	0	1.33	0	1.33	0	0	0	2	0	0	0	1.33	0	0	0	0.67	2.67	0	0
Spio sp.	0	0	0.67	0.67	0	0.67	0	0	2.67	0	0	3.33	2.67	0.67	1.33	0	0	0.67	0.67	0
Spiophanes bombyx	0	0	0	0	0	0.67	0	0	0.67	1.33	0.67	0	0	0	0	0	0	0	0	0
Pygospio elegans	0.67	5.33	2.67	1.33	7.33	2	30.67	16.33	5.33	4	0.67	6	5.33	3.33	0	0.67	12.67	2.67	1.33	3.33
Streblospio benedicti	271.33	325.67	253.33	250.67	321.33	49.33	4	0	94.67	4.67	44.67	28.67	40.67	75.33	76	53.67	173.33	406	279.67	144.67
Scolelepis squamata	0	0	0	0	0	0	0.67	0	0	0	0	0	0	0	0	0	0	0	0	0
Scolelepis (Parascolelepis) texana	17.33	26.67	18.67	20	33.33	185.33	5.33	0	251.33	50	103.33	81.33	132	108.67	122.67	82.67	59.33	113.33	91	20.67
Dipolydora quadrilobata	0	0	0.67	2	0	0	0	0	0	0	1.33	0	0	0	0	0	0	0.67	1.33	0.67
Marenzelleria viridis	0	0	0	0	0	0	0.67	0	0	0	0	0	0	0	0	0	0	0	0	0
Cirratulidae	0	4	0.67	10.33	7	89.33	0	0	17.33	2	86.67	14	10.67	0.67	1.33	87.33	4.67	0.67	1.33	1.33
Tharyx acutus	136	46.67	58.67	36	34.67	398.67	0	0.67	219.67	14	158.67	86.33	93.33	116	24.67	70.33	14	82	65.33	54.67
Chaetozone sp.	0	0	0	0	0.67	0.67	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ctenodrilidae	0	0	0	0	0	0	0	1.33	0	0	0	0	0	0	0	0	0	0	0	0

(continued)

Table C–1. Continued.

Taxon	B01	B02	B03	B04	B05	B06	B07	B08	B09	B10	B11	B12	B13	B14	B15	B16	B17	B18	B19	B20
Capitellidae	0	0.67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capitella capitata complex	0	0	0	0	0	1.33	0.67	0	4	8.33	0.67	12	10.67	8	0	0	0	0	0	0.67
Heteromastus filiformis	52.67	56.67	97.33	104.67	86.67	4.67	1.33	0	2	0.67	9.33	2	0	0	6.67	11.33	14	40	55.33	21.33
Mediomastus ambiseta	0.67	0	0.67	0	0.67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maldanidae	0	0	0	0	0.67	0	0	0	3.33	0	0	1.33	0.67	0.67	0	0	0	0.67	0	0.67
Clymenella torquata	0	0.67	0.67	1.33	0	1.33	0	0	28.67	0	0	7.33	7.33	10	2	1.33	17.33	34.67	22.67	13.33
Euclymene collaris	0	0	0	0	0	0.33	0	0	0	0	0	0	0.67	0	0	0	0	0	0	0
Ampharete oculata	0	2.67	2.67	0	0.67	0.67	0	0	0	0	0	0.67	0	0	0	0	0	2.67	2.67	0
Ampharete finmarchica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.67	0
Polycirrus eximius	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0
Polycirrus phosphoreus	0	0	0	0	0	0	0	0	2	0	0	0.67	0	0	0.67	0	0	0	0	0
Polycirrus sp.	0	0	0	0	0	1.33	0	0	19.67	0.67	0	2.67	4	0	2	0	0	0	0	0
Sabellidae	0	0	0	0	0	0	0	0.67	0	0	0	0	0	0	0	0	0	0	0	0
Parasabella microphthalma	0	0	0	0	0	0	0	0	0	0.67	0	2	0	1.33	2	0	0	0	12	0
Fabricia stellaris	0	0	0	0	0	0	0	2	1.33	0	0	0.67	0	0	0	0	0	0	5.33	0
Polygordius jouinae	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Oligochaeta																				
Oligochaeta	420	119.67	139.33	112	225	68.67	36	134	253.33	3.33	195.33	257.33	174	149	240	97.67	39	42	72.33	44.67
Gastropoda																				
Astyris lunata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.67	0	0	0	0	0.67
Tritia obsoleta	44	28	24.67	27.33	20.67	0	0	0	0	1.33	11.33	0	0.67	0	0.67	16	0	0	0	5.33
Tritia trivittata	0	0	0	0	0	0	0	0	0.67	0	0	0	0	0	0	0	0	0	0	0
Pyramidellidae	0	0	0	0	0	0	0	0	0	0	0	0	0.67	0	0	0	0	0	0	0
Odostomia eburnea	0	0	0.67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Boonea bisuturalis	1.33	3.33	1.33	0	0	0	0	0	1.33	0	0	0	0	0	0	0	0	0	0	0
Acteocina canaliculata	0	0	0	0.67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bivalvia																				
Solemya velum	0	0	0	0	0	0	0	0	0	0.67	0	0	0	0	0	0	0	0	0	0
Mytilus edulis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.67	0	0	0	0	0
Modiolus modiolus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.67

(continued)

Table C–1. Continued.

Taxon	B01	B02	B03	B04	B05	B06	B07	B08	B09	B10	B11	B12	B13	B14	B15	B16	B17	B18	B19	B20
Spisula solidissima	0	0	0	0	0	0	9.33	20.67	0	0	0.67	0	0	0.67	0	0	0	0	0	0
Mulinia lateralis	2	2	20.67	4	3.33	0	0	0	0	0	0	0	0	0	0	0	2	1.33	1.33	0.67
Ensis leei	0	0	0	0	0	0	0	2	0	0	0	0.67	1.33	0.67	0	0	0	1.33	0	0
Ameritella agilis	5.33	5.33	4.67	4.67	3.33	46.67	29.33	18	27.33	29.33	14.67	6.67	10.67	10.67	10.67	10.67	6.67	11.33	7.33	0.67
Mercenaria mercenaria	0	0	0	0	0.67	0	0	0	0	0	0	0	0	0	0	0	0.67	0	0	0.67
Pitar morrhuanus	0	0	0	0	0	0	0	0	0	0.67	0	0	0	0	0	0	0	0	0	0
Gemma gemma	0	1.33	3.33	1.33	7.33	0	0	0	0	2	4.67	0.67	2	0.67	1.33	3.33	1.33	1.33	0.67	0.67
Mya arenaria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.67	1.33
Lyonsia hyalina	0	0	0	0	0	0	0	0	0	0	0	0	0	0.67	0.67	0	0	0	0.67	0
Arthropoda																				
Heteromysis formosa	0	0	0	0	0	0	0	0	1.33	0	0	4.67	2.67	5.33	2	0	0	2.67	0	0
Neomysis americana	0.67	0	0	0	0	0	0	0	0	0.67	0	0	0	0	0	0	0.67	0	0	0
Leucon americanus	19.33	2.67	4.67	8	11.33	4	0.67	0	4.67	0	0.67	1.33	0.67	2.67	0	0.67	0	1.33	1.33	0
Diastylis sculpta	0	0	0	0	0	0	0	0	0	0	0.67	0	0	0	0	0	0	0	0	0
Oxyurostylis smithi	2	4	1.33	3.33	4	3.33	1.33	0.67	2.67	0.67	10	4	0.67	2.67	4	8.67	6	3.33	4.67	10.67
Tanaissus sp. A NAI	0	0	0	0	0	0	621.33	288	2	210.33	0.67	0	0.67	0.67	0	0.67	1.33	0	0	0
Cyathura burbancki	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.67	0	0	0
Idotea phosphorea	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0.67	0.67	0	0	0.67	0
Edotia triloba	0	0	0	0	0	0	0	0	0.67	0	0	0	0	0	0	0	0	0	0	0.67
Chiridotea tuftsii	0	0	0	0	0	0	0.67	0	0	0	0	0	0	0	0	0	0	0	0	0
Ampelisca abdita	152	136	128	140.67	186	4.67	0.67	0	11.33	6	3.33	2.67	4	6	0.67	1.33	405	457	124.33	44
Ampelisca vadorum	0	0	0	0.67	0	0	0	0	1.33	0	0	0	0	0	0.67	0.67	2	3.33	0	2
Ampithoe valida	0	0	0	0	8.67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.33
Microdeutopus gryllotalpa	1.33	0	1.33	0	246.67	16	0	0	22.33	2	20	22.67	19.67	19.33	56.67	52.67	0.67	13.33	137.33	16.67
Grandidierella japonica	40	11.33	10	17.33	16	3.33	0	0	24.67	18.67	98.67	73.33	80	41	136.67	110	55.33	39.33	34.67	193.67
Monocorophium acherusicum	0	0.67	0.67	0	1.33	0	0	0.67	4	4	1.33	25.33	23.33	12	20.67	3.33	5.33	5.33	2	6.67
Monocorophium insidiosum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.67	0
Apocorophium acutum	0	0	0	0	3.33	0	0	0	0	0	0	0	1.33	0.67	2	0	0	1.33	2.67	0
Gammarus mucronatus	0	0	0	0.67	81.33	0	0	0	1.33	0	1.33	0	0	0.67	1.33	22.67	0	0.67	0	0.67
Melita nitida	0	0	0	0	51	9.33	0	0	7.67	2	1.33	19	14.33	27.33	48.67	11.33	1.33	6.67	46	4.67

(continued)

Table C–1. Continued.

Taxon	B01	B02	B03	B04	B05	B06	B07	B08	B09	B10	B11	B12	B13	B14	B15	B16	B17	B18	B19	B20
Acanthohaustorius millsi	0	0	0	0	0	0	81.33	56.67	0.67	34	0	0	0	0	0	0	0	0	0	0
Jassa marmorata	0	0	0	0	2	0.67	0	0	1.33	0.67	0	0	0	0	0	0	0	0	0	0
Lysianopsis alba	0	0	0.67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phoxocephalus holbolli	0	0	0	0	0	0	0	0	2.67	0	0	6.67	8.67	6.67	4.67	0	0	0	0	0
Rhepoxynius hudsoni	0	0	0	0	0	0.67	35.33	14	0	47.33	0	0	1.33	0.67	0	0	0	0	0	0
Paracaprella tenuis	0	0	0	0	12.33	13.33	0	0	5.33	7.33	0	2	0.67	4	4.67	0.67	2	18	64	7.33
Crangon septemspinosa	0	0	0.67	0	0	0	0.67	0	0	0	0	0	0.67	0	0	0	2.67	1.33	0.67	0
Pagurus longicarpus	0.67	0	0	1	0	1.33	0	0	0	0	0.67	1.33	0.67	0.67	1.33	0.67	0	0	0	3.33
Cancer irroratus	0	0	0	0	0	0	0	0	0	0	0	0	0	0.67	0	0	0	0	0	0
Dyspanopeus sayi	0	0	0	0	0.67	0	0	0	1.33	0	0	0.67	0	0	2	0	0	0	0.67	0.67

Appendix D:

Numerical Classification of Post-Construction Benthic Infaunal Community Structure using Station Replicates

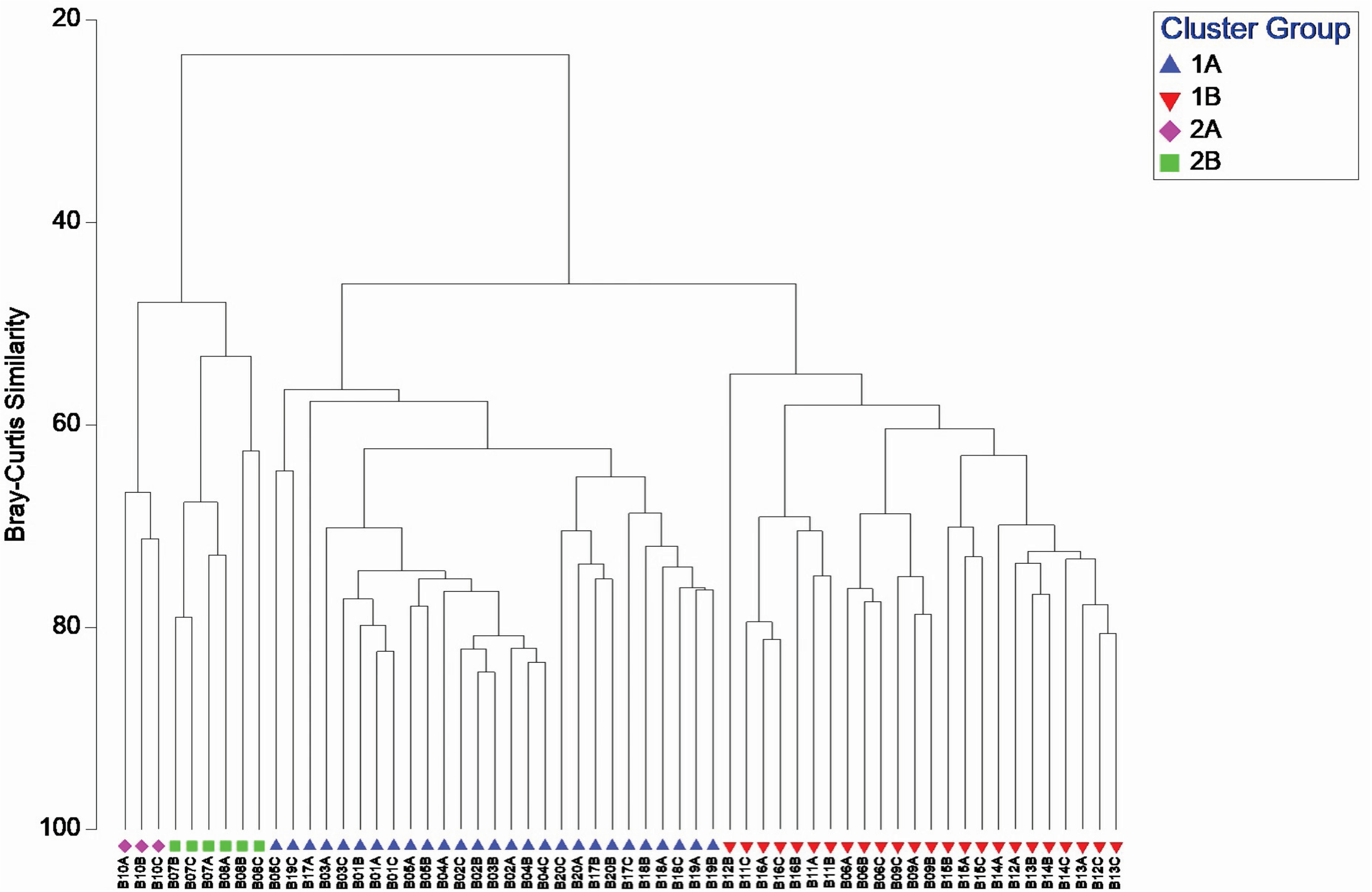

Figure D–1. **Dendrogram formed from numerical classification of replicate samples collected along transects in the SRP project area during post-construction survey, August 2020.**

Table D–1. Abundance (no./0.04 m^2) of Dominant Taxa (Top Ten within any Group) in Groups Formed from Numerical Classification of Replicate Samples Collected along Transects in SRP Project Area during Post-Construction Survey, August 2020

Major_Taxon	Species	Group 1	Group 2	Group 3	Group 4
Polychaeta	*Aricidea (acmira) catherinae*	4.2	239.6	464.0	155.2
	Scolelepis (parascolelepis) texana	44.5	133.4	50.0	2.7
	Cirratulidae	3.3	38.4	2.0	-
	Heteromastus filiformis	58.7	4.5	0.7	0.7
	Hypereteone heteropoda	23.7	13.6	0.7	0.7
	Neanthes arenaceodentata	1.8	11.4	12.0	0.7
	Paraonis fulgens	-	0.2	24.7	36.7
	Pygospio elegans	4.1	2.9	4.0	23.5
	Scoletoma tenuis	54.1	24.8	-	1.0
	Streblospio benedicti	269.6	57.9	4.7	2.0
	Streptosyllis varians	-	-	3.3	36.3
	Tharyx acutus	58.7	146.0	14.0	0.3
Oligochaeta	Oligochaeta	134.9	179.4	3.3	85.0
Bivalvia	*Ameritella agilis*	5.5	17.3	29.3	23.7
	Spisula solidissima	-	0.2	-	15.0
Arthropoda	*Acanthohaustorius millsi*	-	0.1	34.0	69.0
	Ampelisca abdita	197.0	4.3	6.0	0.3
	Grandidierella japonica	46.4	71.0	18.7	-
	Melita nitida	12.2	17.4	2.0	-
	Microdeutopus gryllotalpa	46.4	28.7	2.0	-
	Rhepoxynius hudsoni	-	0.3	47.3	24.7
	Tanaissus sp. A nai	0.1	0.6	210.3	454.7