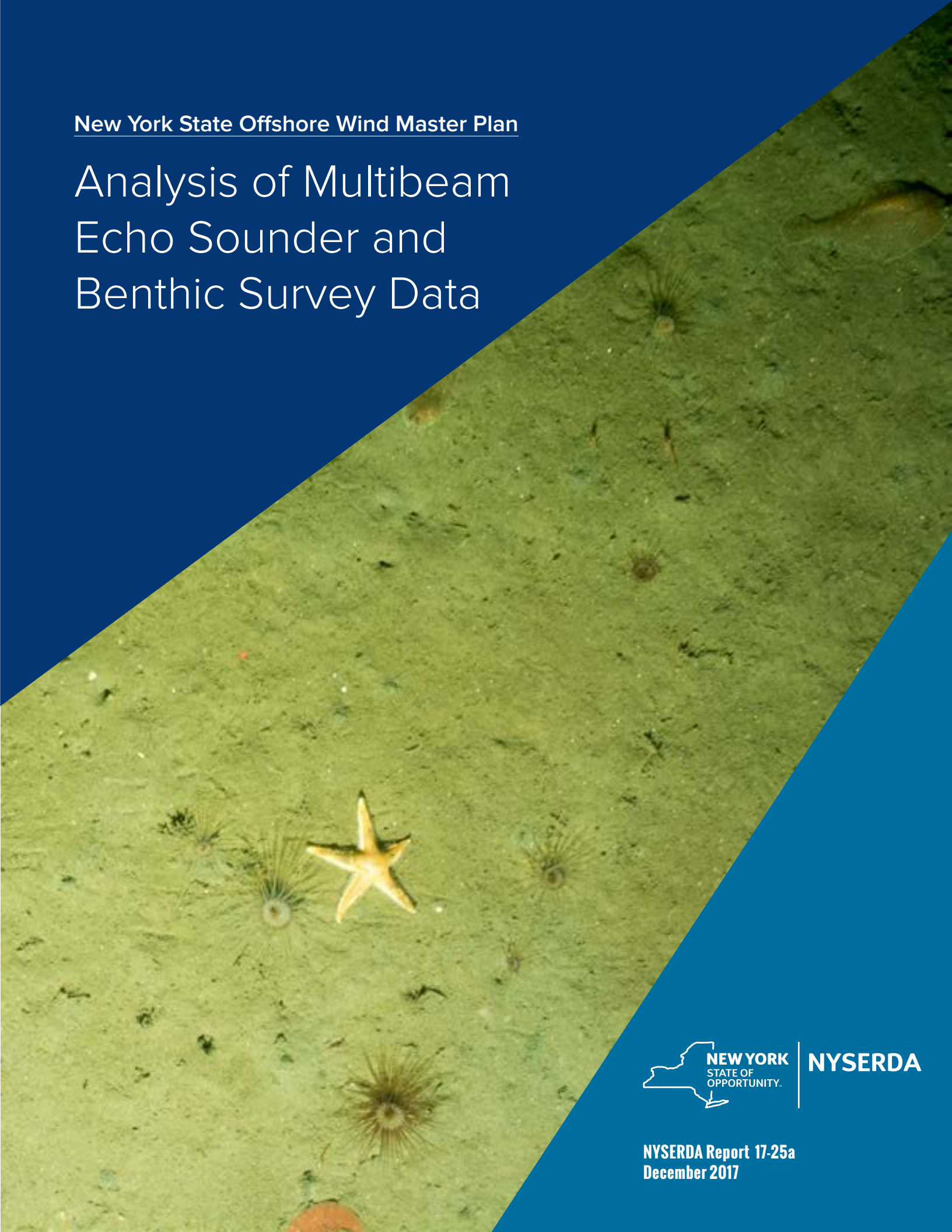
New York State Offshore Wind Master Plan

Analysis of Multibeam Echo Sounder and Benthic Survey Data



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NYSERDA Report 17-25a
December 2017

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New York State Offshore Wind Master Plan Analysis of Multibeam Echo Sounder and Benthic Survey Data

Final Report

Prepared for:

New York State Energy Research and Development Authority

Prepared by:

INSPIRE Environmental

Middletown, Rhode Island

NYSERDA Report 17-25a December 2017

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Table of Contents

List of Figures

List of Tables

Acronyms and Abbreviations

Alpine	Alpine Ocean Seismic Survey, Inc.
AoA	Area of Analysis
BOEM	Bureau of Ocean Energy Management
cm	centimeters
CMECS	Coastal and Marine Ecological Classification Standard
DOS	New York State Department of State
E&E	Ecology and Environment, Inc.
GIS	geographic information system
GNSS	global navigation satellite system
GPS	global positioning system
INSPIRE	INSPIRE Environmental, LLC
ISO	International Organization for Standardization
km	kilometers
km^2	square kilometers
m	meters
Master Plan	New York State Offshore Wind Master Plan
MBES	Multibeam Echo Sounder
MLLW	mean lower low water
NEF	Nikon Electronic Format
nm	nautical mile
nm^2	square nautical miles
NOAA	National Oceanic and Atmospheric Administration
NYSERDA	New York State Energy Research and Development Authority
OCS	Outer Continental Shelf
OCSLA	Outer Continental Shelf Lands Act
OSA	Offshore Study Area
PSD	Photoshop Document
PV	Plan View
QINSy	Quality Integrated Navigation System
QPS	Quality Positioning Services BV
R/V	Research Vessel
SBET	smoothed best estimate of trajectory
SLR	single-lens reflex
SPI	Sediment Profile Imaging
SVP	sound velocity profile

Executive Summary

Physical and biological characterization of the seafloor is critically important for future offshore wind development in the New York Offshore Study Area (OSA) and, while full site characterization of any particular areas proposed for development will be performed at the project development stage, improved understanding of the OSA's characteristics will facilitate New York State's Offshore Wind master planning process.

The overall objective of this Analysis of Multibeam Echo Sounder (MBES) and Benthic Survey Data (Study) was to provide planning-level characterization of the geological (sediment size and type), geotechnical (density of bottom), and benthic (animal habitat) characteristics of potential offshore wind energy areas within previously identified water depth zones off the shore of New York State. This objective was accomplished with the collection and analysis of broad area reconnaissance MBES data products (primarily high resolution bathymetry and backscatter) and Sediment Profile Image (SPI) and Plan View (PV) photographic data used to ground truth the acoustic data and provide an initial assessment of benthic habitat types within the Area of Analysis. The SPI/PV imagery provided ground truth data of surface sediment characteristics (grain size, shear strength, and biological activity) that were used to identify areas with potential sensitive habitats.

The survey conducted for this Study was performed from June 21 to August 11, 2017, and collected data within four survey areas. The MBES survey collected a total of 2,498 linear nautical miles of high resolution acoustic imagery of seafloor topography and relative seafloor hardness/softness data (backscatter). All MBES data collected within the survey areas covered 229 square nautical miles (787 square kilometers) or 9% of the seafloor within the survey areas, which covered a total of 2,598 square nautical miles (8,910 square kilometers) of seafloor.

The SPI/PV survey occupied 300 stations throughout the four survey areas and collected up to four replicate image-pairs at each station. A total of 1,181 SPI images and 1,177 PV images were collected. Stations were distributed among cohesive regions of backscatter values and clustered in areas where steep gradients in backscatter values were observed. Further placement of SPI/PV stations occurred in areas where an existing regional model indicated higher degrees of uncertainty regarding the composition of seafloor surface sediments. On-board processing of acoustic data and review of SPI/PV images allowed ground truth station planning and field interpretation of the data in near real-time.

All data collected for this study indicated soft-bottom substrata that were determined to be suitable for offshore wind farm planning with respect to seafloor surface geology and benthic habitats. Data revealed a range of bedforms and surface sediment features, as well as associated benthic biotic communities, all of which can be characterized as soft substrata subject to episodic sediment transport events. No sensitive habitats (e.g., hard bottom with attached epifauna and flora) were observed in the acoustic and optical data collected. Additionally, surface sediment grain size data from this Study will help fill data gaps and improve an existing regional grain size model. The interpretations of surface sediments and benthic biological communities presented in this report are believed to be representative of the surveyed areas, given the survey design and collection of images across a range of seafloor features and textures.

1 Introduction

This Analysis of Multibeam Echo Sounder and Benthic Survey Data (Study) is one of a collection of studies prepared on behalf of New York State in support of the New York State Offshore Wind Master Plan (Master Plan). These studies provide information on a variety of potential environmental, social, economic, regulatory, and infrastructure-related issues associated with the planning for future offshore wind energy development off the coast of the State. When the State embarked on these studies, it began by looking at a study area identified by the New York State Department of State (NYSDOS) in its two-year Offshore Atlantic Ocean Study (DOS 2013). This study area, referred to as the "offshore study area (OSA)," is a 16,740-square-mile (43,356-square-kilometer) area of the Atlantic Ocean extending from New York City and the south shore of Long Island to beyond the continental shelf break and slope into oceanic waters to an approximate maximum depth of 2,500 meters (m) (Figure 1). The OSA was a starting point for examining where turbines may best be located, and the area potentially impacted. Each of the State's individual studies ultimately focused on a geographic Area of Analysis (AoA) that was unique to that respective study. The AoA for this study is described below in Sections 1.4 and 2.2.

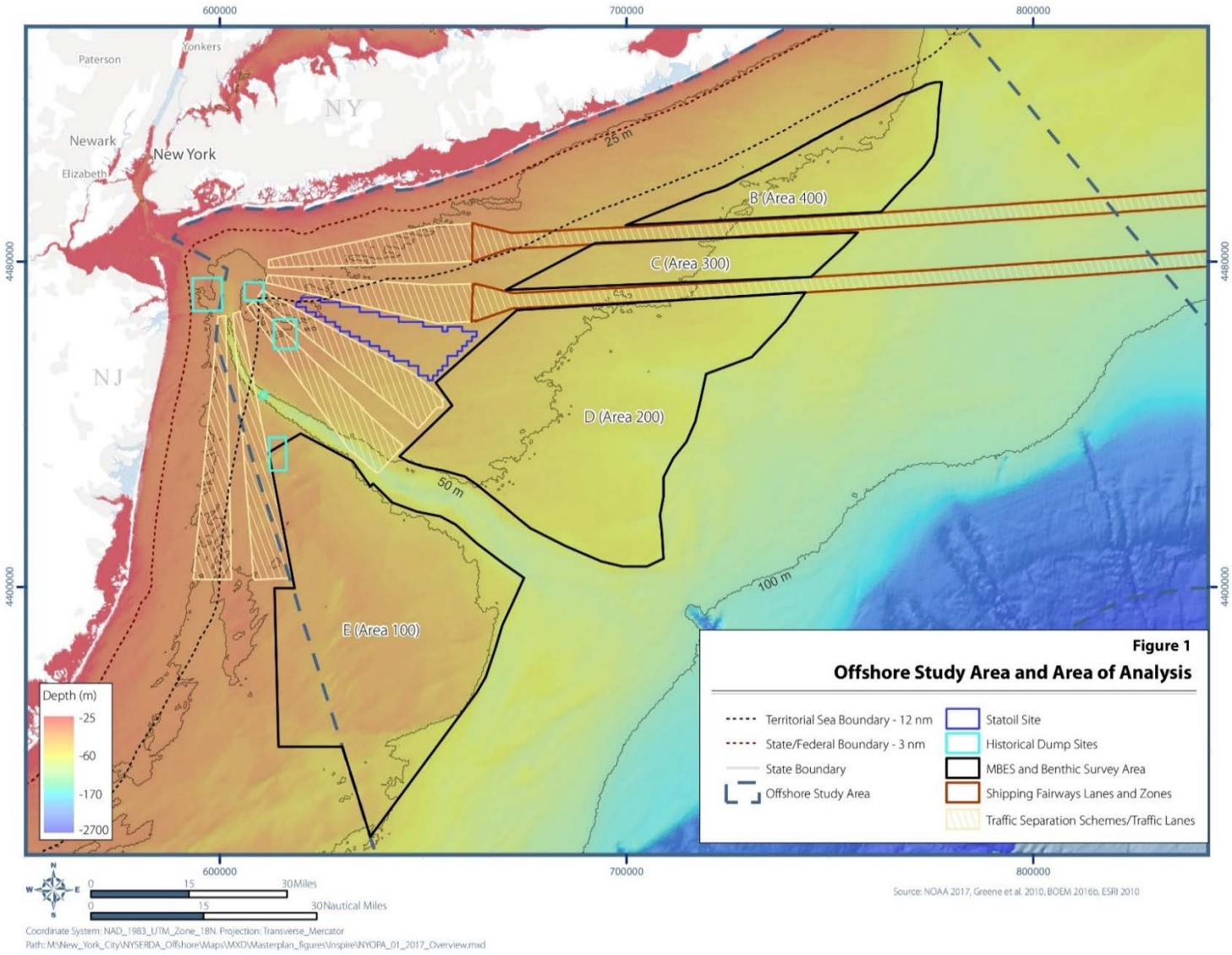
The State envisions that its collection of studies will form a knowledge base for the area off the coast of New York that will serve a number of purposes, including (1) informing the preliminary identification of an area for the potential locating of offshore wind energy areas that was submitted to the Bureau of Ocean Energy Management (BOEM) on October 2, 2017, for consideration and further analysis; (2) providing current information about potential environmental and social sensitivities, economic and practical considerations, and regulatory requirements associated with any future offshore wind energy development; (3) identifying measures that could be considered or implemented with offshore wind projects to avoid or mitigate potential risks involving other uses and/or resources; and (4) informing the preparation of a Master Plan to articulate New York State's vision of future offshore wind development. The Master Plan identifies the potential future wind energy areas that have been submitted for BOEM's consideration, discusses the State's goal of encouraging the development of 2,400 megawatts of wind energy off the New York coast by 2030, and sets forth suggested guidelines and best management practices that the State will encourage to be incorporated into future offshore wind energy development.

Each of the studies was prepared in support of the larger effort and was shared for comment with federal and State agencies, indigenous nations, and relevant stakeholders, including nongovernmental organizations and commercial entities, as appropriate. The State addressed comments and incorporated feedback received into the studies. Feedback from these entities helped to strengthen the quality of the studies, and also helped to ensure that these work products will be of assistance to developers of proposed offshore wind projects in the future. A summary of the comments and issues identified by these external parties is included in the Outreach Engagement Summary, which is appended to the Master Plan.

The Energy Policy Act of 2005 amended Section 8 of the Outer Continental Shelf Lands Act (OCSLA) to give BOEM the authority to identify offshore wind development sites within the Outer Continental Shelf (OCS) and to issue leases on the OCS for activities that are not otherwise authorized by the OCSLA, including wind farms. The State recognizes that all development in the OCS is subject to review processes and decision-making by BOEM and other federal and State agencies. Neither this collection of studies nor the State's Master Plan commit the State or any other agency or entity to any specific course of action with respect to offshore wind energy development. Rather, the State's intent is to facilitate the principled planning of future offshore development off the New York coast, provide a resource for the various stakeholders, and encourage the achievement of the State's offshore wind energy goals.

Figure 1. Offshore Study Area and Area of Analysis

NOAA 2017; Greene et al. 2010; BOEM 2016b; ESRI 2010



1.1 Purpose

The purpose of this Study was to improve understanding of the benthic and sedimentological characteristics of the seafloor within the AoA to facilitate the planning process for future offshore wind development in the OSA. Characterization of the physical and biological properties of the seafloor is critically important for development, and a baseline of understanding is required for planning; full site characterization of any particular areas proposed for development will occur at the project development stage.

An earlier analysis covering the OSA and region conducted by National Oceanic and Atmospheric Administration (NOAA) for the DOS concluded that "for the vast majority of the study area [OSA], data could only detect features at scales on the order of 10^2 m and in some areas 10^3 m. In general, new Multibeam Echo Sounder (MBES) and/or sidescan sonar surveys are needed if greater detectability at short spatial scales is required" (Poti et al. 2012a). Supplemental, high resolution MBES data were collected during this Study, along with imagery to ground truth seafloor surface features and to fill data gaps in the NOAA study (Poti et al. 2012b). These data have been analyzed to support a planning level assessment of seafloor topography and to identify habitat patches and potential cultural remains smaller than 10^2 m.

1.2 MBES and Benthic Survey Project Objectives

The overall objective of this Study was to characterize the geological (sediment size and type), geotechnical (density of bottom), and benthic (animal habitat) characteristics of an area off the shore of New York State that has been designated for potential offshore wind energy development. This objective was accomplished through broad area reconnaissance MBES (primarily high resolution bathymetry and backscatter) and Sediment Profile Image (SPI) and Plan View (PV) photographic data. The SPI/PV was used to ground truth the MBES data and provide an initial assessment of habitat types, including identification of sensitive habitat, within the AoA. Characterization of the seafloor with SPI/PV at areas of differing backscatter intensities (and on landscape-scaled seafloor features) allowed for the extrapolation of substrate and habitat types across the entire area surveyed with the MBES.

1.3 Survey Rationale and Design

For the purposes of planning this Study's field data collections, existing data concerning sediments, substrata, and benthic habitats and communities within the OSA were evaluated. BOEM's guidelines for

offshore energy development were also considered in designing the Study. These guidelines indicate that future offshore wind projects should avoid locating facilities near sensitive seafloor habitats, including some hard bottom habitats, seagrass habitats, and corals. Guidelines also recommend that such projects minimize scour and sediment suspension and resuspension (BOEM 2013).

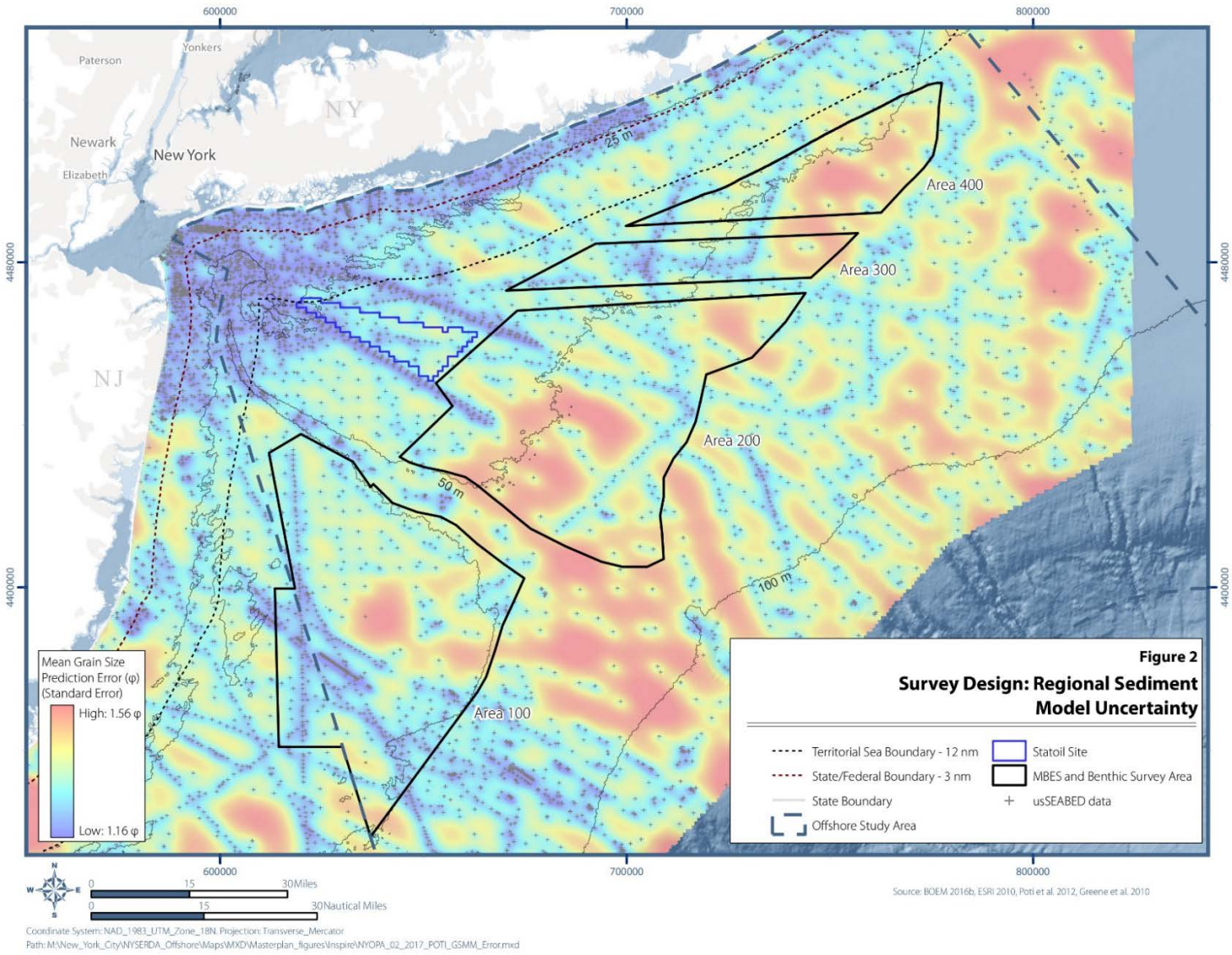
Review of existing oceanographic data in the New York Bight region revealed several sources of geological, geophysical, biological, bathymetric, and sedimentary data. Most geological data sources focused on sand resources in the regions near the coast (within 15 nautical miles [nm]) (e.g., Byrnes et al. 2004). Many of these sources were reviewed in BOEM's Environmental Assessment (BOEM 2016a). Existing biological data sources were limited to large regional syntheses. The most recent sources included Brooks et al. (2004) and Greene et al. (2010). These sources included thorough reviews of older biological and geological sources from the Minerals Management Service and U.S. Geological Survey and were not further reviewed. Regional syntheses, such as these, that focus on large-scale distributions or modeled information are sub-optimal for comparative assessments of potential offshore wind development areas.

The most recent and comprehensive resource was a desktop study of historical geophysical data conducted by NOAA for the DOS (Menza et al. 2012). This study aimed to provide essential background information to coastal managers when siting offshore entities such as wind farms, historical dredged material disposal areas, and shipping lanes. The analysis relied on statistical models that interpolated between historical data collection points, resulting in uncertainty in interpolated regions. The report authors included maps to accompany the predicted geophysical data they presented, which identified areas where additional data collection would be beneficial. The survey conducted for this Study used this NOAA data synthesis as the primary tool for survey planning and identification of data gaps because the scale and analytical approach best matched the requirements of the Study's data collection objectives.

The final survey plan for this Study relied on a combination of modelled information about existing sediment distribution (Figure 2) and MBES sampling. By placing MBES lines and SPI stations in a manner that emphasized collection from areas with the lowest density of sampled points (highest uncertainty) per the 2012 NOAA study of surface sediments (Poti et al. 2012b), this survey was intended to increase the resolution and decrease the uncertainty of the existing grain size prediction model.

Figure 2. Survey Design: Regional Sediment Model Uncertainty

Source: BOEM 2016b; ESRI 2010; Poti et al. 2012; Greene at al. 2010

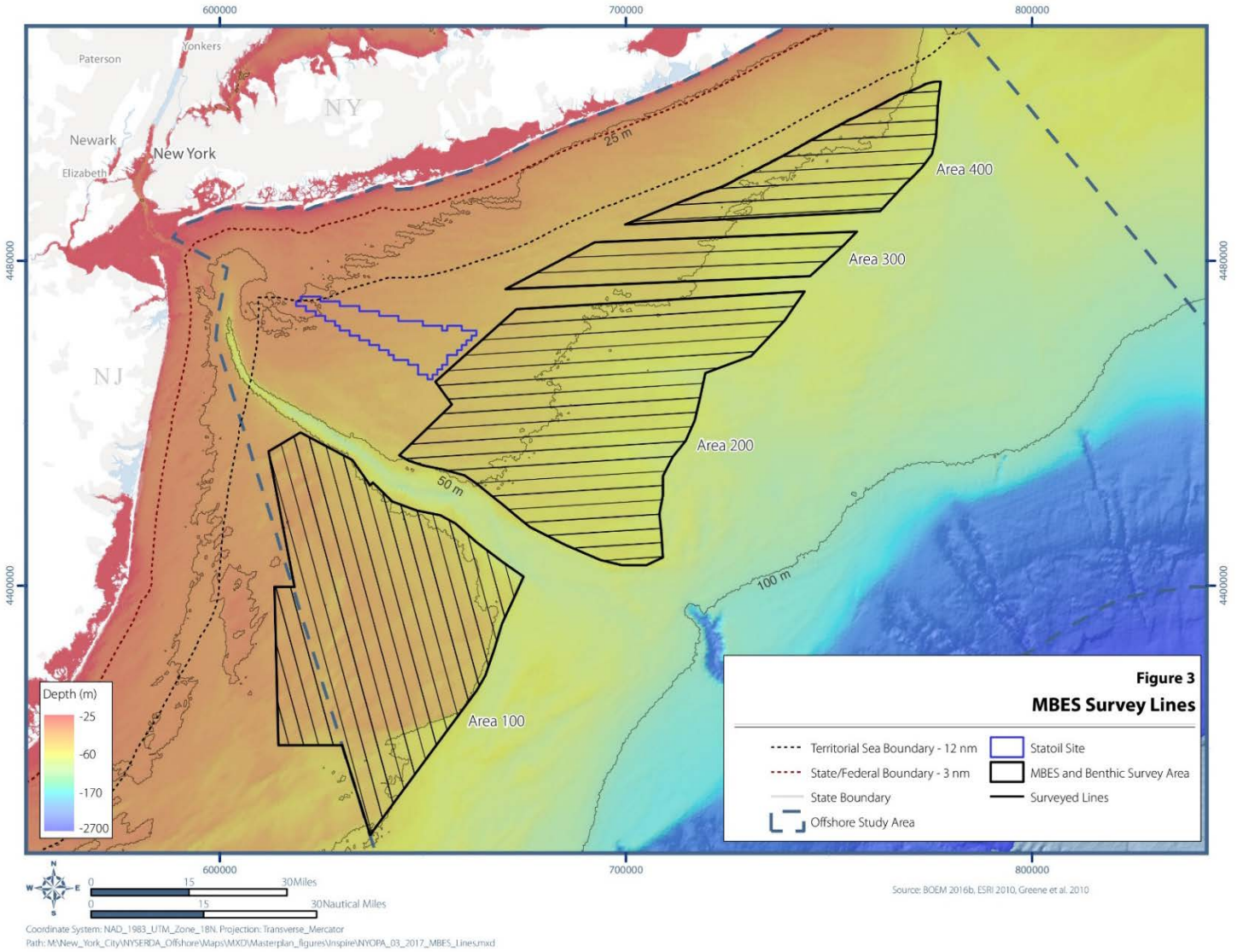


1.4 Survey Location

The MBES and SPI/PV survey was conducted off the shore of New York State within selected areas of the OSA. The planning area for the survey was initially defined by a subset of the OSA to exclude areas closer than 15 nm from shore and water depths deeper than 62 m. The survey additionally excluded major known shipping lanes, the sensitive habitat area of the Hudson Shelf Valley, and existing lease blocks (Figure 1). By restricting the AoA to exclude areas based on objective criteria (depth, distance from shore, intense use, habitat quality), it was possible to survey the remaining area with higher data density than would have been possible across the entire OSA. These areas were identified as Areas 100 to 400 on maps related to this survey (Figure 3). Additionally, based on stakeholder feedback, the survey area adjacent to the western New Jersey/New York OSA boundary was modified to include several additional MBES lines and SPI/PV stations on the western side of the OSA (Figure 3).

Figure 3. MBES Survey Lines

Source: BOEM 2016b; ESRI 2010; Greene et al. 20910



1.5 Project Participants and Organization

INSPIRE Environmental, LLC (INSPIRE) was the prime contractor to the New York Energy Research and Development Authority (NYSERDA) for this Study. Alpine Ocean Seismic Survey, Inc. (Alpine), was sub-contracted to INSPIRE and was responsible for providing the survey vessel and collection and processing of the MBES and navigation data. Ecology and Environment, Inc. (E&E), also provided a representative aboard the vessel to aid in continuity between this Study's goals and the broader Master Planning work E&E is performing for NYSERDA on behalf of the State of New York.

INSPIRE led all scientific decisions regarding sample plans, processing and delivery of data, and communications with NYSERDA. Alpine provided the offshore survey vessel, marine crew, and science team to conduct multibeam bathymetry while also concurrently deploying INSPIRE's SPI/PV camera system. In addition, near real-time preliminary processing was conducted on board the survey vessel to provide the research team with the bathymetric, backscatter, and water column data needed to assess the bottom conditions and help define the deployment positions for the SPI system. INSPIRE provided equipment and personnel to conduct the SPI/PV survey, geographical information system (GIS) support, and on-board geological and biological expertise for data interpretation and adaptive sampling.

Final MBES data processing and operations reporting was performed on shore by Alpine surveyors and geoscientists. Image analysis and reporting was conducted by INSPIRE at their offices.

2 Methods

2.1 Survey Overview

Acoustic (MBES) and benthic (SPI/PV) data acquisition was carried out by INSPIRE and Alpine on board the Research Vessel (R/V) Shearwater, which was mobilized in New Bedford, MA on June 21, 2017; operations were completed on August 11, 2017. The acoustic and optical data sets were reviewed for the presence of any natural or man-made hazards, as well as variations in bottom type to aid in planning additional data collection areas.

The MBES Survey Line Plan (Figure 3) was developed to optimize the coordination of high resolution MBES data collection with SPI/PV data collection to produce integrated, interactive mapping tools to support the Master Plan development. The MBES survey collected detailed acoustic imagery of the seafloor topography and relative hardness/softness (backscatter) of the seafloor and surface sediments in transects while the vessel was underway.

On-board processing of acoustic data allowed the development of an optimal SPI/PV sampling strategy across the main survey areas to ground truth observed areas of suspected habitat and sediment composition variability as evidenced by changes in backscatter and bathymetry. The SPI/PV system collected downward looking (plan view) and cross-sectional (profile) images of the seafloor to help assess seafloor characteristics (sediment type and benthic habitat) at individual stations.

Together, these two technologies and the resulting data provided planning level data (5% to 10% coverage of the potential wind energy areas) sufficient to inform the Master Plan.

2.2 Survey Plan

The overall survey plan was predicated on a two-part objective: collecting quality MBES data over as large a representative set of environments within the OSA as possible and ground truthing the MBES data with an efficient means of sediment sampling. SPI/PV was selected for sediment sampling as it is an effective rapid reconnaissance tool for assessing habitat characteristics in benthic environments (Germano et al. 2011) and has been specified by BOEM as a monitoring tool for providing benthic habitat survey information on the Atlantic Continental Shelf (BOEM 2013).

The SPI/PV sampling design utilized all available data, with heaviest weighting on geophysical results collected during the MBES survey and modeled uncertainty (as discussed in Section 1.3) (Poti et al. 2012b). As acoustic data were collected and processed on board the survey vessel, scientists on board reviewed and compared the MBES data with existing NOAA data and selected optimal ground truth sampling stations for SPI/PV data collection using the following criteria:

- Complexity of bathymetry and backscatter: higher variation = more SPI stations.
- Density and uncertainty parameters of existing data (usSEABED and NOAA bathymetry): lower density/greater uncertainty = more SPI stations.
- Evidence of hard ground, cobbles, or patchy/complex textures that could be indicative of sensitive benthic habitats.

Additionally, the survey plan was developed to minimize MBES data collection or direct sampling in shipping lanes, known sensitive habitat (Hudson Shelf Valley), and existing lease areas (Figure 1). MBES operations were conducted with the vessel underway and did not disturb the seafloor.

2.3 MBES Survey Equipment, Procedures, and Processing

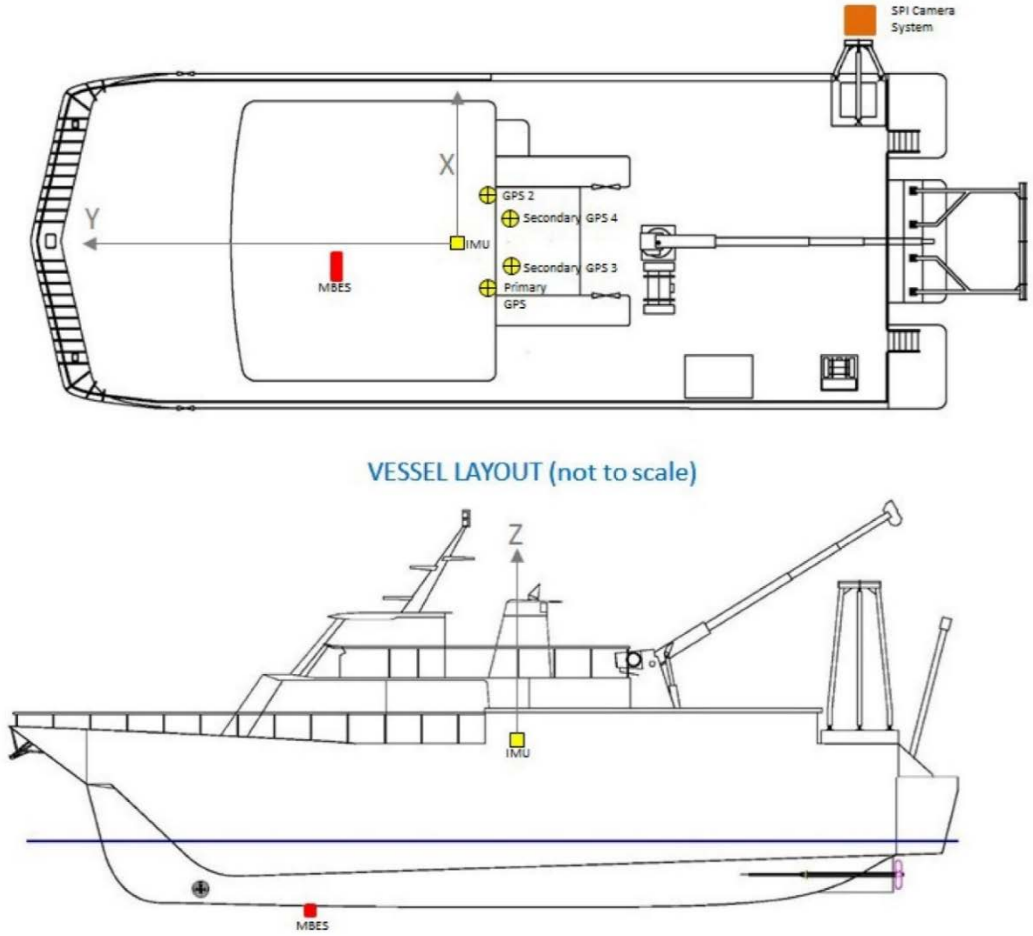
The objective of the MBES survey was to provide high quality swath MBES data for interpretation of bathymetry; relative hardness of the seafloor, measured as intensity or backscatter; and limited water column anomaly data, as indicated by on-board review of MBES data during acquisition for presence of likely water column anomalies (pelagic assemblages of fish, methane plumes, archaeological sites such as wrecks with rigging, etc.).

An R2Sonic 2024 (dual-head) MBES was used to collect bathymetry and backscatter. The bathymetry data were logged in Quality Positioning Services BV (QPS) Quality Integrated Navigation System (QINSy) navigation software. The system was operated at 340 to 370 kilohertz to ping simultaneously without interference between sonar heads. The R2Sonic 2024 MBES system provided for focused 0.5 x 1.0 degree beams and incorporated a sound velocity probe to monitor the speed of sound in water in real time, and that was used in beam steering. The sound velocity probe incorporated into the MBES system has an accuracy of ±0.15 meters per second and was used to generate sound velocity profile (SVP) records. Layout of the vessel's sensors and systems is shown in Figure 4.

All MBES data were collected and presented using the NAD 83 (2011) geodetic datum, the Universal Transverse Mercator Zone 18 North projection, and mean lower low water as the vertical datum, with depth units expressed in meters.

Figure 4. R/V Shearwater: Hydrographic and Sampling Equipment Layout

Source: Alpine 2017



2.3.1 MBES Processing

The MBES data collected with the dual R2Sonic systems were processed using QPS QINSy and Caris HIPS 10.3.1 software. The data were loaded into Caris HIPS; SVP corrections were applied; POSPac smoothed best estimate of trajectory (SBET) for global navigation satellite system (GNSS) was used for tidal corrections; and a Delayed Heave was applied. Data were de-spiked, their water level and datum corrected, and then exported as 1.0 m binned ASCII XYZ sounding files. These files were used to create 1 m grids in ArcGIS and to generate shaded relief images of seafloor elevations. Seafloor relief grids were produced at 2x vertical exaggeration using the ArcGIS Spatial Analyst Hillshade tool, with an azimuth angle of 315 degrees, an altitude angle of 45 degrees, and no shadows within the shaded relief output.

Slope and rugosity data sets were also derived from bathymetric data. Slope represents the degree of change in elevation, with the maximum value retained per grid cell. Seafloor slope grids were produced at 1 m resolution using the ArcGIS Spatial Analyst Slope tool, with an output measure of degree and a z-factor of 1. Rugosity represents a measure of seafloor roughness (unit of measure = ratio of depths). Seafloor rugosity grids were produced using the ArcGIS Spatial Analyst Neighborhood Focal Statistics tool to create mean and range bathymetry 1 m grids using a rectangular search neighborhood of 3 x 3 grid cells. The ArcGIS Spatial Analyst Map Algebra Raster Calculator was then used to produce the rugosity grid by subtracting the bathymetry grid from the mean bathymetry grid and dividing the result by the bathymetry range grid.

2.3.2 Backscatter Processing

Backscatter post-processing was completed in QPS Fledermaus Geocoder Toolbox. The raw sonar files and cleaned bathymetry files were loaded into the software for backscatter processing. Backscatter processing included application of angle varying gain corrections and custom processing parameters specific to the dual head R2Sonic system. Due to the size of the area covered by the survey, backscatter mosaics were generated for each survey line individually. After mosaic generation, the survey lines were inspected for any anomalies or features of interest. The de-spiked backscatter data were then tiled and exported as 0.25 m binned ASCII XYI and Floating Point GeoTiff files. For use in ArcGIS, these data were gridded from geotiff files at 1 m and at 0.25 m pixel resolution using the mosaic tool within the Surfer software application (Golden Software).

2.4 MBES Data Quality Control Procedures

Mobilization and verification testing procedures included calibration/testing of all on-board equipment to verify that all systems were fit for survey in accordance with manufacturer specifications. Before commencing MBES operations in the survey area, a patch test was performed in an area outside New Bedford Harbor that had suitable features (slopes, shipwreck) to conduct MBES motion, alignment, and timing calibrations.

The survey used high accuracy instruments such as the R2Sonic 2024 dual MBES, Applanix POS M/V, Teledyne RapidCast SVP, and QPS QINSy. Post-processing and data reduction of bathymetric data to the mean lower low water datum was completed using Caris HIPS 10, Applanix POSPac, and NOAA VDATUM. Total propagated uncertainty was computed within Caris HIPS using manufacturer’s accuracy values, VDATUM uncertainties, and NOAA Field Procedures Manual guidelines.

In some areas, acoustic data were collected in marginal weather to acquire as much data as possible during the field survey. Minimal if any data from outer swaths were rejected to aid in maintaining maximum coverage per single swath (one swath per survey line). The overall survey design was atypical of hydrographic multibeam surveys due to the lack of adjacent and overlapping swaths of MBES data. Multibeam sonar tuning was done to optimize backscatter data as the highest priority. All final processed and accepted bathymetric data met error budget specifications.

2.5 Sediment Profile and Plan View Imagery

The objective of the SPI/PV survey was to ground truth acoustic data, primarily backscatter, in relation to physical characteristics of the seafloor; to characterize the benthic biotic communities observed; and to provide a screening level evaluation of benthic habitats within the surveyed area in relation to suitability for offshore wind farm construction.

A 300-station SPI/PV survey was performed within the four survey areas from June 21 to August 11, 2017 (Figure 5). Stations location placement generally followed survey design plans and were clustered where bathymetry and backscatter data showed cohesive regions of backscatter, across areas where steep gradients in backscatter were observed, and in areas of high uncertainty in a regional surface sediment model (Poti et al. 2012b) (Figure 6). Locations of sampled SPI/PV stations are provided in Appendix A. The methodology for data acquisition and analysis for these images was consistent with the methods described in detail in INSPIRE's standard operating procedure (Appendix B). Four replicate image pairs were collected at each station. Multiple replicates ensured that high-quality images were collected from every station. Additionally, this level of replication will allow variability within each station to be assessed in the future if needed.

Figure 5. SPI/PV Stations

Source: BOEM 2016b; ESRI 2010; Greene et al. 2010

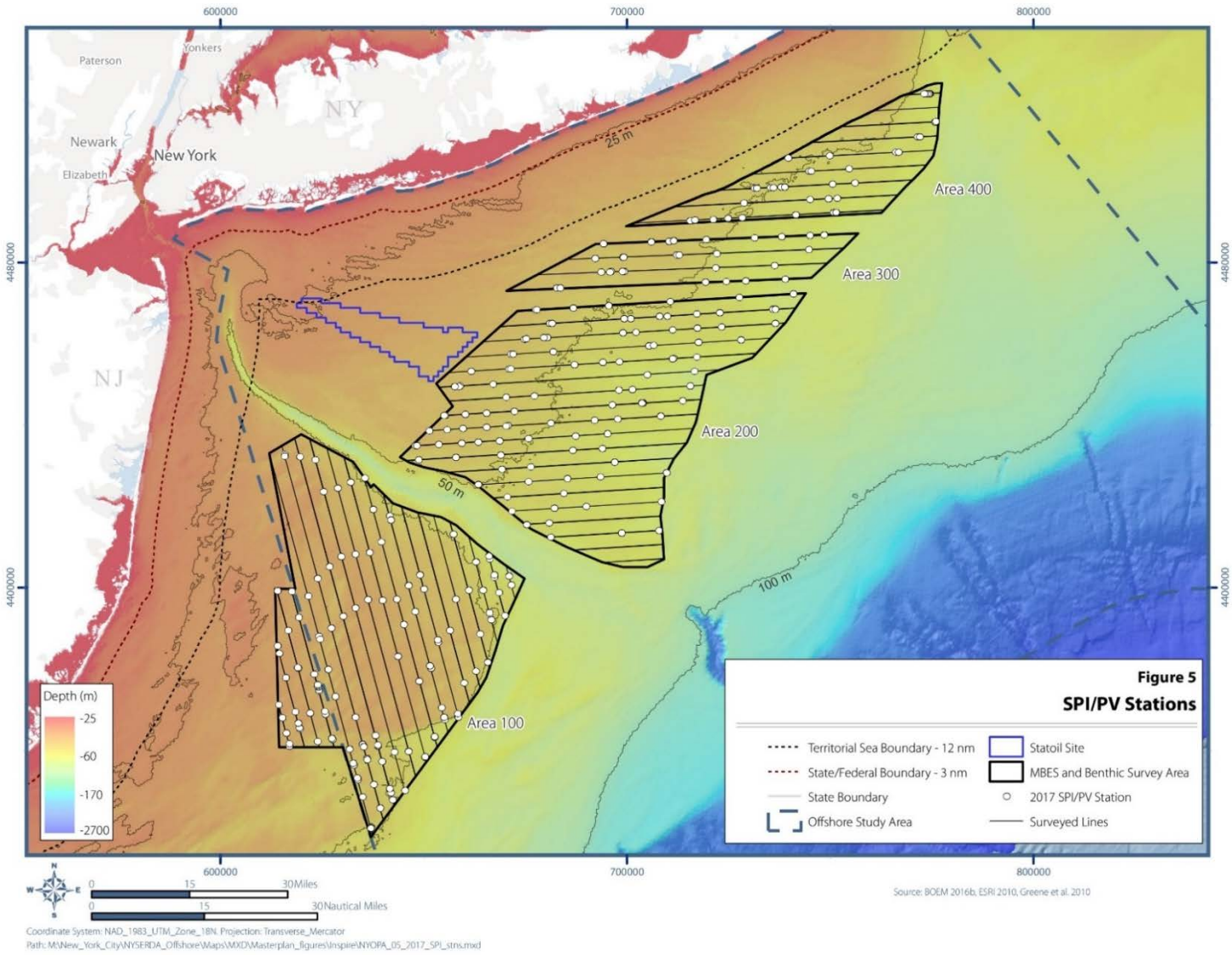
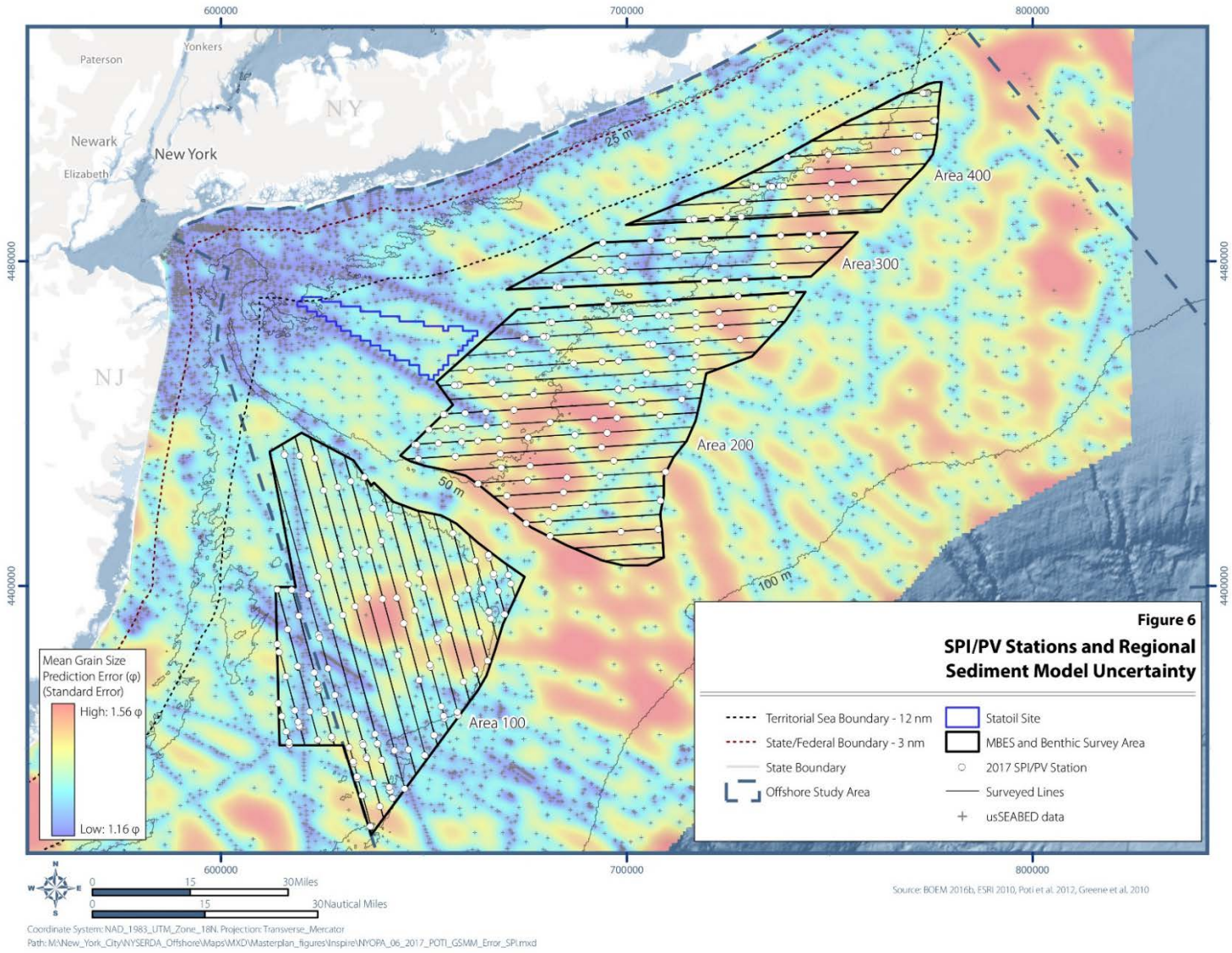


Figure 6. SPI/PV Stations and Regional Sediment Model Uncertainty

Source: BOEM 2016b, ESRI 2010; Poti et al. 2012; Greene et al. 2010



2.5.1 Vessel Positioning for SPI/PV Stations

QPS QINSy navigation and data-logging software were used to position the vessel and record coordinate locations for each “drop” of the SPI/PV camera system. The navigation system was synchronized to Universal Time Coordinates using the pulse per second and associated time-tag from the primary on-board GNSS receiver. All equipment was referenced to a common reference point, and the SPI/PV positioning was referenced to the starboard A-frame. As additional backup, a survey log of each SPI/PV system “drop” and information such as date, time, and position was kept within the QINSy software.

2.5.2 Field Collection of Images

The SPI/PV technique involves deploying an underwater camera system to photograph an aerial view of the seafloor (PV) and a cross-section of the sediment column from the sediment-water interface to 15 to 20 centimeters (cm) below surface (SPI). The PV camera images a much larger field of view than the SPI camera and provides valuable information about the landscape ecology and sediment topography in the area where the pinpoint “optical core” of the sediment profile image was taken (Figure 7). Both SPI and PV images were collected during each “drop” of the system.

High-resolution SPI images were acquired using a Nikon D7100 digital single-lens reflex camera mounted inside an Ocean Imaging Model 3731 pressure housing. The pressure housing sat atop a wedge-shaped steel prism with a glass front faceplate and a back mirror, mounted at a 45 degree angle. The camera lens looked down at the mirror, which reflected the image from the faceplate. The prism had an internal strobe mounted inside at the back of the wedge to provide illumination for the image; this chamber was filled with distilled water so that the camera always had an optically clear path. As the prism penetrated the seafloor, a trigger activated a time-delay circuit that fired an internal strobe to obtain a cross-sectional image of the upper 15 to 20 cm of the sediment column (Figure 8).

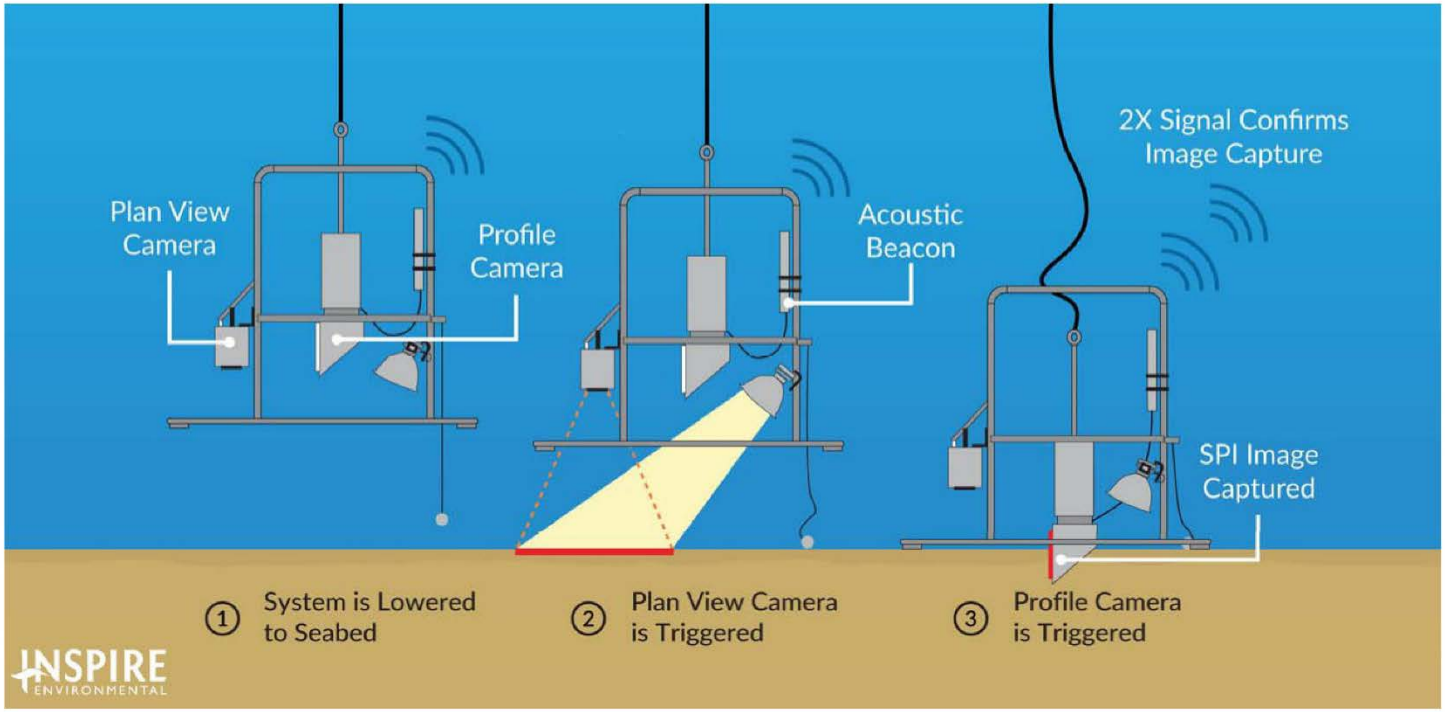
Figure 7. SPI and PV Image Scaling

Source: INSPIRE 2017b

Note:The blue scaling line on this representative PV image shows the sampling relationship between PV and SPI images. PV images differ between surveys and stations, and the area covered by each image may vary between images and stations.

Figure 8. Schematic of SPI/PV Deployment

Source: INSPIRE 2017a



Note:Deployment sequence of SPI and PV cameras. Left to right: the SPI system is lowered to the seafloor; once the trigger weight touches the seabed, the PV image is taken, the SPI camera lands on the seafloor, and the profile head continues into the sediment to acquire the seabed interface imagery. Once the profile image has been taken, the camera can be redeployed by bringing it up 5 to 10 m off the seabed, and the process is repeated until the desired number of replicate image pairs is acquired.

High-resolution PV images were acquired using a Nikon D-7100 single-lens reflex camera encased in an Ocean Imaging Model DSC24000 PV underwater camera system with two Ocean Imaging Model 400-37 Deep Sea Scaling lasers attached to the sediment profile camera frame. The PV system consisted of the camera encased in an aluminum housing, a 24-volt direct current autonomous power pack, a 500-watt strobe, and a bounce trigger. A weight was attached to the bounce trigger with a stainless-steel cable so that the weight hung below the camera frame; the scaling lasers projected two red dots that were separated by a constant distance (26 cm) regardless of the field-of-view of the PV system. The field-of-view can be varied by increasing or decreasing the length of the trigger wire and, thereby, the camera height above the bottom when the picture is taken. As the SPI/PV camera system was lowered to the seafloor, the weight attached to the bounce trigger contacted the seafloor prior to the camera frame reaching the seafloor and triggered the PV camera (Figure 8). The ability of the PV system to collect usable images is dependent on the clarity of the water column. Water conditions during this survey allowed use of an approximately 1 m trigger wire, resulting in an average field-of-view of approximately 0.78 square meters.

Prior to field operations, the internal clocks in the digital SPI and PV cameras were synchronized with the vessel's navigation system. Each image was assigned a unique time stamp in the digital file attributes by the camera's data logger and was later cross-checked with the time stamp in the navigational system's computer data file. Images were downloaded periodically to verify successful sample acquisition and/or to assess the type(s) of sediment present at a given station. In addition, scientists kept a written field log of all SPI/PV deployments.

Test exposures of a Color Calibration Target were made on deck at the beginning of the survey to verify that all internal electronic systems were working to design specifications and to provide a color standard against which final images could be checked for proper color balance. Test images were also captured to confirm proper camera settings for site conditions. All camera settings were recorded in the field log and are also available in the associated parameters file embedded in each electronic image file. For this survey, the International Organization for Standardization (ISO)-equivalent was set at 640 for SPI, 800 for PV; the shutter speed was 1/320 for SPI, 1/30 for PV; the f-stop was f10 for SPI, and for PV, the f-stop was adjusted a couple times on the first day of sampling to optimize image quality, and f11 and f14 were used before selecting f16 as the setting for the remainder of the survey; and the images were stored in compressed raw Nikon Electronic Format (NEF) files (approximately 30 megabytes each).

Following completion of the field operations, all images were quality-checked against the navigation data to ensure that each was assigned to the correct sampling location coordinates. The raw image files were then color-calibrated in Adobe Camera Raw and converted to high-resolution Photoshop Document (PSD) format files, using a lossless conversion file process, maintaining an Adobe RGB (1998) color profile. The PSD images were then calibrated and analyzed in Adobe Photoshop.

2.5.3 SPI/PV Data Analysis and Evaluation

SPI and PV images were analyzed to provide data on surface sediment characteristics (up to 20 cm) and on benthic biotic communities living on and within the sediment column.

2.5.3.1 Habitat Classification and Evaluation

Using a habitat classification approach at multiple scales provides a useful means to assess baseline conditions, evaluate physical and biological habitat relationships, and understand the effects of offshore energy construction on benthic habitats (INSPIRE 2016). The Coastal and Marine Ecological Classification Standard (CMECS) (FGDC 2012) is recommended by BOEM as a tool for benthic habitat assessment of offshore energy development (BOEM 2013). CMECS consists of four components: 1) the Water Column Component, 2) the Geoform Component, 3) the Substrate Component, and 4) the Biotic Component (FGDC 2012). CMECS was designed to provide flexibility to its users: each component can be used on its own or in combination with others (Table 1).

The Substrate and Biotic Components are particularly useful for characterizing sediment and biota distributions and, when monitored over time, for assessing changes to these in relation to offshore energy construction and operation. Annual sampling and classification of the Substrate and Biotic Components over a five-year period using SPI technology has been recommended as a rapid assessment tool for assessing changes to benthic biotic community structure at offshore wind installations (Shumchenia 2011). For this Study, the Substrate and Biotic Components were used to classify select habitat components identifiable from SPI/PV imagery.[1]

[1] CMECS uses the term “substrate” for both a geological substratum (a layer of sediment or rock) and for biological or anthropogenic substrates (solid surfaces on which plants or animals grow). For CMECS descriptions, we adopt this convention, but for SPI descriptions of sediments we use the geological term, i.e., “substratum.”

Table 1. CMECS Classification Levels Used in Analysis and Classifications

CMECS Term	Scale of Classification	Classification/Example
Geoform Component		
Tectonic Setting	Site	Passive Continental Margin
Physiographic Setting	Site	Continental Shelf
Geoform Origin	Site	Geologic
Substrate Component		
Substrate Origin	Site	Geologic Substrate
Substrate Class	SPI/PV	Unconsolidated Mineral Substrate
Substrate Subclass	SPI/PV	Fine Unconsolidated Substrate
+Substrate Group	SPI/PV	Muddy Sand; Mud; Sand; Slightly Gravelly; Gravelly; Gravel Mixes
+Substrate Subgroup	SPI	Silt; Silty Sand; Slightly Gravelly Muddy Sand; Very Fine Sand; **Fine Sand, Medium Sand**; Coarse Sand; Very Coarse Sand; Slightly Gravelly Sand; Gravelly Sand; Sandy Gravel
Biotic Component		
Biotic Setting	SPI/PV	Benthic/Attached Biota
Biotic Class	SPI/PV	Faunal Bed
Biotic Subclass	SPI/PV	Soft Sediment Fauna
+Biotic Group	SPI/PV	**Sand Dollar Bed**; Diverse Soft Sediment Epifauna; Small Tube-building Fauna; Burrowing Anemones; Inferred Fauna
+Biotic Community	SPI/PV	Echinocardium Bed; Thin Ampelisca Bed; Cerianthus Bed; Tracks and Trails
Associated Taxa Modifier	SPI/PV	Moon snail (Polinices); Scallops; Sea stars; Hermit crabs; Flatfish; Stingray

+ Indicates variability within the survey area at this level of the hierarchy.

Bold text indicates an overwhelming dominant classification across the survey area

One classifier, Biotic Subclass, was particularly useful in meeting survey objectives. This CMECS classifier presents valuable information about the survey area in terms of physical habitat and the potential presence of sensitive habitats or those that might otherwise preclude turbine installation. Biotic subclasses describe dominant biota (by percent cover) at a coarse level. Within the Benthic/Attached Biota Biotic Setting, there are eight classes, of which the Faunal Bed class is of most relevance to the U.S. Atlantic offshore waters on the continental shelf. Three subclasses fall under the Faunal Bed hierarchy: Attached Fauna, Soft Sediment Fauna, and Inferred Fauna. Inferred Fauna (e.g., tracks and trails, egg masses) are often present, but in this study, were primarily used to inform or confirm the selection of either the Attached Fauna or Soft Sediment Fauna subclass. Although the Biotic Component Subclass is not directly based on sediment grain size distributions, it reflects them at the scale of relevance to the dominant fauna present, thus serving as an integrator of physical and biological characteristics of the seafloor. CMECS expressly states that “substrate

type is such a defining aspect of the Faunal Bed class that CMECS Faunal Bed subclasses are assigned as physical-biological associations involving both biota and substrate" (FGDC 2012).

2.5.3.2 SPI and PV Image Analysis

Computer-aided analysis of SPI/PV images provided a set of measurements selected to meet survey objectives. Measured parameters for SPI and PV images were recorded in Microsoft Excel spreadsheets. These data were subsequently checked by one of the team's senior scientists as an independent quality assurance/quality control review before final interpretation was performed. Spatial distributions of SPI/PV parameters were mapped using ArcGIS.

Variables analyzed from SPI images included grain size major mode, camera prism penetration depth, small scale surface boundary roughness, bedform types, substrate type, presence of methane bubbles, CMECS Biotic Component Subclass, presence of sensitive taxa (e.g. coral, lobster, squid egg masses), and epifaunal taxa present. Variables measured from PV images include sediment type, sediment oxidation state, bedform types, debris types, CMECS Biotic Component Subclass, presence of sensitive taxa; presence of tubes, burrow openings, and tracks; infauna, epifauna, and flora taxa present; and density of sand dollars. A descriptive comment was also recorded for each SPI and PV image. Full definitions of SPI and PV parameters can be found in Appendix B and in CMECS documentation (FGDC 2012). Full data results are presented in Appendix C.

Analysis of sediment type and dominant grain size was critical to meeting the objectives of the survey, including positioning SPI/PV stations to gather information to fill existing data gaps and areas of uncertainties in a regional grain size model (see Section 1.3). A crosswalk between grain size scales and classification systems utilized in the Poti et al. model (2012b) and in analysis of SPI and PV images is provided in Table 2. Grain size major mode and range were estimated from SPI images using a visual grain size comparator created at a similar scale. Results were reported using the phi scale. The broader scale of PV images provides valuable context for observations made in the SPI images, e.g., for determining whether a surface feature is part of a rippled seafloor surface or an isolated anomaly. PV images can also reveal features that are not captured in the SPI images; e.g., patches of pebbles, epifauna, and fish. Sediment type was analyzed in SPI and PV images independently and, subsequently, in concert for ground truthing acoustic data with optical SPI/PV results.

Table 2. Grain Size and Classification Crosswalk for Sediments

Phi (Φ) Size	Size Range (mm)	Size Class (Udden-Wentworth Class)	Poti et al. (2012b) Probability	CMECS Substrate Group	CMECS Substrate SubGroup
>-8	>256	Boulders	Boulders and larger	Gravel; Gravel Mixes; Gravelly; Slightly Gravelly (depending on percent composition)	Boulder
-6 to -8	64 to 256	Cobbles	Cobbles and larger		Cobble
-5 to -6	32 to 64	Very coarse gravel	Pebbles and larger		Pebble
-4 to -5	16 to 32	Coarse gravel			
-3 to -4	8 to 16	Medium gravel			
-2 to -3	4 to 8	Fine gravel			
-1 to -2	2 to 4	Very fine gravel			Granule
0 to -1	1 to 2	Very coarse sand	Very fine sand and larger	Sand	Very coarse sand
1 to 0	0.5 to 1	Coarse sand			Coarse sand
2 to 1	0.25 to 0.5	Medium sand			Medium sand
3 to 2	0.125 to 0.25	Fine sand			Fine sand
4 to 3	0.0625 to 0.125	Very fine sand			Very fine sand
>4	<0.0625	Silt/clay	-	Muddy Sand, Sandy Mud, Mud (depending on percent composition)	Silt/clay

2.5.3.3 Ground Truth Analysis of Backscatter and Sediment Type

Backscatter is a measure of acoustic reflectivity or intensity of sound waves returning to the MBES. Although return intensity can be influenced by multiple parameters unrelated to sediment type (i.e., seafloor slope angle relative to the transducer, frequency response of the sediments, marine growth, etc.), intensity can typically be interpreted to be most influenced by the relative hardness or softness of the seafloor and surface sediments, e.g., stronger acoustic returns usually denote harder sediments and weaker acoustic returns, softer sediment. Therefore, the backscatter results from this survey were ground truthed with results from SPI and PV images and allowed the backscatter to inform interpretation over the survey area with greater confidence. Sediment types based on grain size major mode (SPI), CMECS substrate

classifications (PV), and real-time review of imagery were examined against the backscatter across the survey area. This evaluation of backscatter and optical results on sediment type was conducted to determine if backscatter signal ranges (displayed as colors on the maps) consistently represented a specific type or types of surface sediment and identify reasons for variations between predicted sediment types based on backscatter and observed sediment types based on SPI/PV images.

3 Results

3.1 MBES Survey

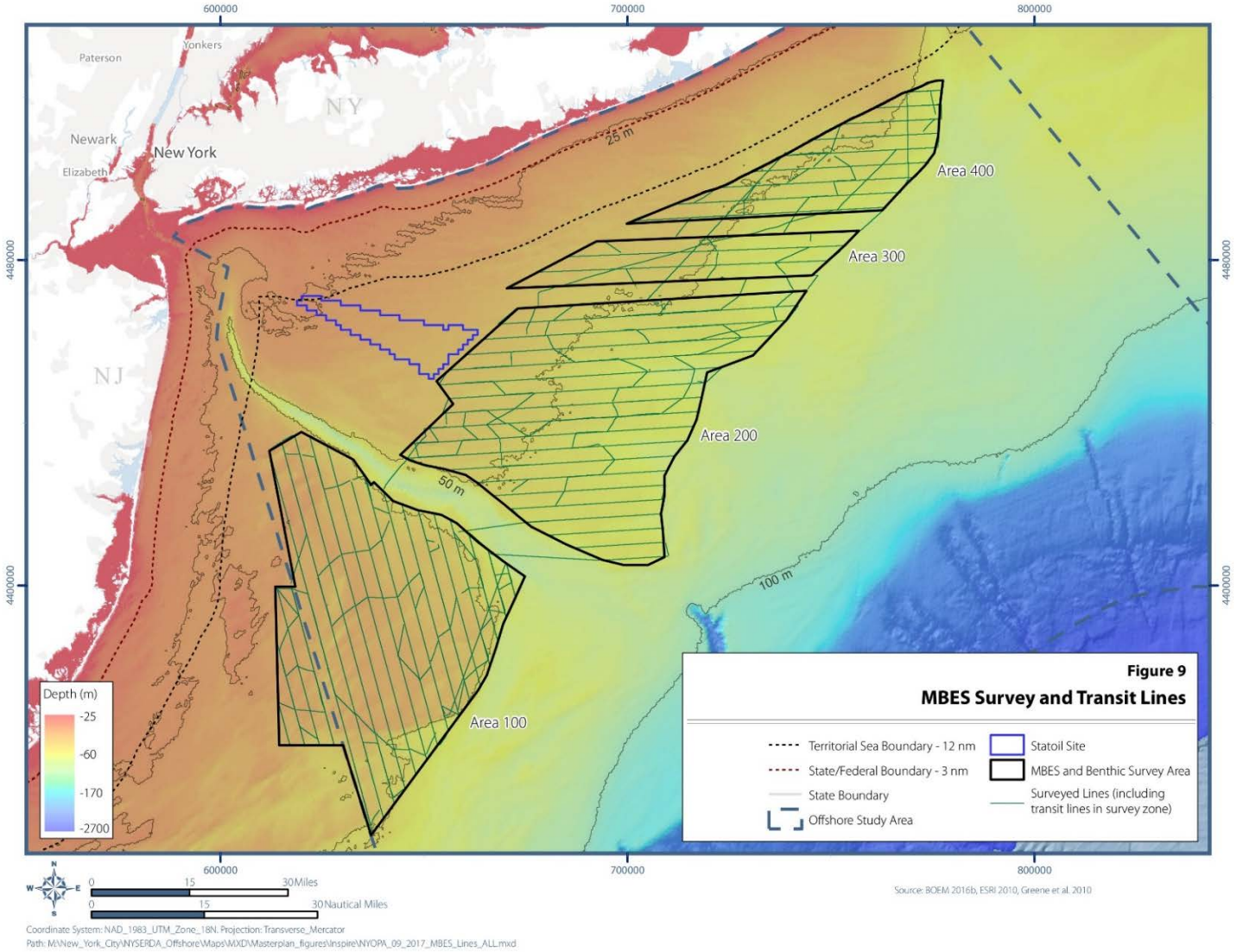
A total of 2,498 nm (4,626 kilometers [km]) of MBES data were collected (Figure 9). A total of 1,447 nm (2,679 km) of mainline survey data were collected along 51 lines in the four survey areas. Lines were spaced 1.9 nm (3.5 km) apart. In addition to the main survey lines (straight lines across Areas 100 to 400), the survey continued to collect ancillary MBES data during opportune transits. A total of 1,051 nm (1,947 km) of ancillary survey MBES data were collected in the form of line turns, cross lines, transit between survey areas, and transit between SPI/PV stations.

3.1.1 MBES Coverage

The average swath width of usable MBES data over all main survey lines was approximately 200 m. Swath width increases with water depth, so deeper areas (i.e., Area 400) had wider swath coverage then shallower areas (i.e., Area 100). The four survey areas comprised a total of 2,598 square nautical miles (nm^2) (8,910 square kilometers; km^2) of seafloor area. The 51 main survey lines mapped represented 157 nm^2 (538 km^2), or 6% of the total seafloor area. All MBES data collected within the survey area covered 229 nm^2 (787 km^2), or 9% of the seafloor.

Figure 9. MBES Survey and Transit Lines

Source: BOEM 2016b; ESRI 2010; Green et al. 2010



3.1.2 MBES Data Products

Processed MBES data are presented in four forms: bathymetry, backscatter, slope, and rugosity to further inform interpretation of habitats and sediments (Figure 10). Bathymetry data are presented at 1 m pixel resolution, a grid density sufficient to discern discrete objects or bedforms greater than a few feet in size (horizontally) and to detect subtle vertical elevation changes or to identify depressions.

Acoustic backscatter can be defined as the measured amount of acoustic energy received (and reflected by) surface sediments and organisms on the seafloor surface. Backscatter, while seemingly simple, is a qualitative measurement and does not "measure" the true acoustic properties of the sediment. Results can be influenced by changes in seafloor structure, composition, and rugosity, and by peculiarities of acquisition electronics, ship motion, and water column properties. There is also a complex, and frequency-dependent, interaction between the transmitted power levels of the instruments and the sediments. The data, however, are key for discriminating features, objects, and relative changes in surface structure and ultimately are efficient measures/approximations of sediment composition. Steady progress is being made by the research community to further model and advance these measurements from qualitative to meaningful quantitative values; until then, ground truthing with sediment grabs or with camera systems is a best practice. Backscatter data were used here to estimate seafloor types, broadly arranged by the amount of energy reflected back to the MBES transducer. Backscatter data were gridded at 0.25 m resolution.

Slope and rugosity were both derived from 1 m bathymetry, and both were gridded at 1-m pixel resolution. Slope is particularly good at detecting circular depressions (pockmarks) and curved shapes when the MBES depth grid is of sufficient resolution. Rugosity is a measurement of seafloor roughness or seafloor complexity and is calculated from bathymetry grids as a ratio of surface area to planer areas within a user-selected grid. A ratio of -1 is considered typical of a flat surface, whereas a value of +1 corresponds to high terrain roughness.

Figure 10. MBES Data Products

Source: Greene et al. 2010; INSPIRE Environmental©

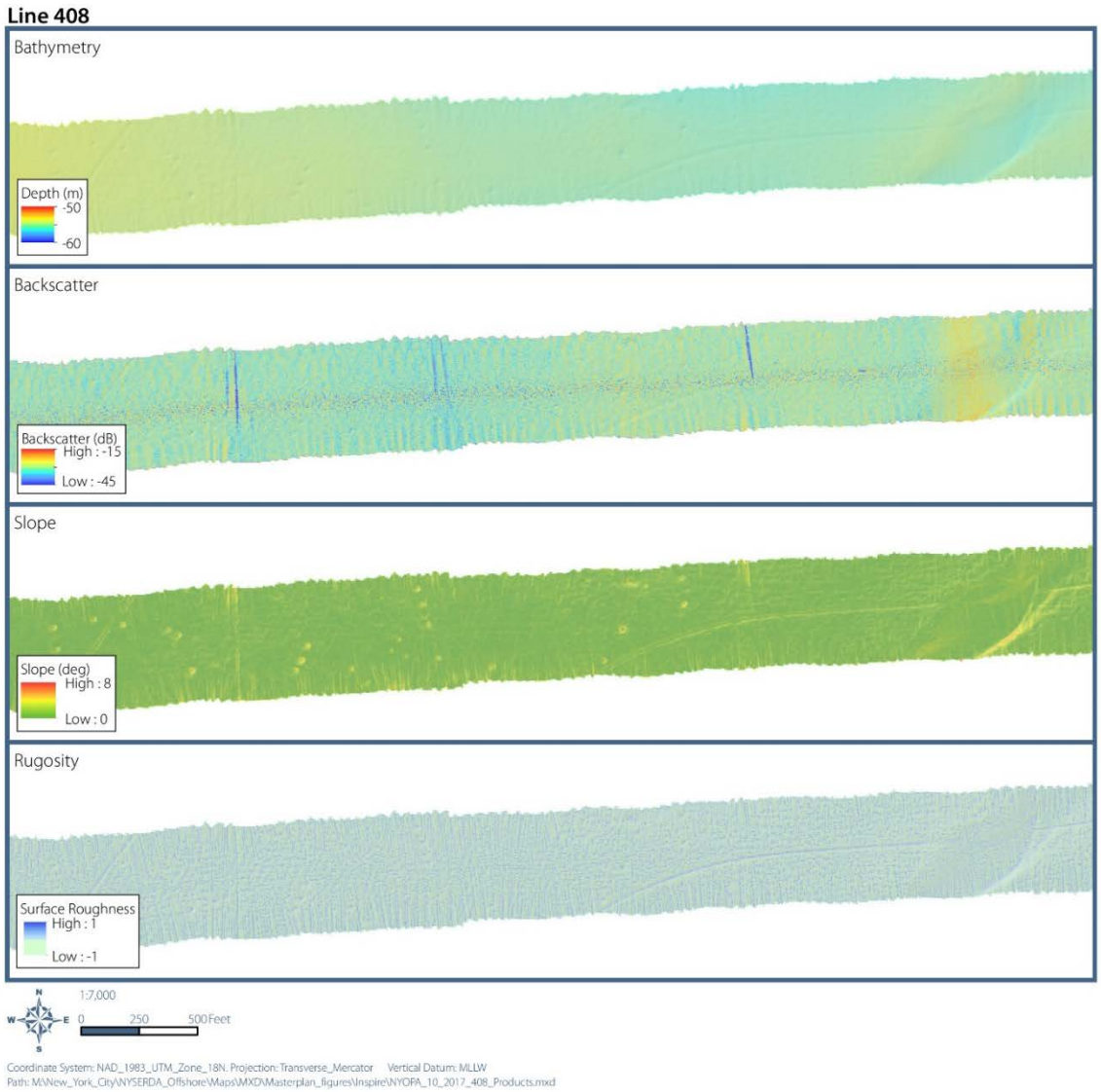
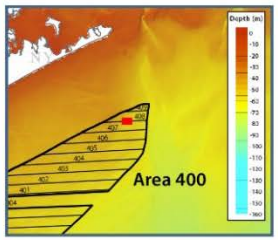


Figure 10
MBES Data Products



Source: Greene et al. 2010, INSPIRE Environmental ©

A single swath (or ping) of a MBES system can result in multiple data products. These include measurements of water depth (bathymetry), acoustic reflectivity of the sediments (backscatter), slope, and rugosity or surface roughness are commonly derived data sets.

3.2 Seafloor Features Observed in MBES/Backscatter Data

Throughout the survey, MBES data were evaluated in real time, as well as after all post-processing corrections were applied. In addition, the final MBES/backscatter data were evaluated after the conclusion of the survey.

Seafloor features, ranging from sediment-transport induced bedforms to post-glacial remnants or other long-term geologic features, were identified from acoustic data. The identification of these landscape-scaled features coupled with relative backscatter intensities also permitted preliminary identification of habitat types that were further defined with SPI/PV. Types of seafloor features observed across the entire area surveyed included:

- Sediment bedforms such as sand waves, sand bars, and ripples that developed as a response of the seafloor to hydrodynamic conditions.
    - Multiple scales of bedforms were observed, in terms of both vertical relief (amplitude) and wavelength (from 15–30-foot to 2500+ foot wavelengths) (Figures 11 and 12).
    - Short wavelength sediment ripples that indicate mobile sands and active bedload transport were also observed (Figure 13).
- Hummocked terrain where there was vertical relief without any systematic pattern or features.
    - This terrain may be related to glacial processes with subsequent reworking (Figures 14 and 15).
- Distinct depressions, at times ringed with discernible fringe deposits, that were most likely of glacial origin (Figure 16).
- Pockmarks expressed as 0.5 to 1 m vertical relief circular depressions that were approximately 10 to 15 feet in diameter (Figure 17).
    - An important feature of the pockmarks is that they may be expressed over seafloor that also exhibits other features (e.g., bedforms, planar features, etc.).
- Trawl or other fishing gear scars that were expressed as long, linear, or arcuate furrows mostly in pairs but occasionally as a single furrow (Figures 18 and 19).

Across the entire AoA, the seafloor was characterized by regions showing multiple types and scales of bedforms. These bedforms are most typically observed in the MBES data as sand waves, bars, and ripples. Additionally, these bedforms occurred at multiple scales, in terms of both amplitude and wavelength. In a number of areas, two or more distinct bedform types or physical scales were present (Figures 11 to 15, Figures 18 and 19). Mobile bedforms arise in response to hydrodynamic conditions, and these multiple bedform sets represent different hydrodynamic events and responses of the seafloor to those events. Evidence of similar dynamics was present across all areas at multiple horizontal scales ranging from tens of feet to miles, and vertical scales ranging from inches up to

10 or more feet. These bedforms demonstrate the scale of different sediment resuspension and transport events common throughout the AoA and provide evidence of consistent modification of the seafloor habitats by physical forces at variable intensities and temporal scales. The presence and persistence of these different scaled bedforms across the entire AoA is perhaps the most striking and important observation from the MBES survey with regards to the identification of landscape-scaled features, as well as the range of potential habitat features.

Figure 11. MBES Data Example: Bedforms: Moderate Wavelength and Amplitude

Source: Greene et al. 2010; INSPIRE Environmental©

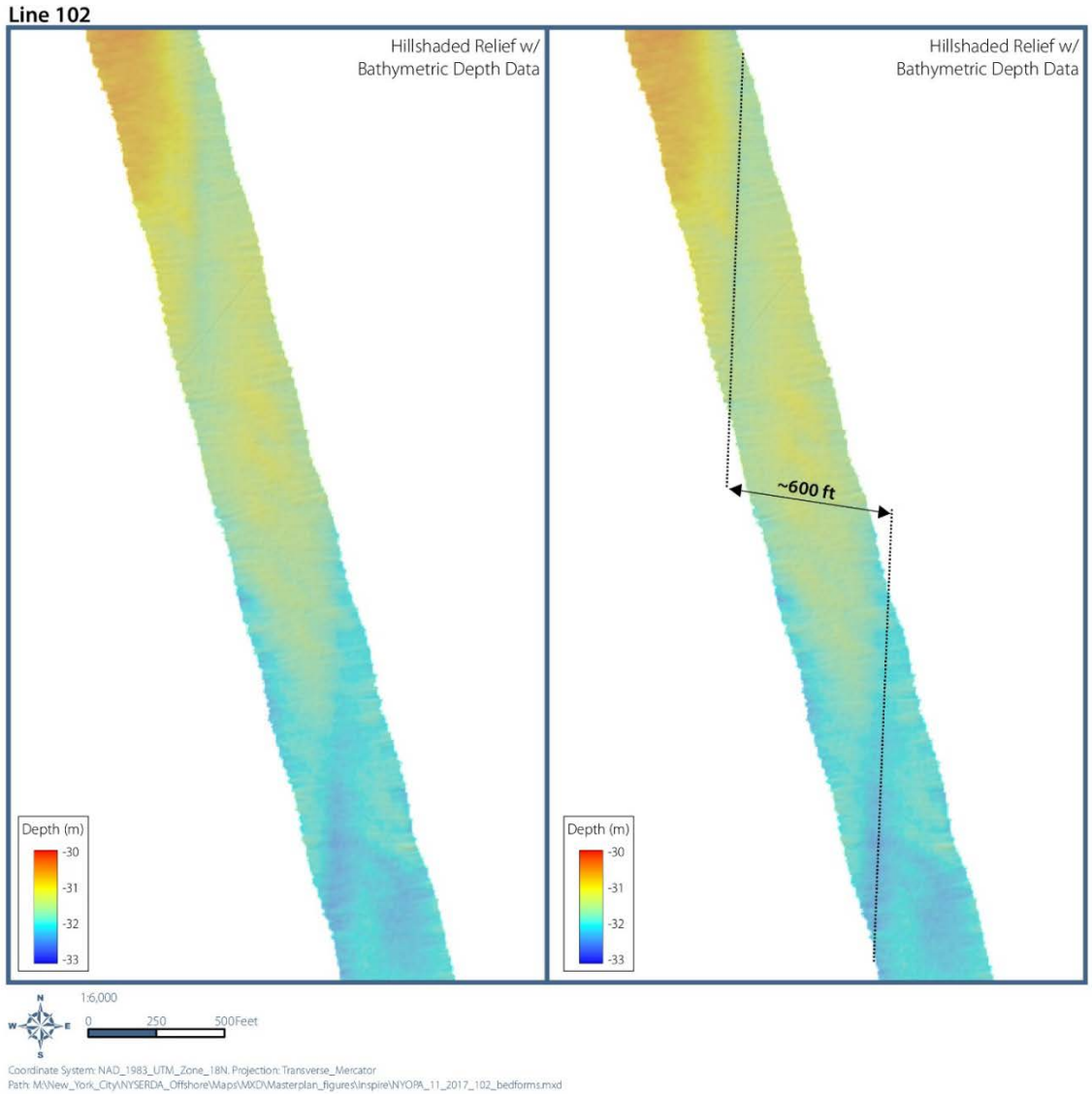
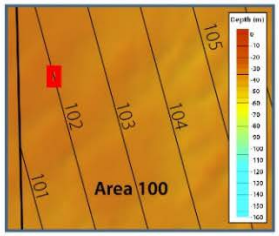


Figure 11
MBES Data Example: Bedforms: Moderate Wavelength and Amplitude



Source: Greene et al. 2010, INSPIRE Environmental ©

North-South trending bedform with a 600-ft. wavelength and vertical amplitude of 0.5 – 0.8 m

Figure 12. MBES Data Example: Bedforms: Long Wavelength and Amplitude

Source: Greene et al. 2010; INSPIRE Environmental©

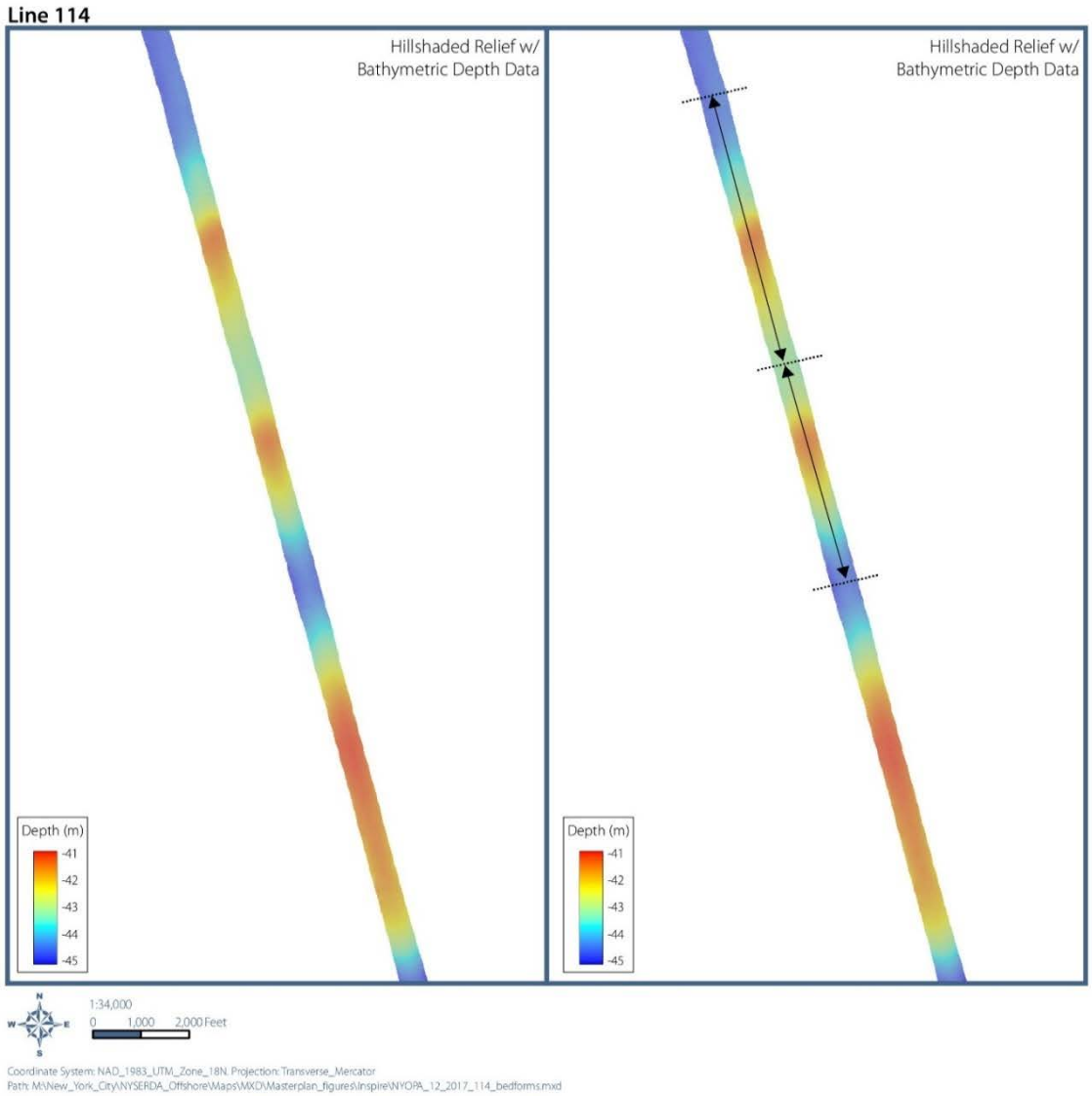
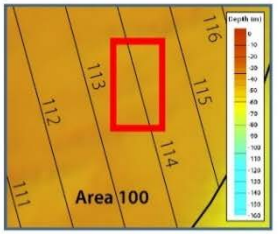


Figure 12
MBES Data Example: Bedforms: Long Wavelength and Amplitude



Source: Greene et al. 2010, INSPIRE Environmental ©

These long wavelength bedforms span 4,800 to 5,800 ft. and an amplitude of >2.5 m tall

Figure 13. MBES Data Example: Bedforms: Short Wavelength and Amplitude

Source: Greene et al. 2010; INSPIRE Environmental©

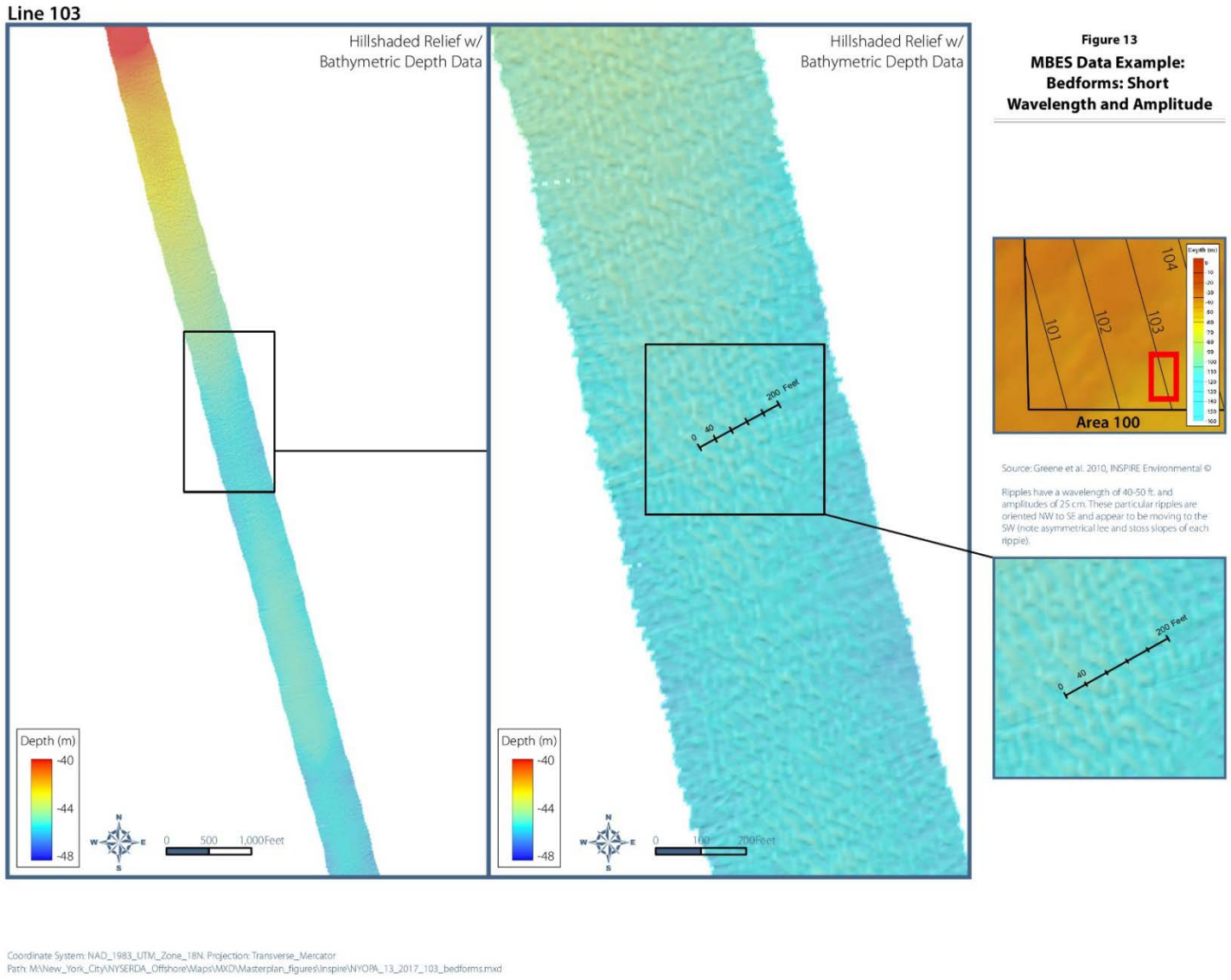


Figure 14. MBES Data Example: Hummocked Terrain: Line 409

Source: Greene et al. 2010; INSPIRE Environmental©

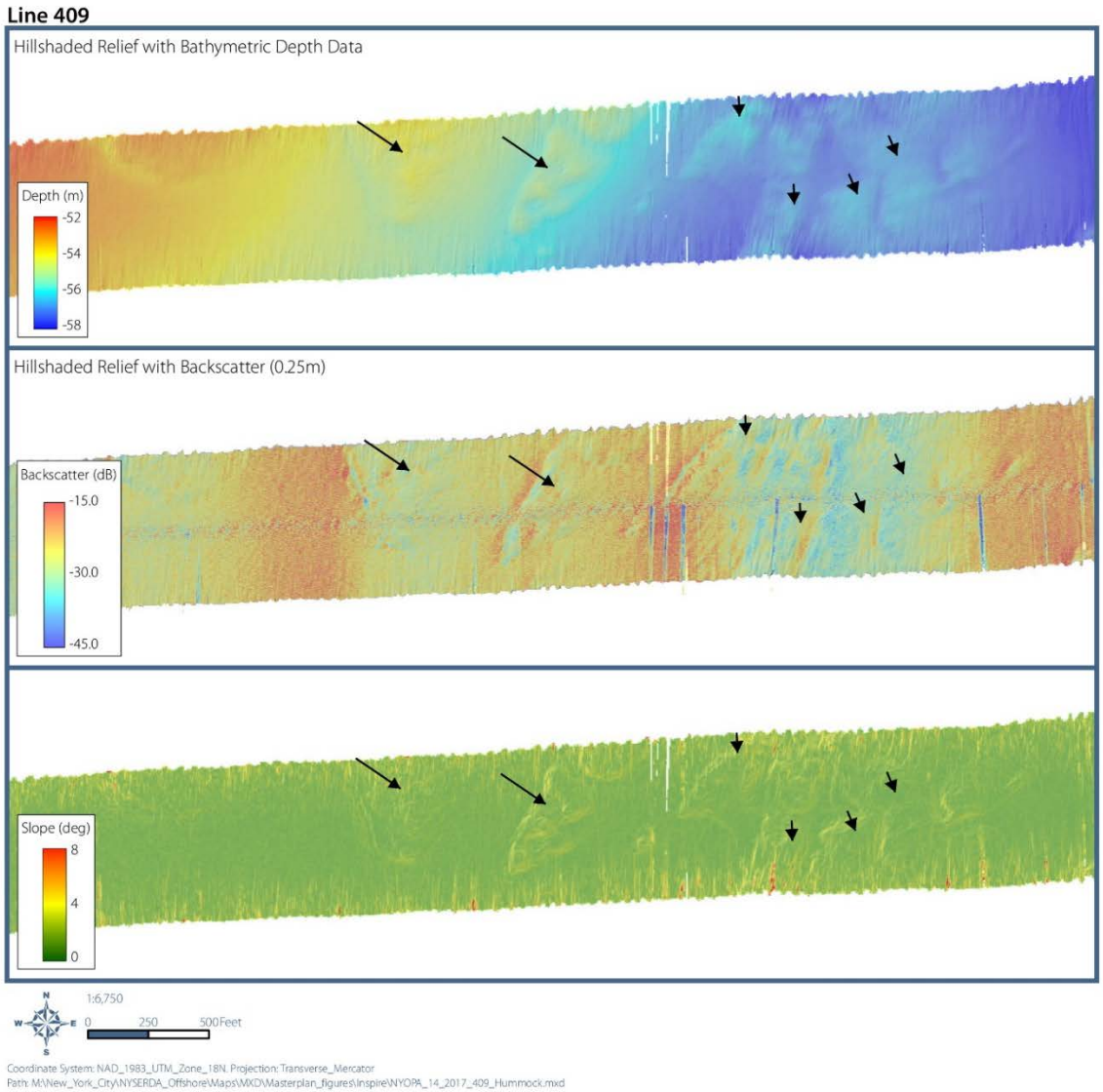
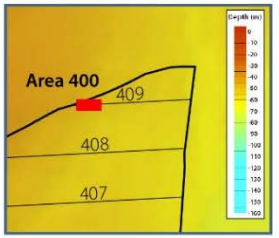


Figure 14
MBES Data Example: Hummocked Terrain: Line 409



Source: Greene et al. 2010, INSPIRE Environmental ©

No genetic origin can be interpreted for this hummocked terrain without further study.

Figure 15. MBES Data Example: Hummocked Terrain: Line 405

Source: Greene et al. 2010; INSPIRE Environmental©

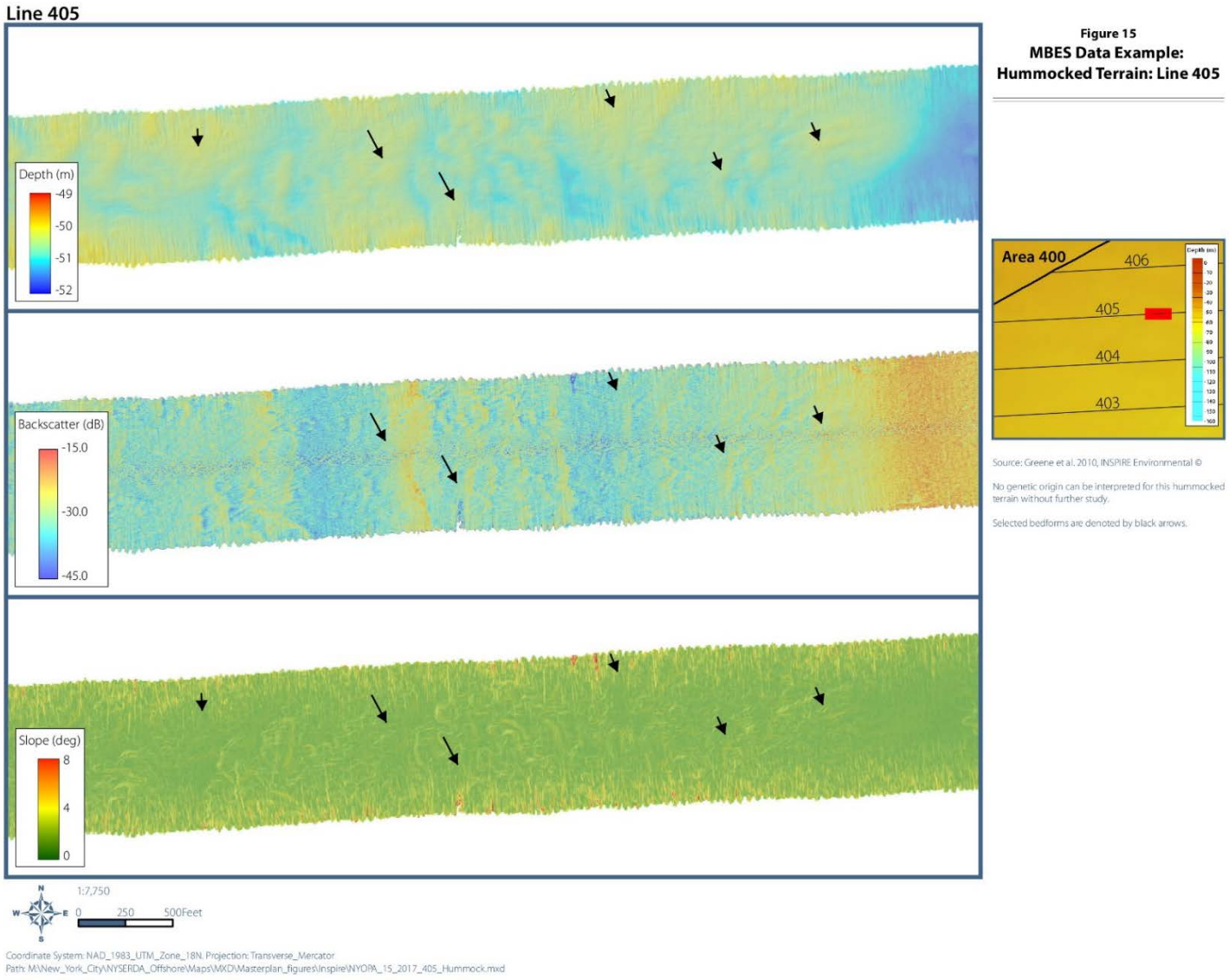


Figure 16. MBES Data Example: Fringe Deposit, Glacial Origin

Source: Greene et al. 2010; INSPIRE Environmental©

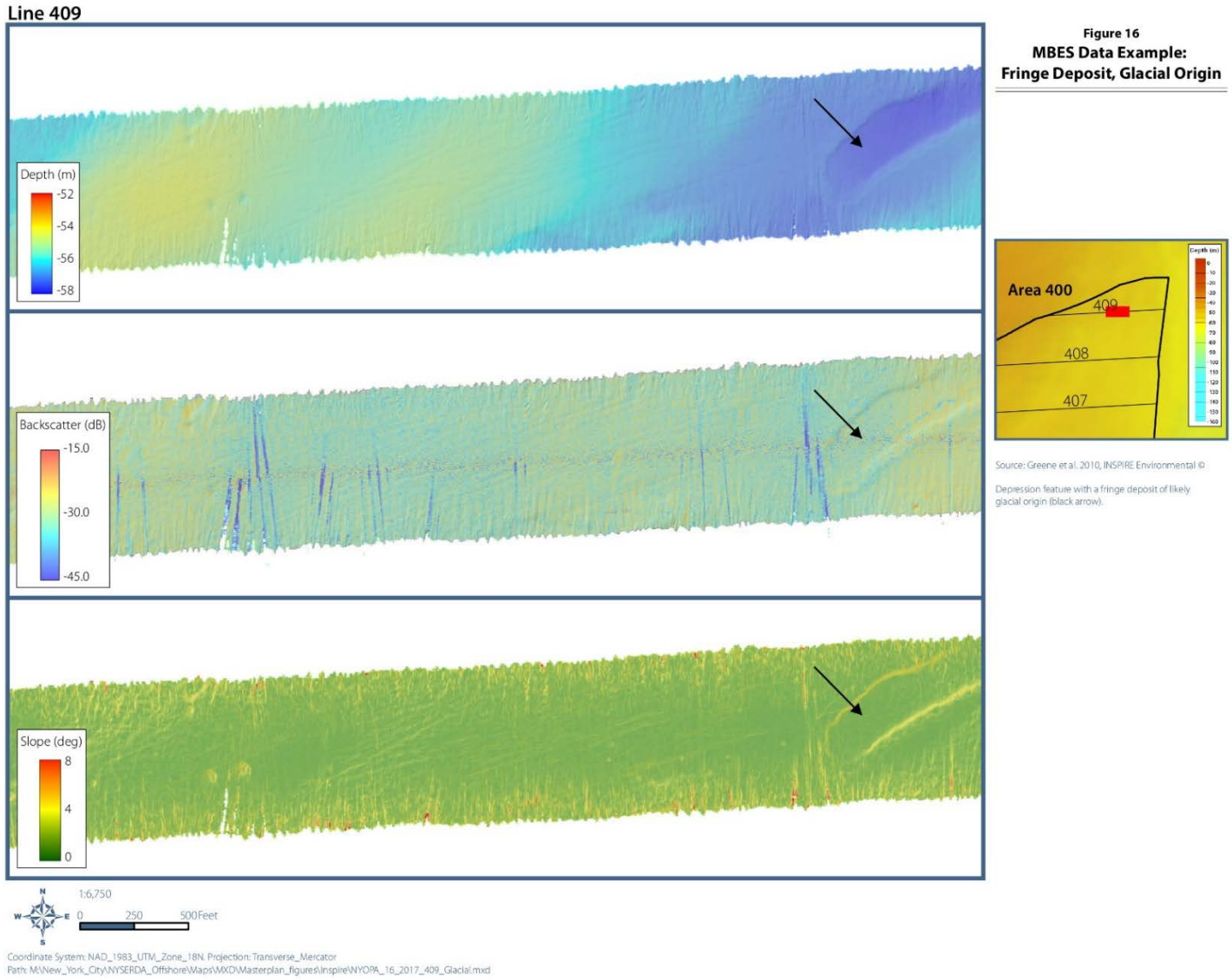


Figure 16
MBES Data Example:
Fringe Deposit, Glacial Origin

Source: Greene et al. 2010, INSPIRE Environmental ©

Depression feature with a fringe deposit of likely glacial origin (black arrow).

Figure 17. MBES Data Example: Pockmarks

Source: Greene et al. 2010; INSPIRE Environmental©

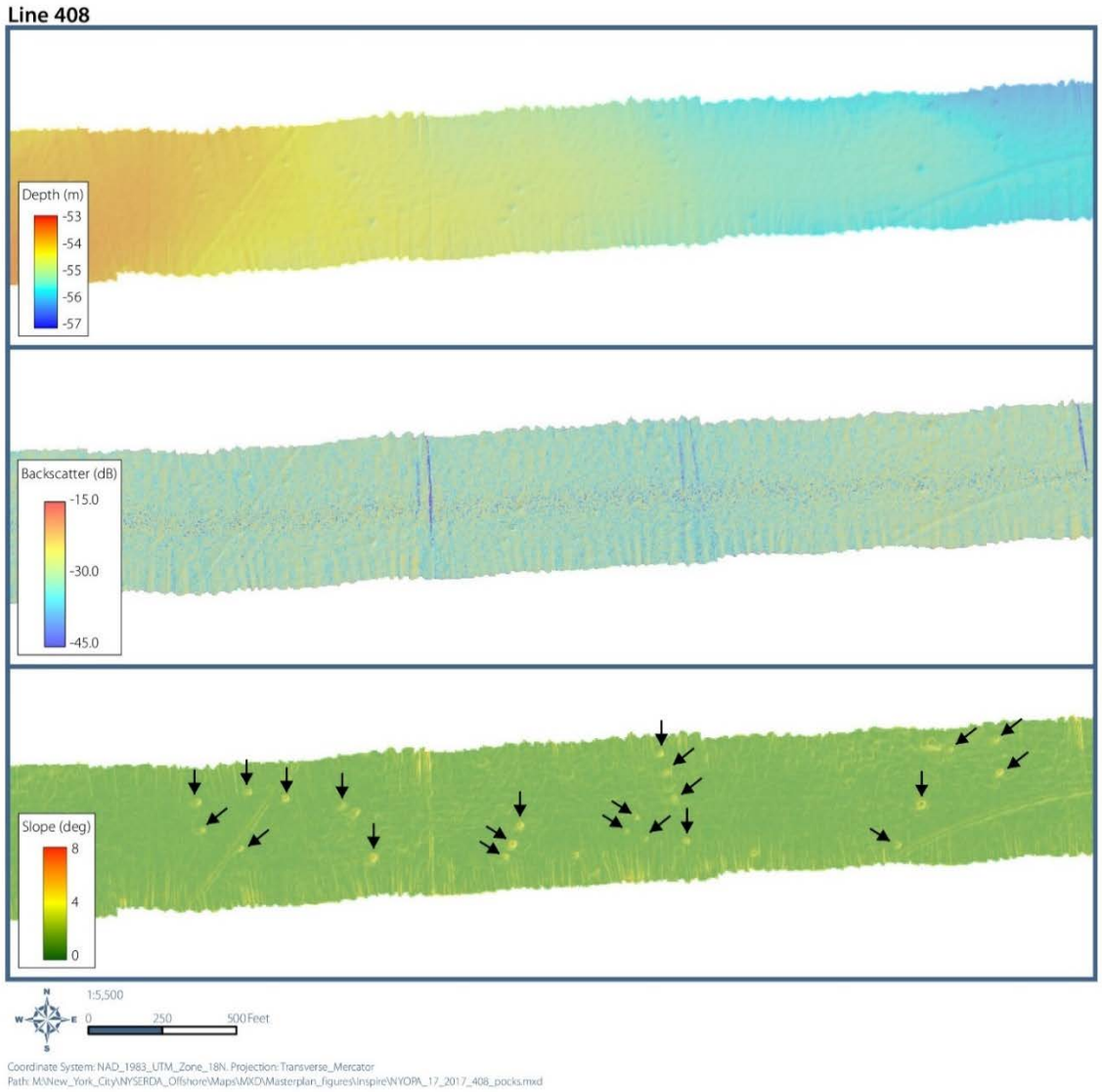
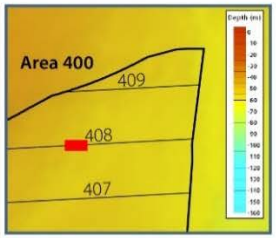


Figure 17
MBES Data Example: Pockmarks



Source: Greene et al. 2010, INSPIRE Environmental ©

Pockmarks denoted with black arrows.

Figure 18. MBES Data Example: Trawl Marks over Short Wavelength Bedforms

Source: Greene et al. 2010; INSPIRE Environmental©

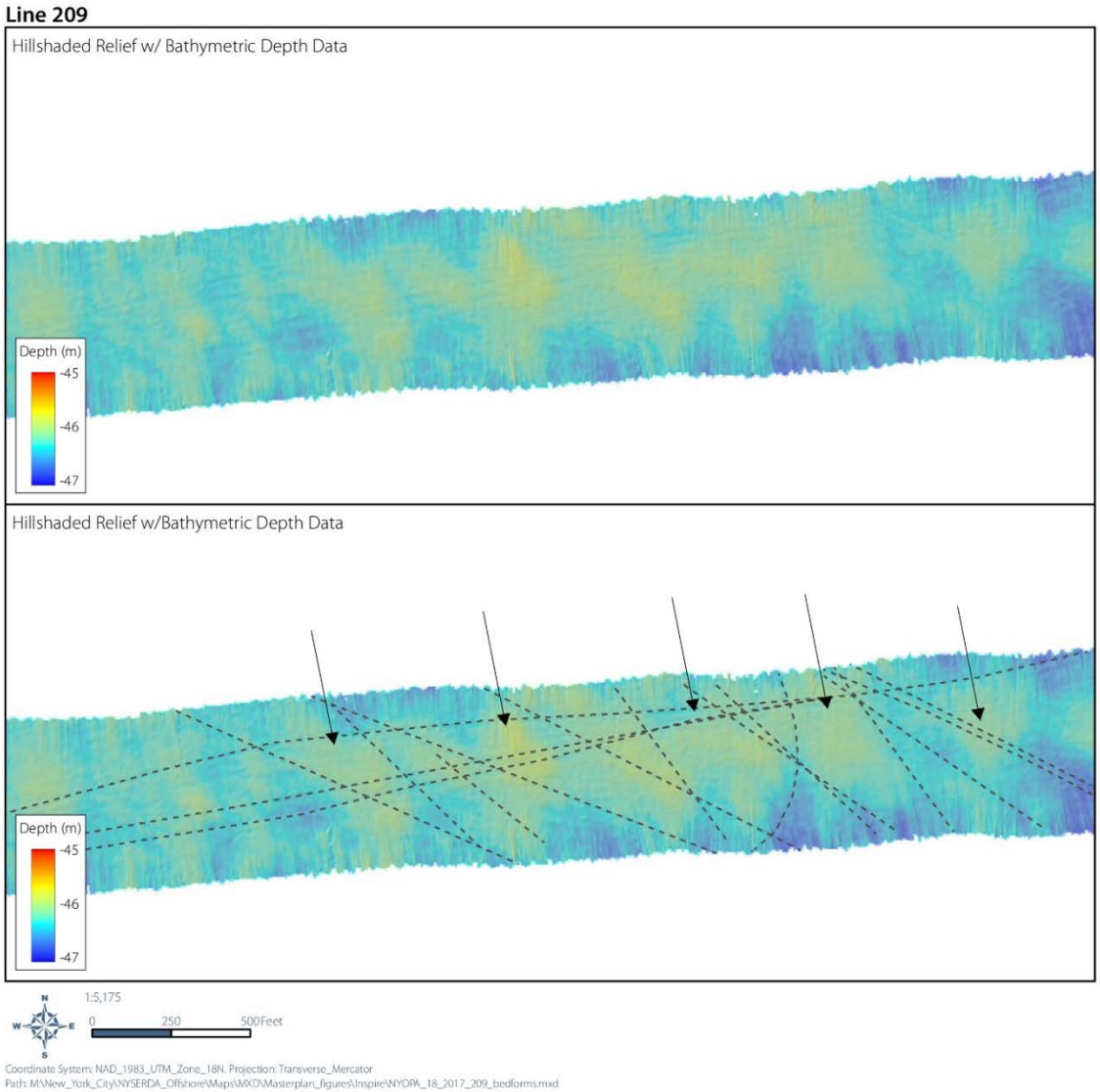
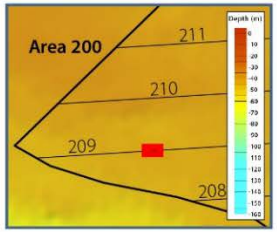


Figure 18
MBES Data Example: Trawl Marks over Short Wavelength Bedforms

Trawl Marks



Source: Greene et al. 2010, INSPIRE Environmental ©

Short to moderate wavelength bedforms (at 200 - 250 feet and <30 foot) wavelengths with about a 15-degree spread in trend. There are numerous trawl scars (dotted lines, lower panel) superimposed on the bedforms (black arrows) and these are clearly flattening or obscuring the bedform relief.

Bathymetry color scale adjusted to highlight the bedforms present in this figure.

Figure 19. MBES Data Example: Trawl Marks

Source: Greene et al. 2010; INSPIRE Environmental©

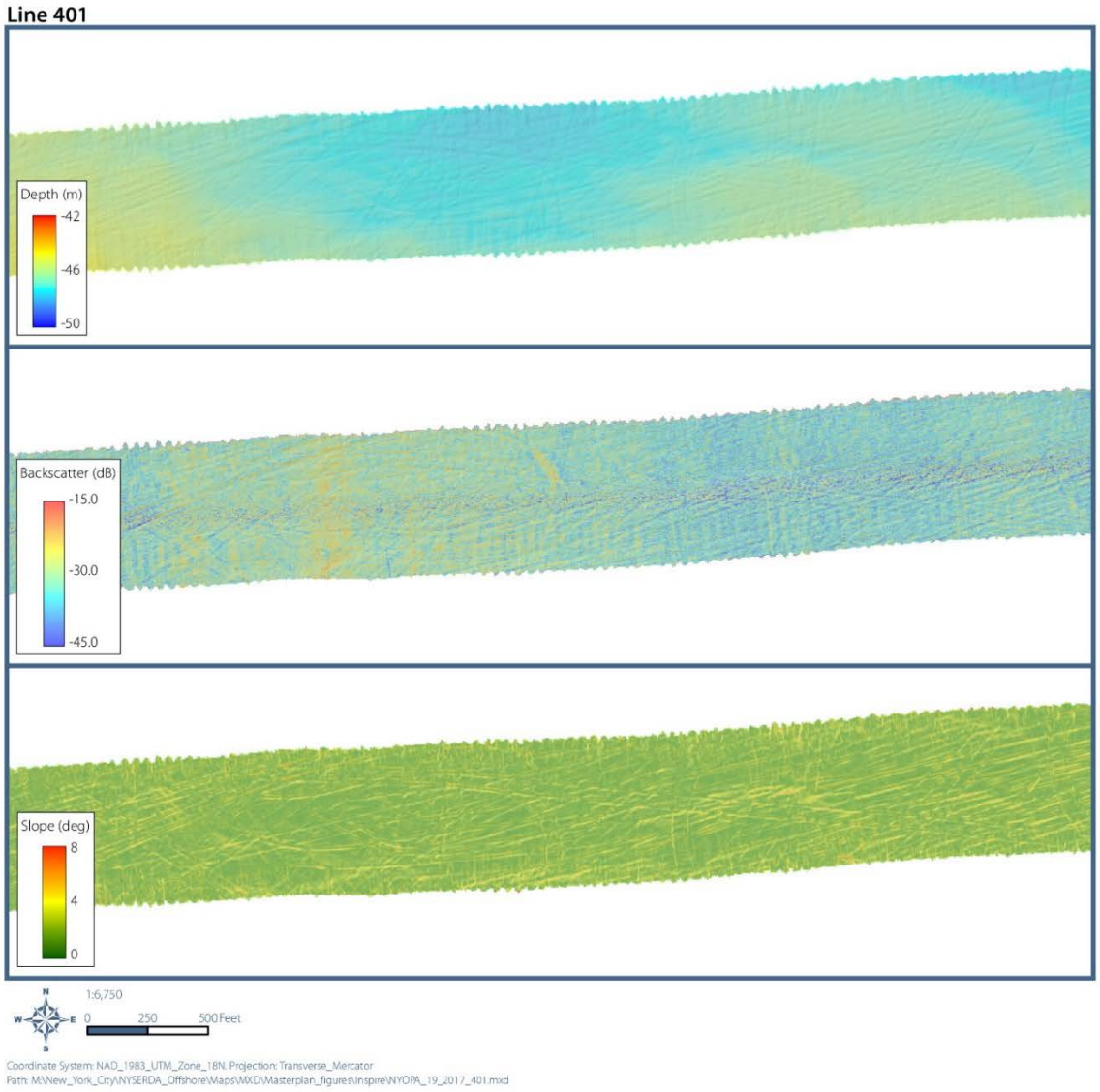
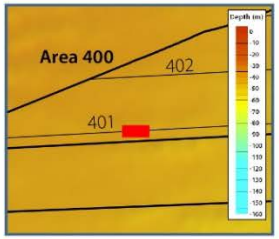


Figure 19
MBES Data Example: Trawl Marks



Source: Greene et al. 2010, INSPIRE Environmental ©

Trawl or other fishing scars expressed as long, linear or arcuate furrows mostly in pairs but occasionally as a single furrow. These areas were ubiquitous in the survey area.

3.3 Archaeological Items

The MBES data were reviewed for any evidence of archeological objects or landscape features. Two shipwrecks were observed during the survey. The first of these wrecks has since been identified as likely the tanker Coimbra, a vessel built in 1937 and torpedoed in 1942 during World War II (NOAA Office of National Marine Sanctuaries and Office of Response and Restoration 2013). The second has not been identified, but consists of a vessel approximately 91 feet long by 27 feet wide. No attempt has been made to identify it. Due to archeological site sensitivities, no figures of these wrecks are provided in this report.

3.4 Sediment Profile and Plan View Imagery Results

A total of 1,179 SPI and 1,175 PV images were collected from 300 stations. One SPI and one PV image from each station, where available (297 SPI, 299 PV), were analyzed to provide data on surface sediment characteristics (up to 20 cm) and on benthic biotic communities living on and within the sediment column.

Data collected from SPI/PV images indicated that the areas surveyed were composed of soft-bottom substrata that were predominantly firm sands and occupied by diverse benthic biotic communities. The CMECS Biotic Subclass for all images was “Soft Sediment Fauna.” SPI/PV images were collected across a range of seafloor features and textures and are believed to be representative of the area contained within the AoA.

3.4.1 Physical Characterization

Sediments across the AoA were largely composed of mobile firm sands, although very fine silty sand and gravel to slightly gravelly sediments were also observed (Table 3). The major modal grain size (the most dominant grain size) estimated in SPI was consistent across all stations (Figure 20). All stations sampled had a component of fine to medium sand mixed with varying amounts of fine silt, other sand fractions, and/or pebbles (Figure 21). This level of consistency across such a wide spatial distribution of stations indicates the relative homogeneity of the surface sediments in the AoA. At some stations where pebbles were observed, the distribution of pebbles at the surface of the seafloor was more readily and consistently captured in PV images given the larger area imaged than SPI images (Figure 22).

Sands across the AoA area were generally firm with shallow to moderate mean camera prism penetration values ranging from 1.97 to 10.52 cm (Appendix C, Figures 23 and 24), values typical of shelf sediments. The penetration depth of the camera can be a useful tool for estimating relative sediment shear strength when the weights and stops of the camera system remain constant throughout the survey. All stops and weights were consistent throughout the survey, allowing for estimation of the weight-bearing capacity of stations surveyed. The majority of stations contained medium to high load-bearing strength reflected in the relatively shallow prism penetration depths observed (< 6 cm). A few stations contained weaker bearing capacity reflected in deeper prism penetrations, often at stations with more fine grain sizes (Figure 24). The penetration depth range was not strictly controlled by grain size, but was also influenced by compaction/porosity as well as infaunal bioturbation.

Evidence of physical dynamics and sediment transport was apparent in many images with ripples and irregular rippling, indicating sediment mobility, observed across the AoA (Figure 25). Sediment transport dynamics were also evidenced in imagery as thin depositional layers of very fine sediment particles on the seafloor surface and by the presence of larger grain fractions “washed” clean by hydrodynamic forcing (Figure 26). The preceding physical dynamics and biological activity, such as burrowing and feeding activity by epi- and infaunal organisms, were responsible for the observed small-scale differences in surface boundary roughness (Appendix C, Figure 27).

One objective of the Study was to provide data to fill gaps in the regional grain size model of Poti et al. (2012b). Comparison of survey grain size data against the grain size predictions in Poti et al. (2012b) indicate that survey data will help improve the model, given that fine and medium sands were found in areas predicted to be very coarse sand and pebbly (Figure 28). The data from the Study should also help improve the Poti et al. (2012b) hard-bottom likelihood occurrence maps; although there was correspondence between some pebbly areas at the northeastern edge of area 100, there was no such correspondence in others, e.g., near the lower-central portion of area 100 where fine to medium sands were observed (Figure 29).

Figure 20. Grain Size Major Mode Map

Source: BOEM 2016b; ESRI 2010, Greene et al. 2010

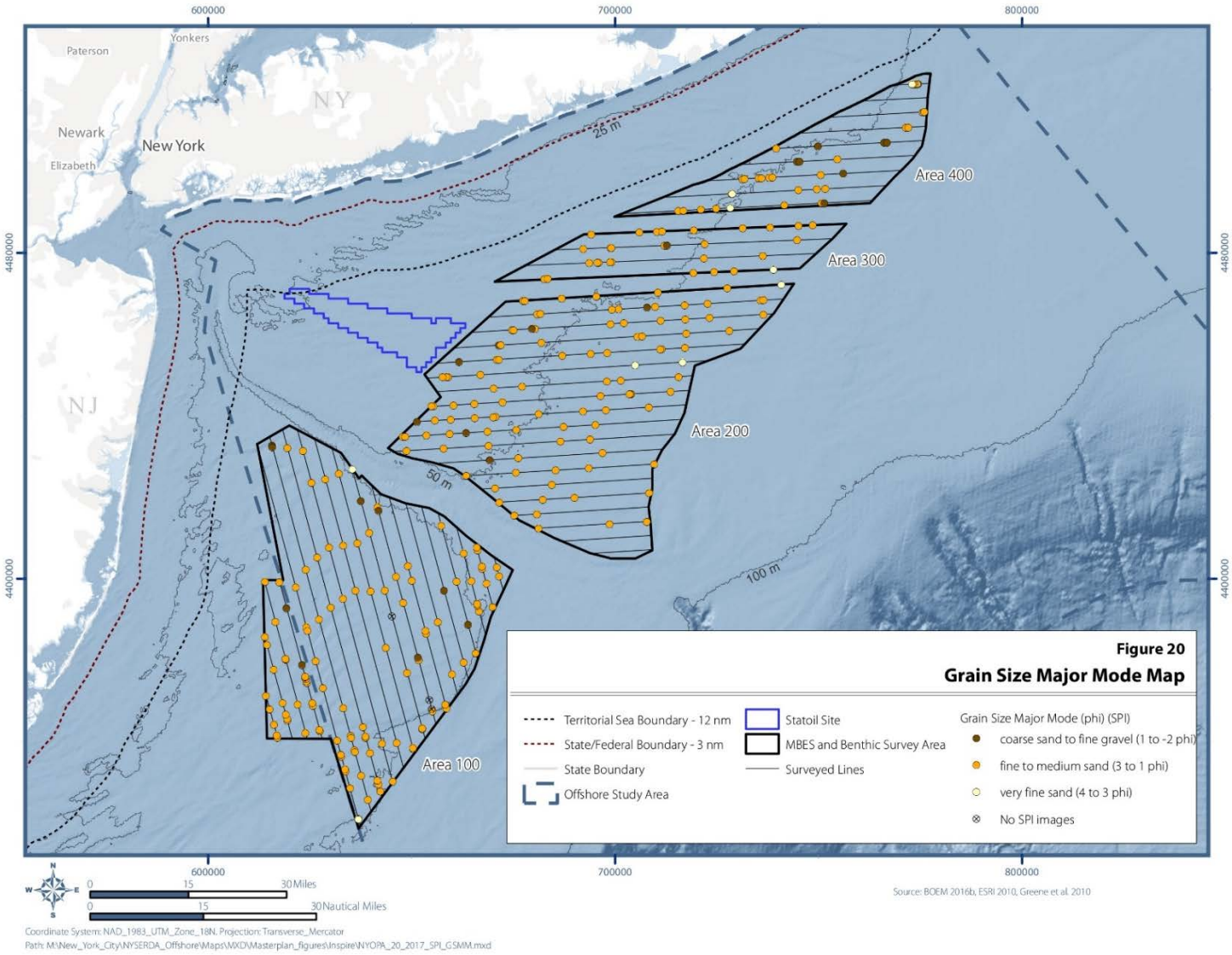
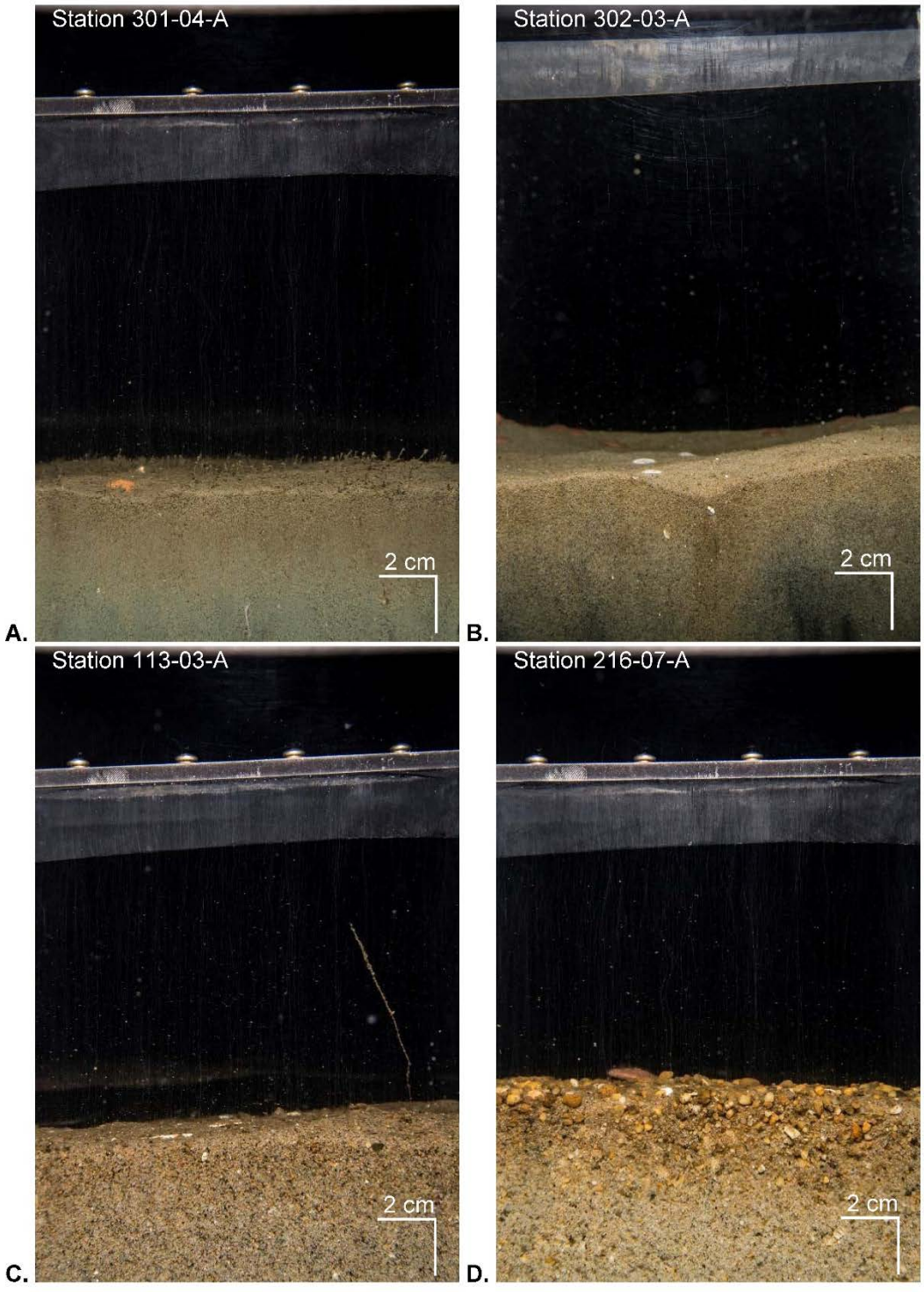


Figure 21. Grain Size Major Mode Images

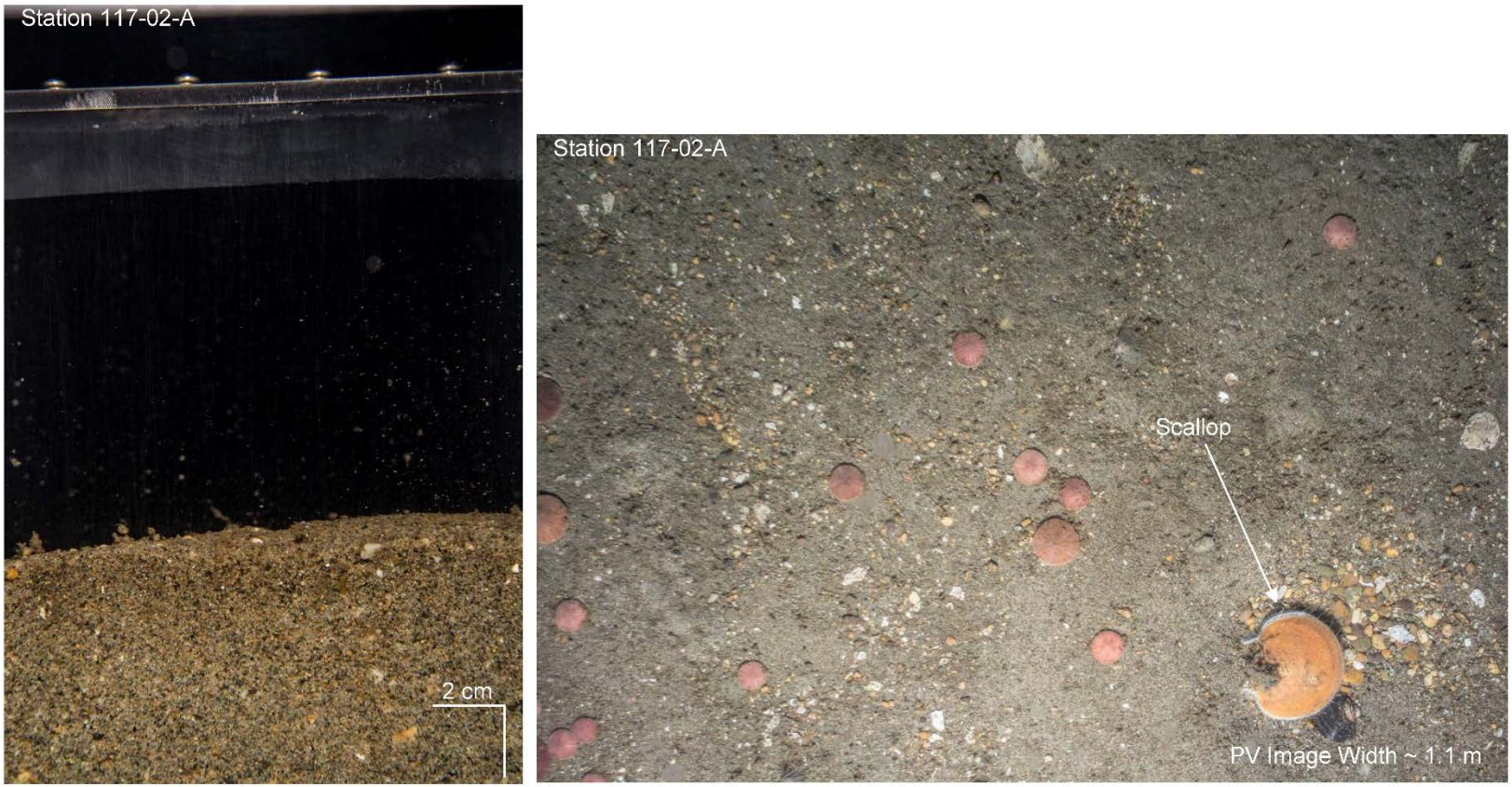
Source: INSPIRE 2017b



Note: A. Very fine sand, 4 to 3 phi; B. Fine sand, 3 to 2 phi; C. Medium sand, 2 to 1 phi; D. Medium sand with small pebbles at surface, -2 / 2 to 1 phi.

Figure 22. Pebbles: Partially Visible in SPI, Clearly Visible in PV

Source: INSPIRE 2017b



Note: Pebbles are somewhat obscure at the sediment water interface of the profile image but can be clearly seen scattered and in patches across the seafloor surface in the PV image.

Figure 23. Prism Penetration Map

Source: BOEM 2016b; ESRI 2010, Greene et al. 2010

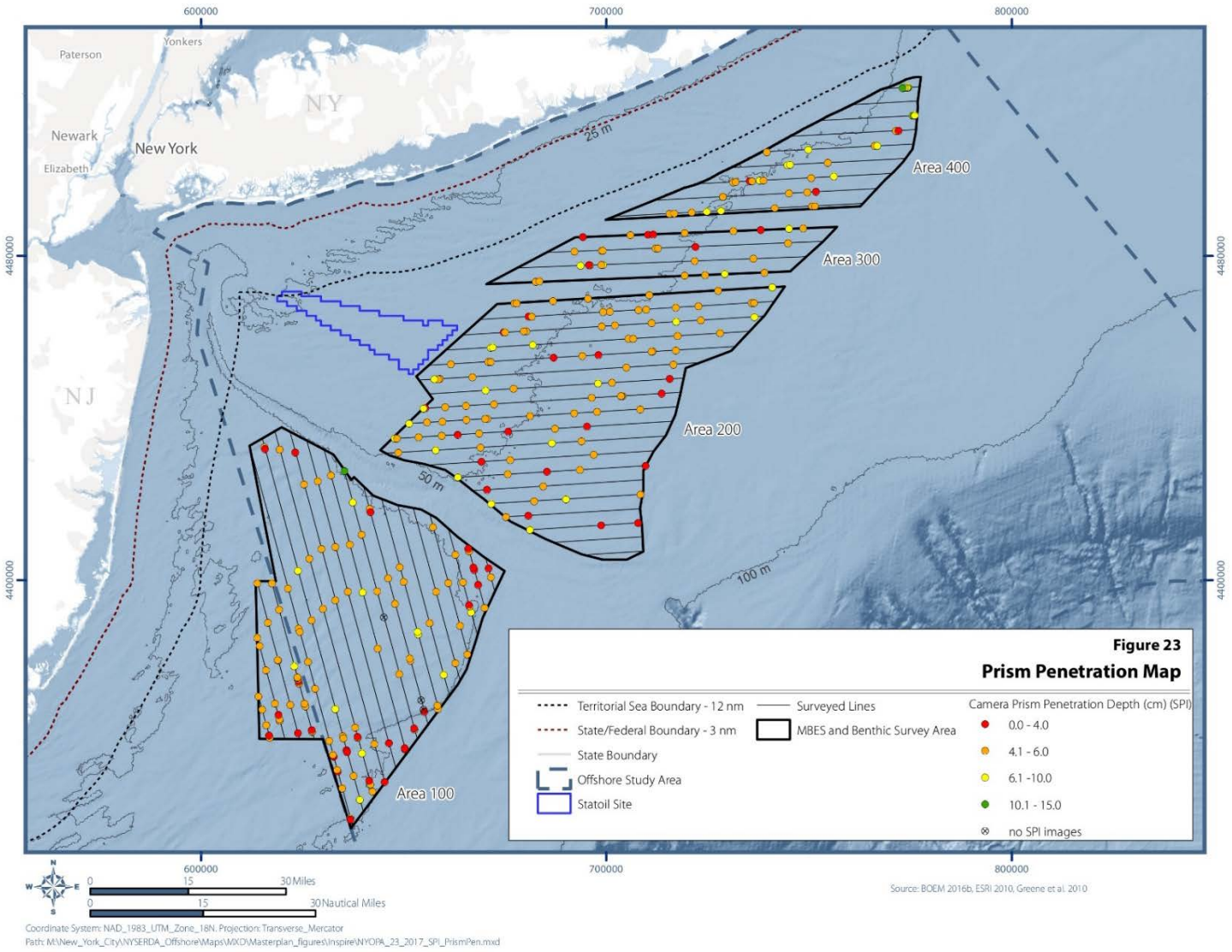


Figure 24. Prism Penetration Images

Source: INSPIRE 2017b

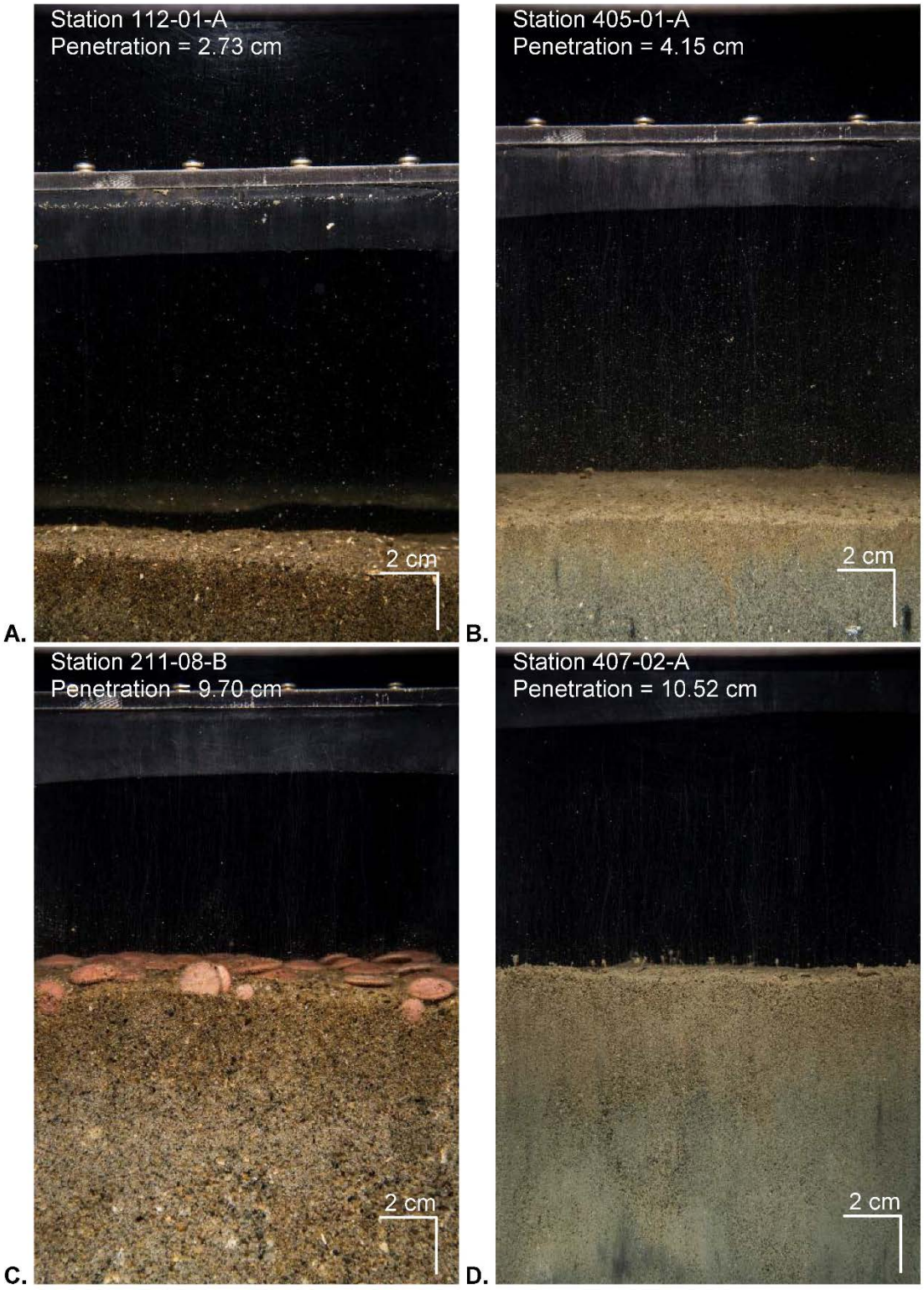


Figure 25. Sediment Transport: Ripples

Source: INSPIRE 2017b

Note: Profile and PV images showing sediment mobility, evidenced here as ripples (white dashed lines) with small pebbles gathered in the troughs.

Figure 26. Sediment Transport: Deposition and Washed Gravel

Source: INSPIRE 2017b

Note: A. Thin depositional layer of fine silty sediment particles; B. Pebbles “washed” clean by hydrodynamic forcing on the seabed.

Figure 27. Boundary Roughness Map

Source: BOEM 2016b; ESRI 2010, Greene et al. 2010

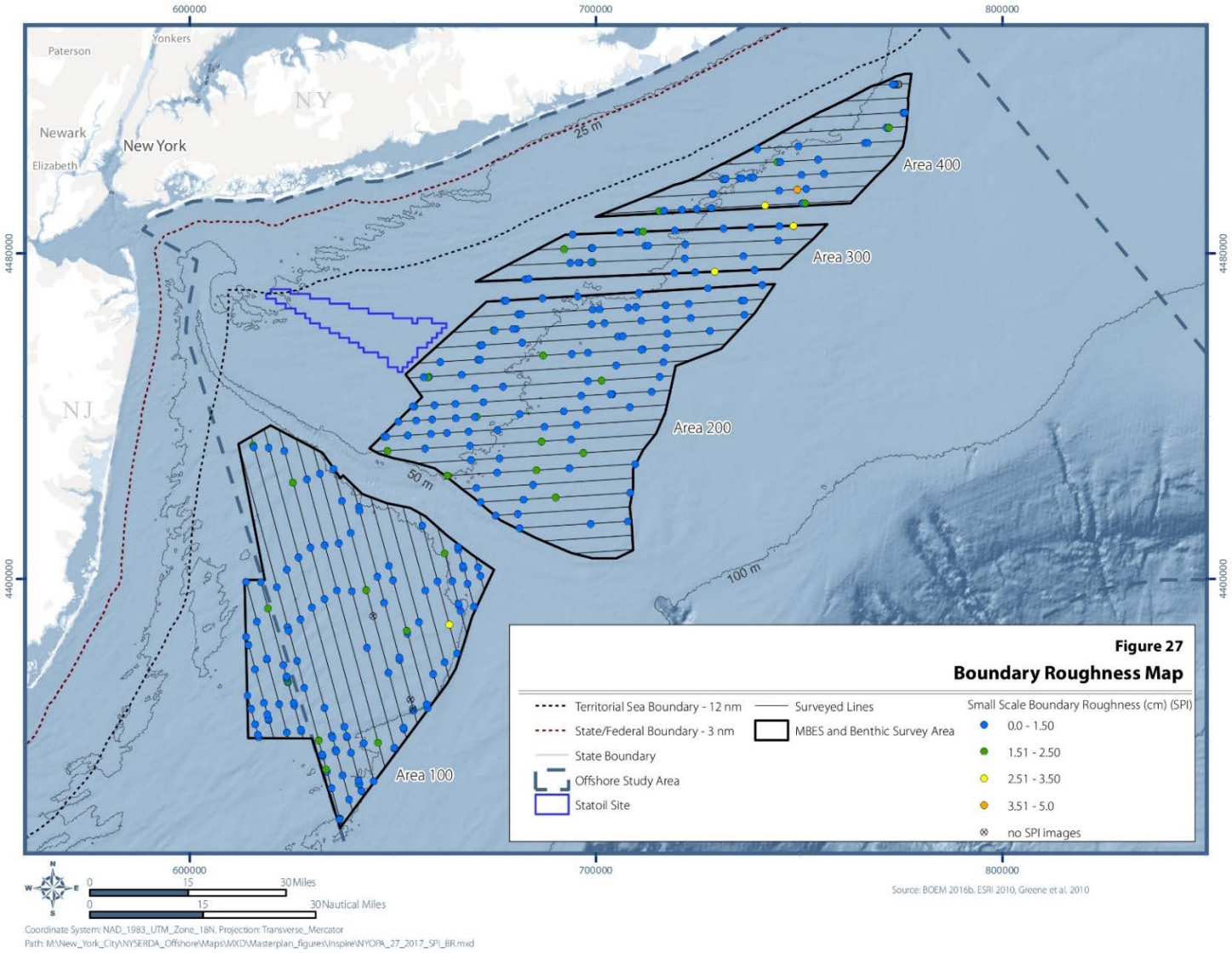


Figure 28. Grain Size Major Mode & Regional Sediment Model

Source: BOEM 2016b; ESRI 2010; Poti et al. 2012; Greene et al. 2010

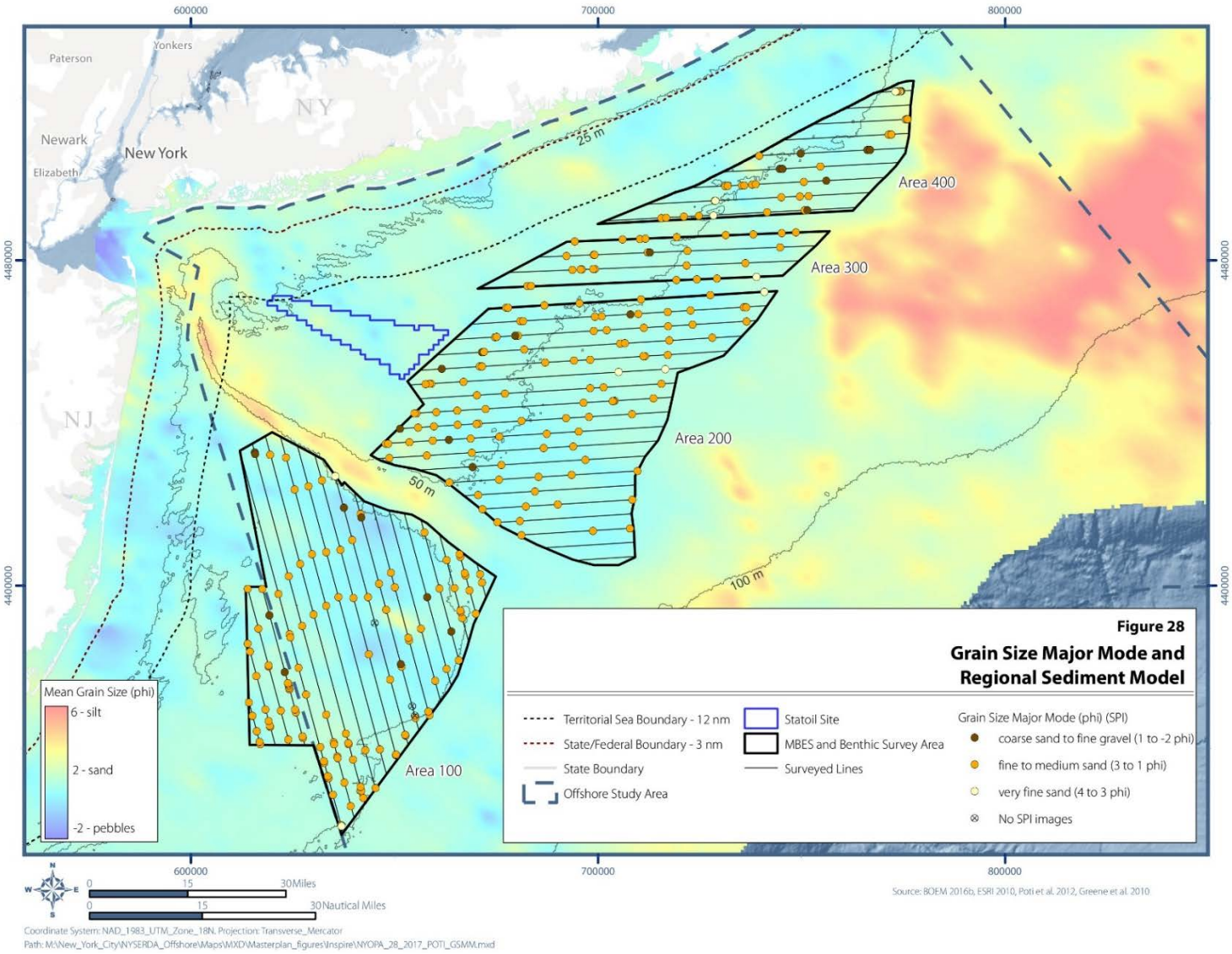
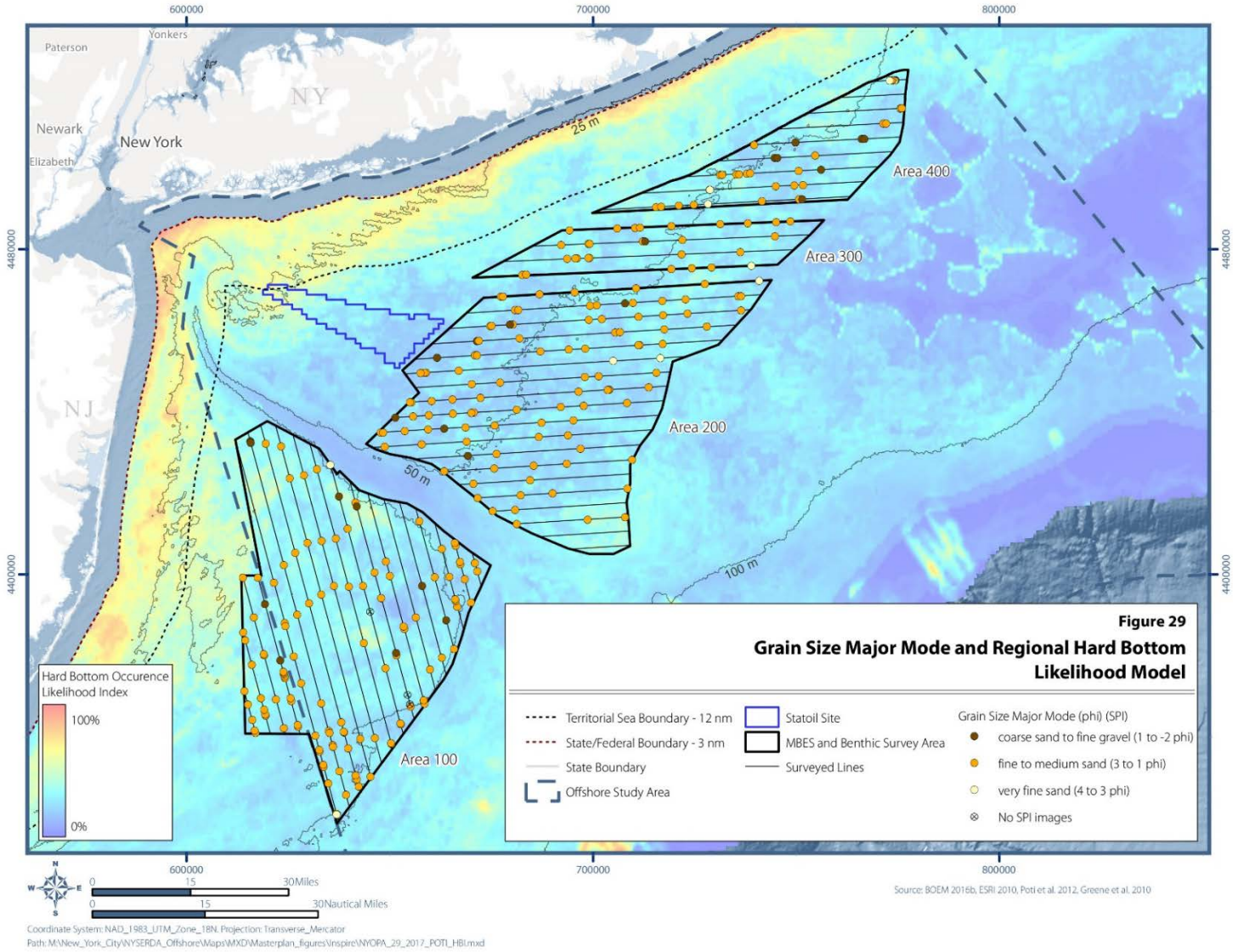


Figure 29. Grain Size Major Mode & Regional Hard Bottom Likelihood Model

Source: BOEM 2016b; ESRI 2010; Poti et al. 2012; Greene et al. 2010



3.4.2 Biological Characterization

At a coarse level of classification, biological habitats observed across the AoA were largely similar (Table 3). All stations were classified within the Soft Sediment Fauna Biotic Subclass of CMECS, which is defined as "Areas that are characterized by fine unconsolidated substrates (sand, mud) and that are dominated in percent cover or in estimated biomass by infauna, sessile epifauna, mobile epifauna, mobile fauna that create semi-permanent burrows as homes, or by structures or evidence associated with these fauna (e.g., tilefish burrows, lobster burrows)." This subclass includes the Diverse Soft Sediment Epifauna Biotic Group, defined as: "Highly varied and diverse communities of mixed fauna that are present on the surface of soft unconsolidated substrates. Common taxa include annelids, holothurians, ophiuroids, anemones, tunicates, mollusks, sea pansies, hydroids, bryozoans, sea urchins, sponges, echiuroids, priapulids, sand dollars, and many others." These two definitions summarize the benthic biotic communities observed within the AoA.

The primary Biotic Community observed throughout the AoA was Echinocardium Bed, as the sand dollar Echinarachnius parma was observed at most stations, ranging from sparse to complete cover (Figure 30). In addition to sand dollars, infauna and mobile epifauna associated with soft sediments, such as crabs, gastropods, bivalves, burrowing anemones, and sea stars, were observed throughout the AoA (Figure 31). In softer fine and very fine sand, infaunal tube-building and burrowing polychaetes, as well as abundant beds of thin Ampelisca amphipod tubes, were observed (Figure 32). Orange sponges present in SPI as small round balls were observed at several stations, mostly along line 403 (Figure 33). In many images, a depositional layer of orange to rust-colored detrital material was observed (Figure 34); this food source likely shaped patterns of biological community distribution within the AoA.

Figure 30. Macrofauna Distribution Map: Sand Dollars

Source: BOEM 2016b; ESRI 2010; Greene et al. 2010; INSPIRE Environmental ©

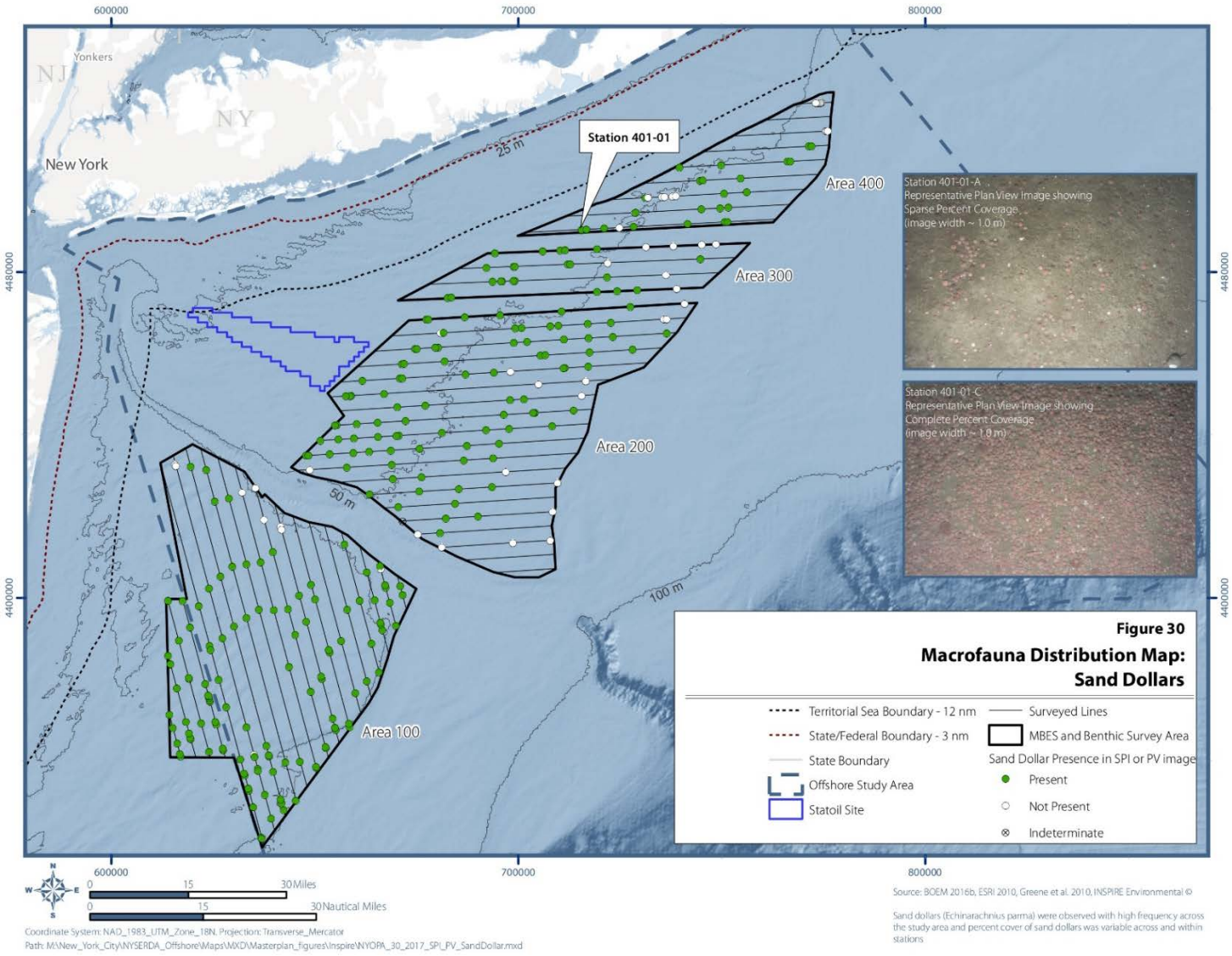


Figure 31. Macrofauna Distribution Map: Sand Dollars

Source: INSPIRE 2017b

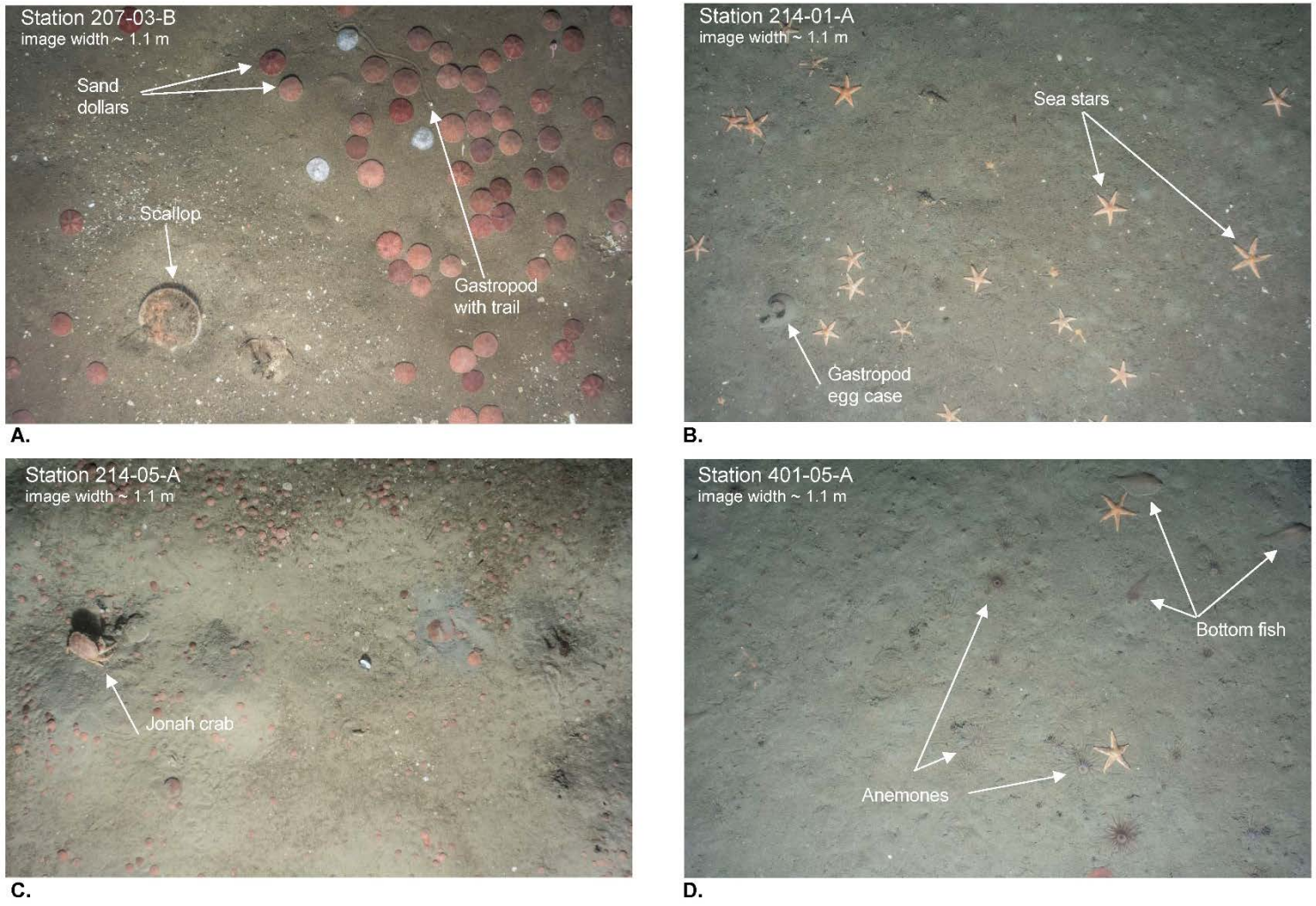
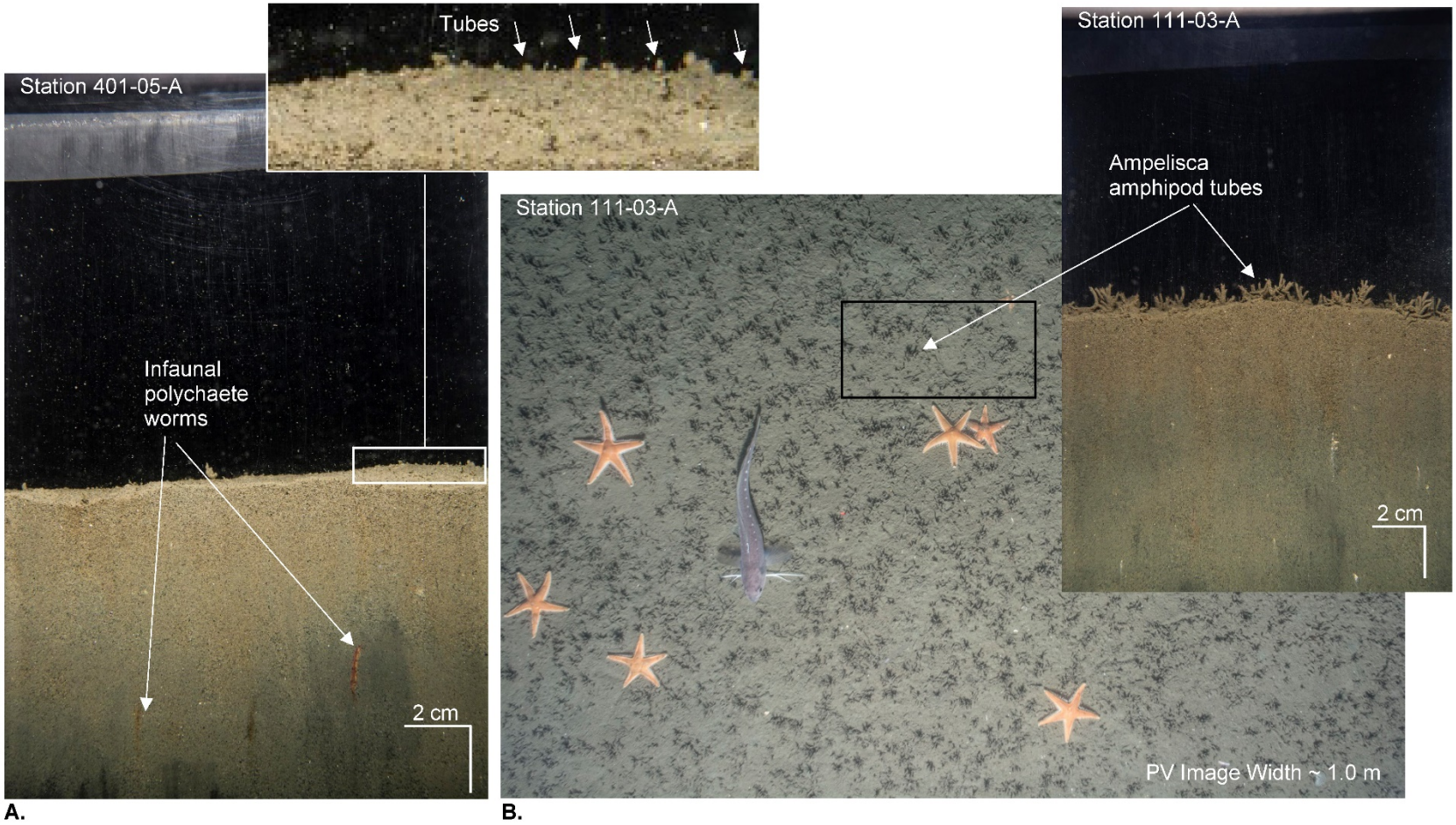


Figure 32. Infaunal Image Examples: Polychaetes and Tube-building Amphipods

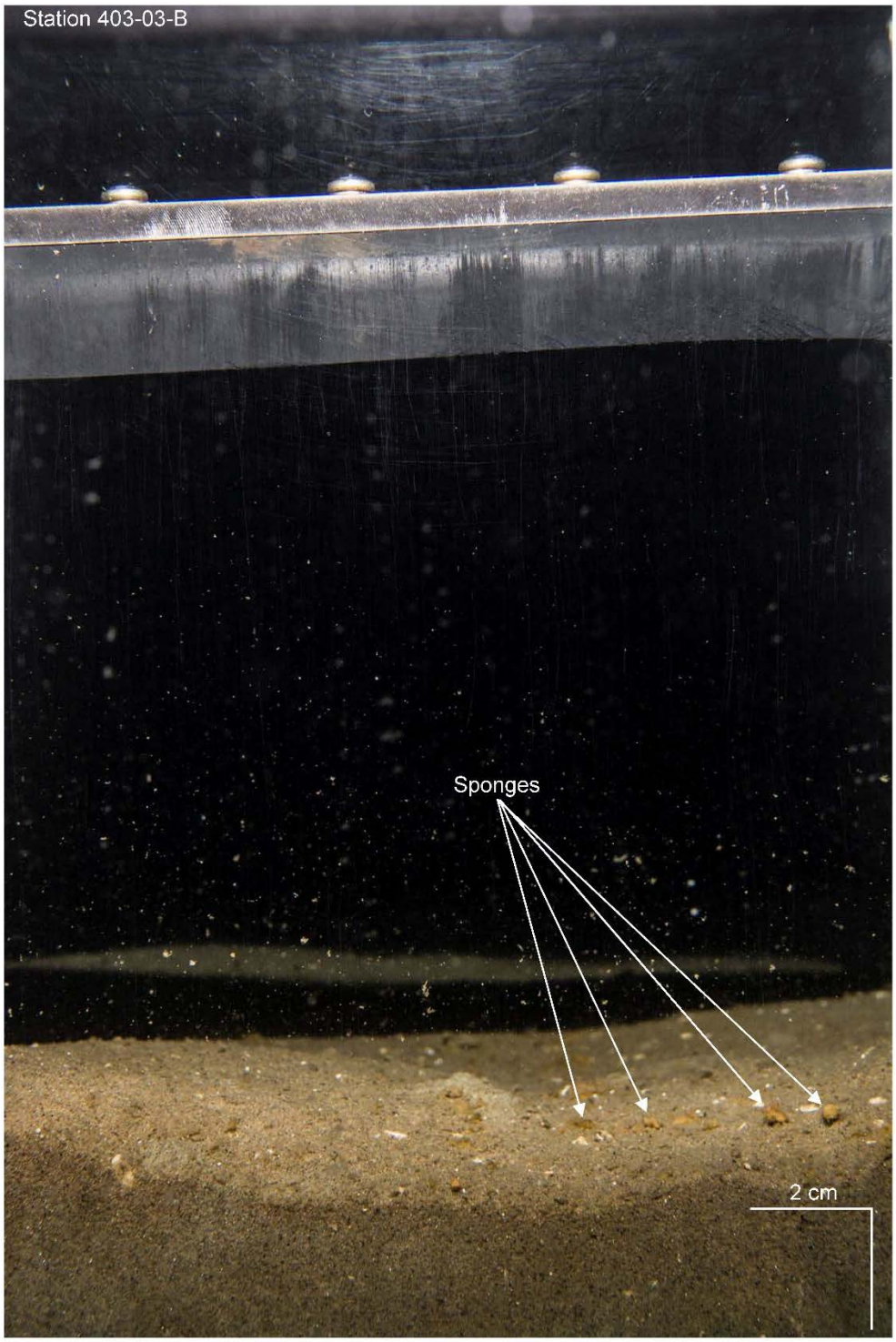
Source: INSPIRE 2017b



Note: Tubes and infaunal polychaetes and Ampelisca amphipods in silty very fine sand.

Figure 33. Macrofauna Image Examples: Sponges

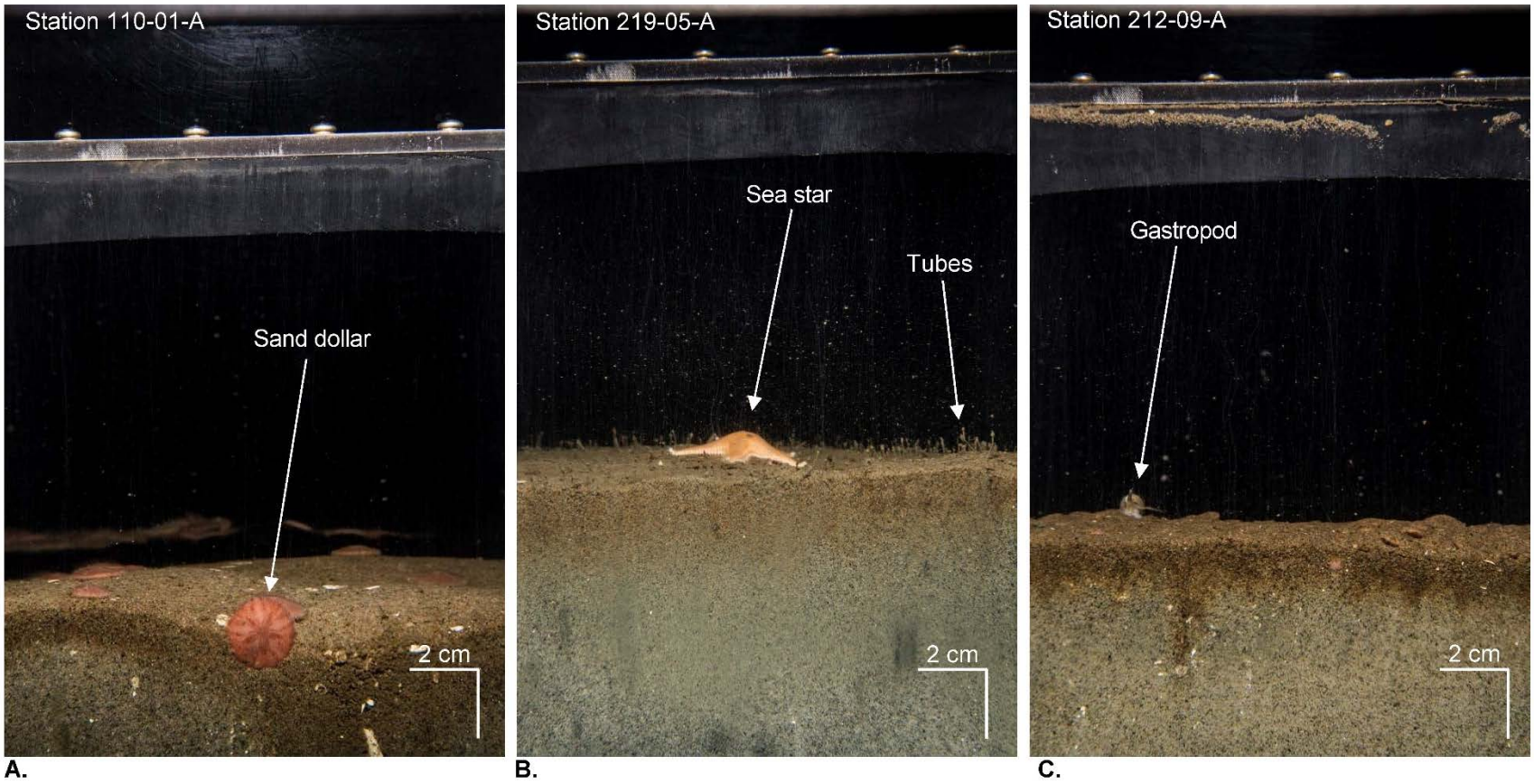
Source: INSPIRE 2017b



Note: Small unidentified orange sponges were observed loose on the sediment surface at a few stations, mostly along line 403.

Figure 34. Detrital (food source) Layer

Source: INSPIRE 2017b



Note: A. Fine sand; B. Very fine sand; C. Fine sand with an unidentified gastropod grazing at the sediment water interface.

3.5 Backscatter and Sediment Type Ground Truth Results

Higher reflectance backscatter values (reds on the maps) were generally found to indicate harder and/or coarser sediments, and lower reflectance backscatter values were generally found to indicate softer and/or finer sediments. Backscatter values did not consistently distinguish differences in sands, from very fine to coarse sand. These grain size types were found across a gradient from low to moderately high backscatter values, represented on maps as blues to yellows to yellows mixed with reds (Figure 35). This finding was consistent across the AoA, which was dominated by sands (Figure 36). Very fine sands fell within the lower portion of the described range of backscatter values, with no very fine sand SPI/PV stations located in areas mixed with harder “red” backscatter values.

Areas of consistently high backscatter—i.e., almost all red—frequently corresponded to seafloor surfaces covered with pebbles (Figure 37). The resolution of the backscatter data also allowed for apparently small areas of scattered pebbles on an otherwise sandy seafloor to be detected (Figure 38). Therefore, we hypothesize that areas with consistently high backscatter values are likely seafloor surfaces covered to some extent with pebbles or larger gravels. Factors other than grain size, such as sediment compaction and water content, also influence backscatter values. Additionally, consideration of bathymetry and acoustic relief models was important in evaluating correspondence between optical results and backscatter values, as these data may explain grain size better than backscatter where unique bedforms are present (Figure 39).

Figure 35. MBES Data Example: Low to Moderate Backscatter: Sands, Line 403

Source: INSPIRE Environmental©

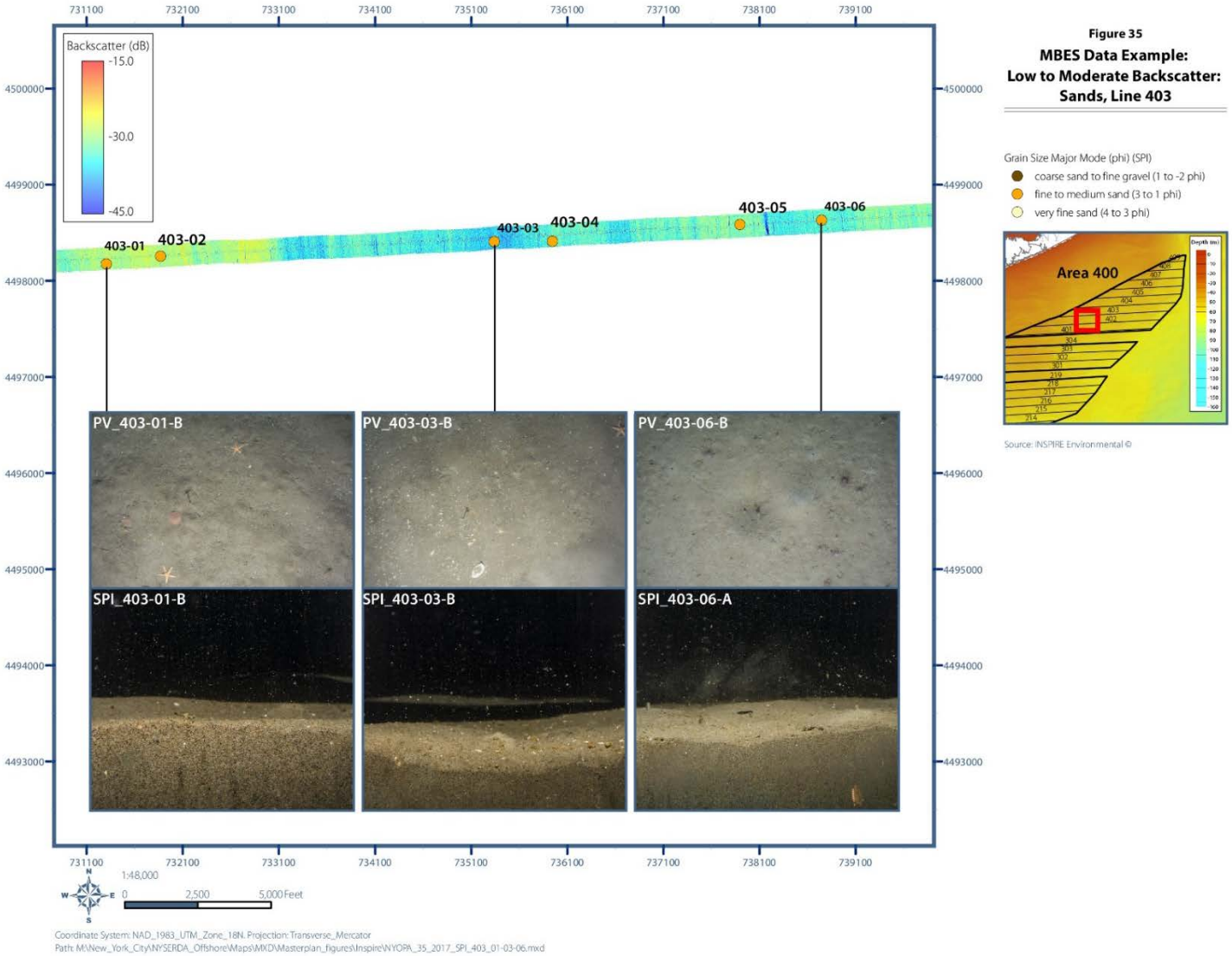
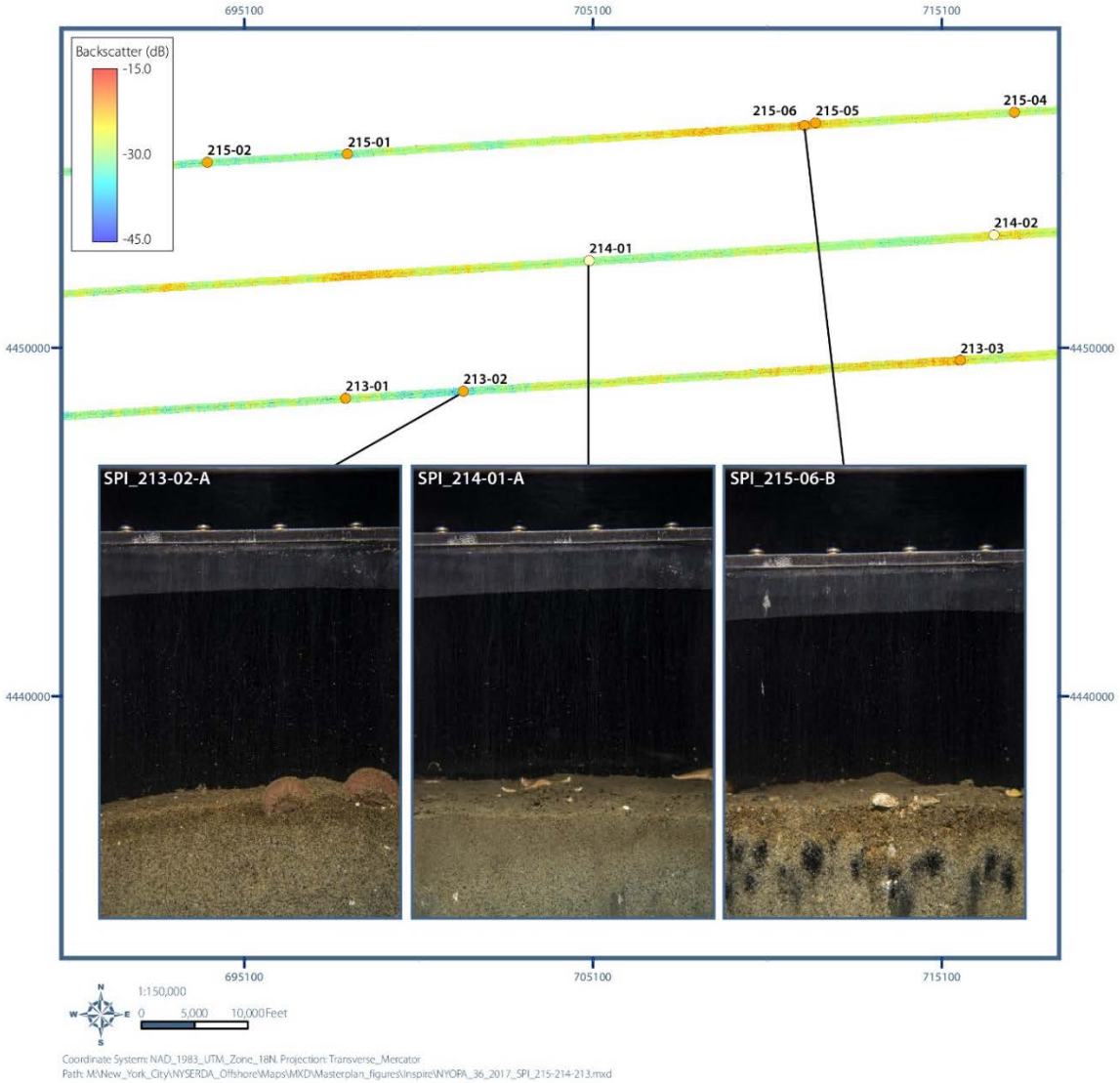


Figure 36. MBES Data Example: Low to Moderate Backscatter: Sands, Area 200

Source: INSPIRE Environmental©



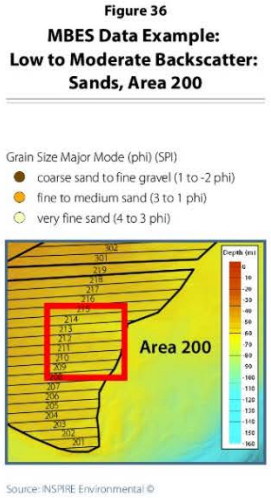


Figure 37. MBES Data Example: High Backscatter: Pebbles & Coarse Sand

Source: INSPIRE Environmental©

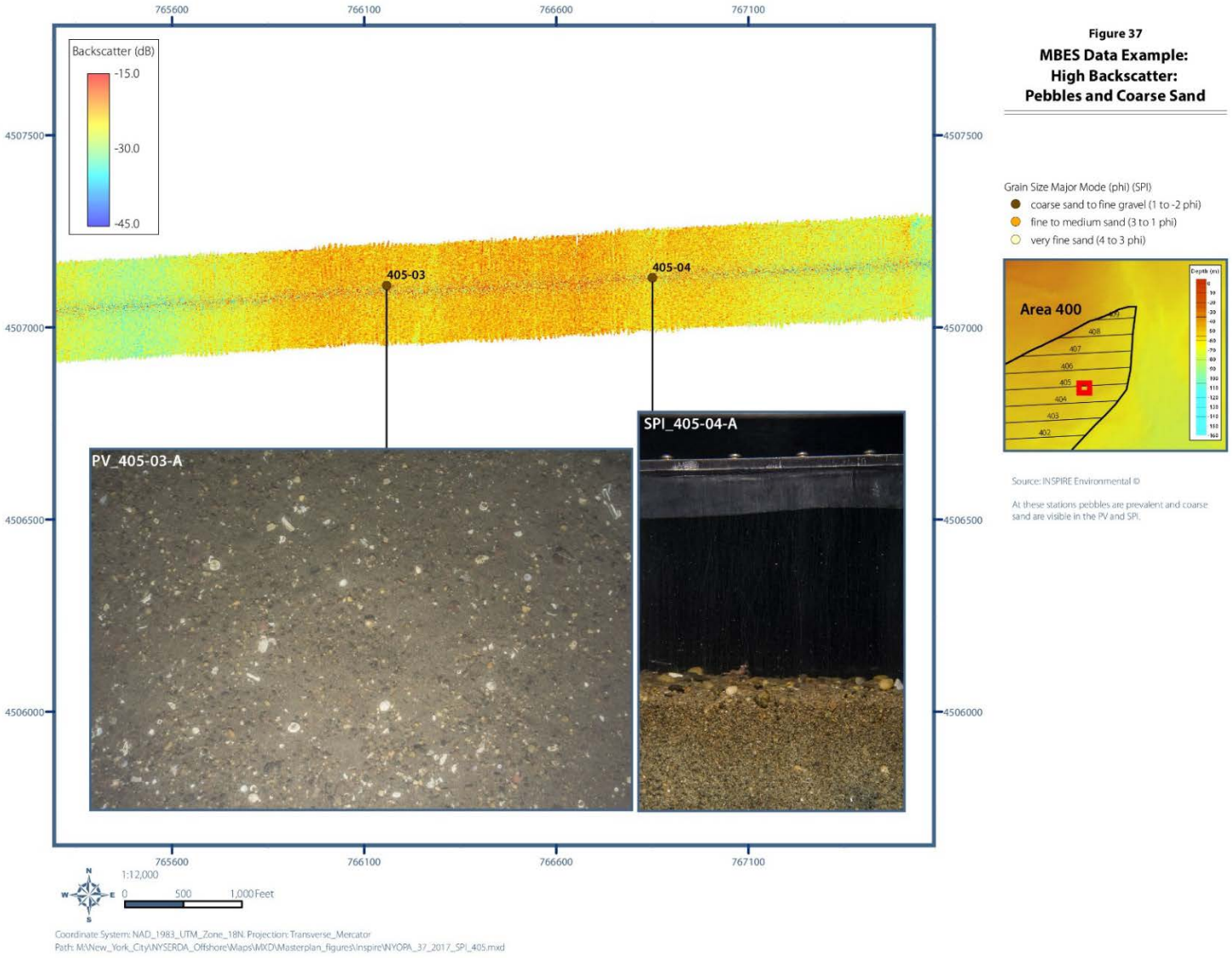


Figure 38. MBES Data Example: High Backscatter: Small Patch of Pebbles & Coarse Sand

Source: INSPIRE Environmental©

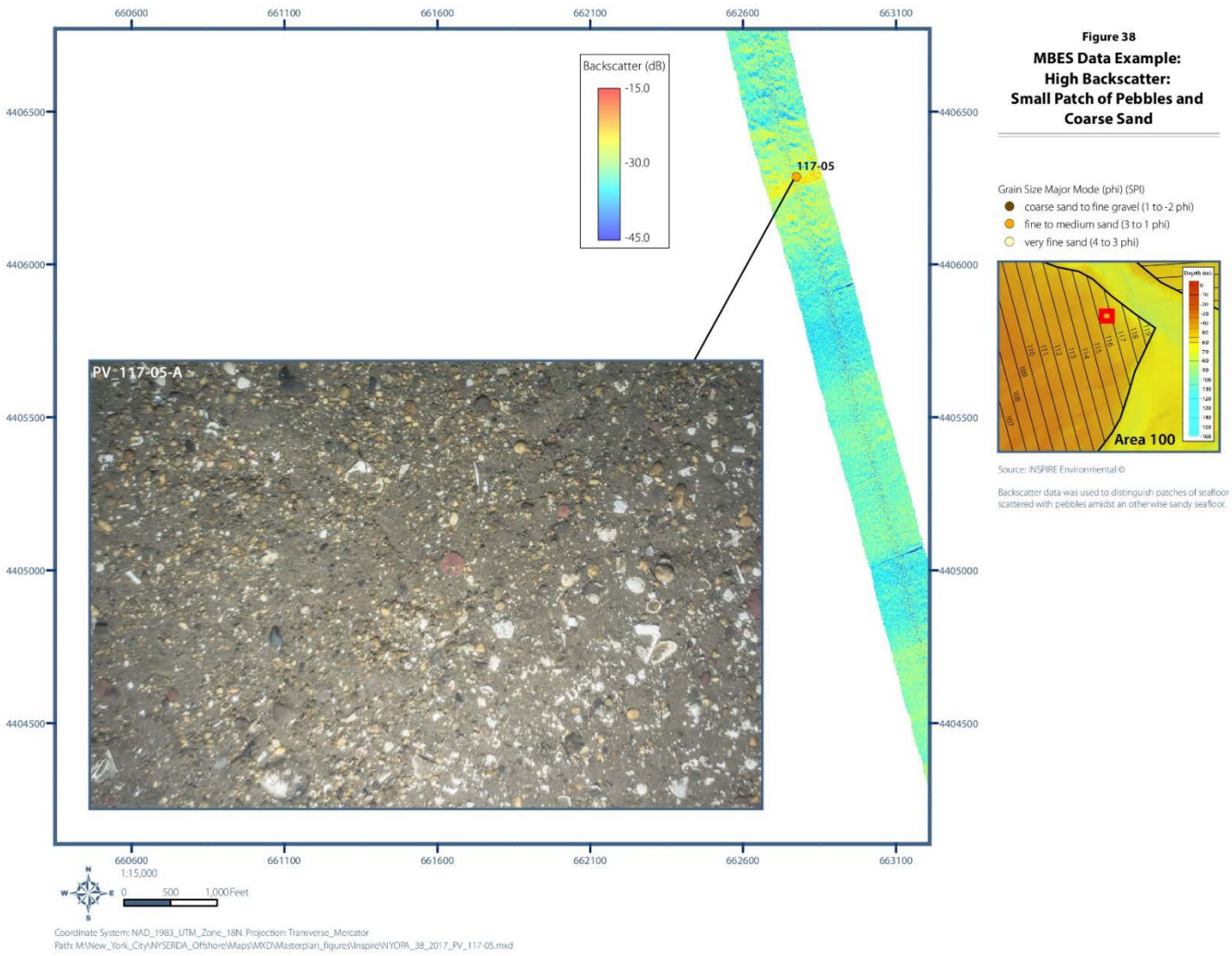


Figure 39. MBES Data Example: Relief to Interpret Backscatter Anomalies

Source: INSPIRE Environmental©

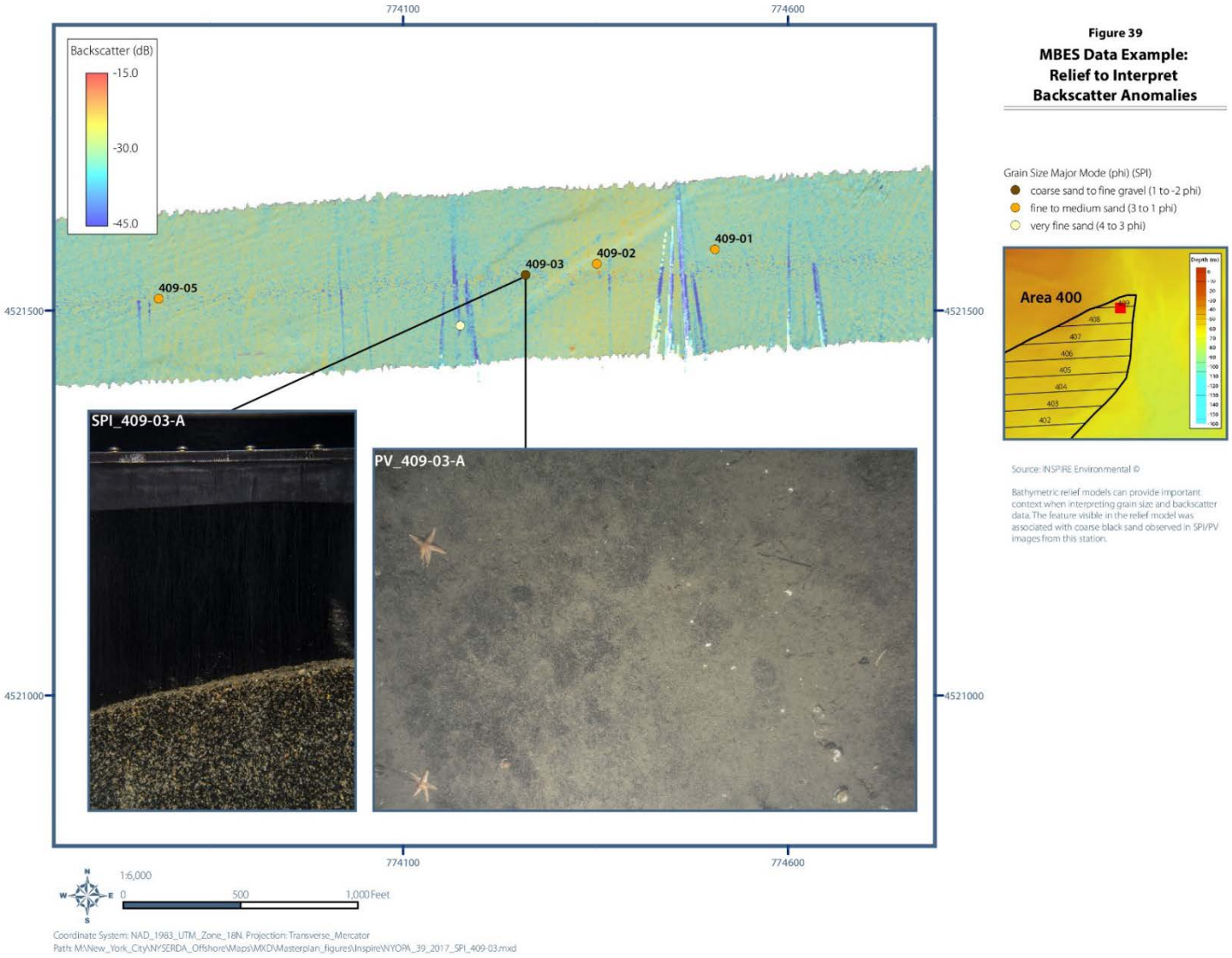


Table 3. Summary of Sediment Profile Imaging Results by Area and MBES Line

Area	Line Number	Station Count (N)	Water Depth Range (m)	Range of Grain Size Major Modes (phi)	Grain Size Major Mode (phi)	Mean Prism Penetration Depth (cm)	Mean Boundary Roughness (cm)	Dominant Type of Substratum
100	101	5	31–39 m	3 to 2	3 to 2	4.5	0.6	Firm, very fine and fine sand
	102	7	30–47 m	3 to 2 | 2 to 1	3 to 2	4.9	0.6	Firm, fine sand
	103	6	25–47 m	3 to 2 | 2 to 1	3 to 2, 2 to 1	4.8	0.8	Firm, fine and medium sand
	104	12	33–48 m	3 to 2 | -1 to -2	3 to 2	4.9	0.7	Firm, fine sand
	105	13	39–56 m	4 to 3 | 2 to 1	3 to 2	4.7	0.8	Firm, fine sand
	106	11	29–53 m	3 to 2 | 0 to 1	2 to 1	5.1	0.7	Firm, fine and medium sand
	107	10	29–54 m	3 to 2 | 2 to 1	3 to 2	5.0	0.5	Firm, fine and medium sand
	108	6	32–56 m	3 to 2 | 2 to 1	3 to 2, 2 to 1	4.8	0.9	Firm, fine and medium sand
	109	4	32–59 m	3 to 2 |2 to 1	3 to 2	4.6	0.9	Firm, fine sand
	110	6	34–60 m	3 to 2 | 2 to 1	2 to 1	4.9	0.7	Firm, medium sand
	111	8	35–59 m	4 to 3 | 0 to 1	2 to 1	6.0	0.9	Firm, very fine and medium sand
	112	9	38–59 m	3 to 2 | -1 to -2	2 to 1	4.0	0.7	Firm, fine and medium sand
	113	6	38–62 m	3 to 2 | 2 to 1	2 to 1	5.5	0.7	Firm, medium sand
	114	2	39–54 m	2 to 1	2 to 1	5.7	1.0	Firm, medium sand
	115	2	38–60 m	2 to 1 | 0 to 1	2 to 1, 0 to 1	5.6	0.9	Firm, medium sand
	116	4	42–63 m	2 to 1 | 0 to 1	2 to 1	5.2	1.4	Firm, medium sand
	117	5	46–65 m	2 to 1	2 to 1	5.5	0.8	Firm, medium sand
	118	6	51–66 m	3 to 2 | 2 to 1	2 to 1	3.6	0.9	Firm, fine and medium sand
	119	2	54–77 m	3 to 2 | 2 to 1	3 to 2, 2 to 1	4.3	0.8	Firm, fine and medium sand
	Max	**13**	**-**	**-**	**-**	**6.0**	**1.4**	**-**
	Min	**2**	**-**	**-**	**-**	**3.6**	**0.5**	**-**
	Mean	**6.5**	**-**	**-**	**-**	**4.9**	**0.8**	**-**
	Standard Deviation	**3.3**	**-**	**-**	**-**	**0.6**	**0.2**	**-**

Table 3 continued

Area	Line Number	Station Count (N)	Water Depth Range (m)	Range of Grain Size Major Modes (phi)	Grain Size Major Mode (phi)	Mean Prism Penetration Depth (cm)	Mean Boundary Roughness (cm)	Dominant Type of Substratum
200	203	3	56–66 m	2 to 1	2 to 1	4.5	0.8	Firm, medium sand
	204	2	54–66 m	2 to 1	2 to 1	4.2	0.3	Firm, medium sand
	205	4	53–63 m	2 to 1	2 to 1	5.8	0.8	Firm, medium sand
	206	2	51–66 m	2 to 1	2 to 1	4.4	0.9	Firm, medium sand
	207	5	50–68 m	2 to 1	2 to 1	4.8	1.3	Firm, fine and medium sand
	208	3	48–67 m	2 to 1 | 0 to 1 / 2 to 1	2 to 1	4.6	1.1	Firm, medium and medium/coarse sand
	209	5	45–68 m	3 to 2 | 2 to 1	2 to 1	5.7	1.1	Firm, fine and medium sand
	210	9	40–62 m	3 to 2 | 0 to 1	3 to 2, 2 to 1	4.5	0.9	Firm, fine and medium sand
	211	10	40–62 m	3 to 2 | 0 to 1	2 to 1	5.5	0.9	Firm, medium sand
	212	10	42–64 m	3 to 2 | 2 to 1	2 to 1	4.9	0.7	Firm, medium sand
	213	5	43–67 m	3 to 2 | 2 to 1	2 to 1	5.5	0.7	Firm, fine sand
	214	6	42–67 m	4 to 3 | 2 to 1	4 to 3, 3 to 2, 2 to 1	5.1	0.8	Firm, fine sand
	215	9	42–63 m	3 to 2 | 0 to 1 / 3 to 2	3 to 2	4.7	0.8	Firm, fine sand
	216	7	41–69 m	3 to 2 | -2 / 2 to 1	2 to 1	5.6	0.7	Firm, medium sand
	217	10	41–62 m	3 to 2 | 0 to 1	3 to 2	5.0	0.9	Firm, fine and medium sand
	218	10	42–65 m	3 to 2 | 0 to 1 / 2 to 1	2 to 1	5.0	0.8	Firm, fine and medium sand
	219	7	41–64 m	4 to 3 | 2 to 1	2 to 1	5.6	0.6	Firm, fine and medium sand
	Max	**10**	**-**	**-**	**-**	**5.8**	**1.3**	**-**
	Min	**2**	**-**	**-**	**-**	**4.2**	**0.3**	**-**
	Mean	**6.3**	**-**	**-**	**-**	**5.0**	**0.8**	**-**
	Standard Deviation	**3.0**	**-**	**-**	**-**	**0.5**	**0.2**	**-**

Table 3 continued

Area	Line Number	Station Count (N)	Water Depth Range (m)	Range of Grain Size Major Modes (phi)	Grain Size Major Mode (phi)	Mean Prism Penetration Depth (cm)	Mean Boundary Roughness (cm)	Dominant Type of Substratum
300	301	6	40–65 m	4 to 3 | 2 to 1	2 to 1	5.3	1.0	Firm, medium sand
	302	7	41–63 m	3 to 2 | 2 to 1	2 to 1	5.5	1.2	Firm, medium sand
	303	7	41–80 m	3 to 2 | 0 to 1 / 2 to 1	3 to 2	5.0	0.8	Firm, fine sand
	304	9	40–70 m	3 to 2 | 2 to 1	2 to 1	4.6	1.3	Firm, medium sand
	Max	**9**	**-**	**-**	**-**	**5.5**	**1.3**	**-**
	Min	**6**	**-**	**-**	**-**	**4.6**	**0.8**	**-**
	Mean	**7.3**	**-**	**-**	**-**	**5.1**	**1.1**	**-**
	Standard Deviation	**1.3**	**-**	**-**	**-**	**0.4**	**0.2**	**-**
400	401	8	40–66 m	4 to 3 | 0 to 1	2 to 1	5.9	1.5	Firm, medium and coarse sand
	402	5	41–67 m	4 to 3 | 2 to 1	3 to 2, 2 to 1	4.6	1.5	Firm, fine sand
	403	8	44–62 m	3 to 2 | 0 to 1	2 to 1	5.5	1.1	Firm, medium sand
	404	3	46–72 m	2 to 1 | 0 to 1	2 to 1, 0 to 1 / 2 to 1, 0 to 1	5.8	1.2	Firm, medium and coarse sand
	405	4	46–71 m	3 to 2 | 0 to 1	0 to 1	5.3	0.7	Firm, coarse sand
	406	2	45–63 m	2 to 1	2 to 1	4.5	1.5	Firm, fine sand
	407	3	45–62 m	4 to 3 | 3 to 2	3 to 2	8.6	0.8	Soft, very fine sand
	409	7	46–61 m	4 to 3 | -1	3 to 2	8.2	1.6	Highly variable from Soft, very fine sand to Firm, very coarse sand
	Max	**8**	**-**	**-**	**-**	**8.6**	**1.6**	**-**
	Min	**2**	**-**	**-**	**-**	**4.5**	**0.7**	**-**
	Mean	**5.0**	**-**	**-**	**-**	**6.0**	**1.2**	**-**
	Standard Deviation	**2.4**	**-**	**-**	**-**	**1.5**	**0.3**	**-**

4 Discussion

The overall objective of this Study was to provide planning-level characterization of the geological (sediment size and type), geotechnical (density of bottom), and benthic (animal habitat) characteristics of potential offshore wind energy areas within previously identified water depth zones off the shore of New York State. The interpretations of surface sediments and benthic biotic communities presented in this report are representative of the surveyed areas, based on the survey design and the suite of images collected across a range of seafloor features and textures.

All acoustic (MBES) and optical (SPI/PV) data collected during the survey indicated soft-bottom habitat substrata determined to be suitable for offshore wind development (Figure 40). No sensitive habitats (e.g., a predominantly hard bottom seabed with attached epifauna and flora) (Figure 41) were observed in the acoustic and optical data collected. Hard bottom habitats are viewed as potentially valuable and sensitive because they often provide stable and protected environments for spawning and residence of juvenile fish, shellfish, and lobster and are ideal locations for squid to lay their eggs. Acoustic data, including bottom seafloor bathymetry and backscatter, provided landscape-level assessment of the distribution of large and small wavelength and amplitude bedforms, changes in slope, and the presence of unique features; optical data provided small-scale visual evidence of surface substrata and biotic communities. No sensitive habitats were identified in either the landscape level or small-scale assessment.

Although the overall assessment was of a relatively uniform survey area composed of mobile sands, natural variability was detected in both landscape-level bedform features and in surface sediments and biotic communities over small spatial scales. The most prevalent bedforms observed across the survey area were sand waves, sand bars, and ripples formed in response to hydrodynamic forcing at multiple scales. Other bedforms observed included hummocked terrain, depressions likely to be glacial features, pockmarks, and linear furrows likely caused by trawl or other fishing gear. The presence and persistence of these different scaled bedforms across the entire area surveyed is perhaps the most striking and important observation from the MBES survey with regards to the identification of landscape-scaled features as well as the range of potential habitats.

Surface sediments were generally firm, fine, and medium sands that showed evidence of episodic sediment transport and can be classified as mobile sands. At a smaller number of stations, very fine silty sands, coarse to very coarse sands, and gravel to slightly gravelly sediments were also observed.

Variability over small spatial scales was observed in grain size major mode, and no distinct spatial patterns were observed (e.g., along depth contours) that might explain the locations of gravelly or soft very fine sand sediments (Figure 20). Differences in biota over small spatial scales were also observed. Related to grain size, thin Ampelisca amphipod tubes, burrowing Ceranthus anemones, and larger soft-bodied infauna were only observed in softer fine and very fine sands (Figures 31 and 32). Mobile epifauna, particularly sand dollars, were prevalent throughout the AoA, but varied in their abundance over small spatial scales (e.g., from sparse to complete cover over distances as short as 1,200 m; Figure 30), likely influenced in part by detrital (food source) material presence (Figure 34).

The primary conclusions of the analysis of MBES and benthic survey data were

- All areas surveyed appeared to be suitable for offshore wind development with respect to seafloor surface geology and benthic habitat resources.
- No sensitive habitats were observed in either acoustic or optical data.
- Data revealed a range of bedforms and surface sediment features, as well as associated benthic biotic communities, all of which can be characterized as soft substrata subject to episodic sediment transport events.
- Acoustic and optical data collected were believed to be representative of the area contained within the survey boundaries.
- Grain size data (from SPI) will help improve the existing regional grain size model of Poti et al. (2012b).
- The reconnaissance-level data will provide valuable information for design of surveys required for offshore wind development and management of offshore resources.

Based on analysis of MBES and benthic survey data, our recommendations for future benthic assessment and monitoring in possible future wind lease areas or along any cable route sites are

- Survey designs for collecting samples of the benthic environment should follow BOEM's guideline of one sample per 1 to 2 km² (BOEM 2013).
- An integrated multiscale approach utilizing acoustic and optical data should be considered. Good correspondence between backscatter data and sediment types proved to be useful for extrapolating results across survey areas for this study.
- Use of the CMECS Biotic Component Subclass classifier—specifically, the subclasses of Attached Fauna and Soft Sediment Fauna—should be considered as a broad-brush tool for screening level assessments of seafloor habitats for offshore wind development. Mapping areas of interest with this CMECS classifier can highlight locations that, from a benthic habitat perspective, might be considered suitable for offshore wind development (Soft Sediment Fauna) and those that may be unsuitable or require further detailed study to determine suitability (Attached Fauna).

Figure 40. Benthic Habitat Suitability Map for Offshore Wind

Source: BOEM 2016b; ESRI 2010; Greene et al. 2010

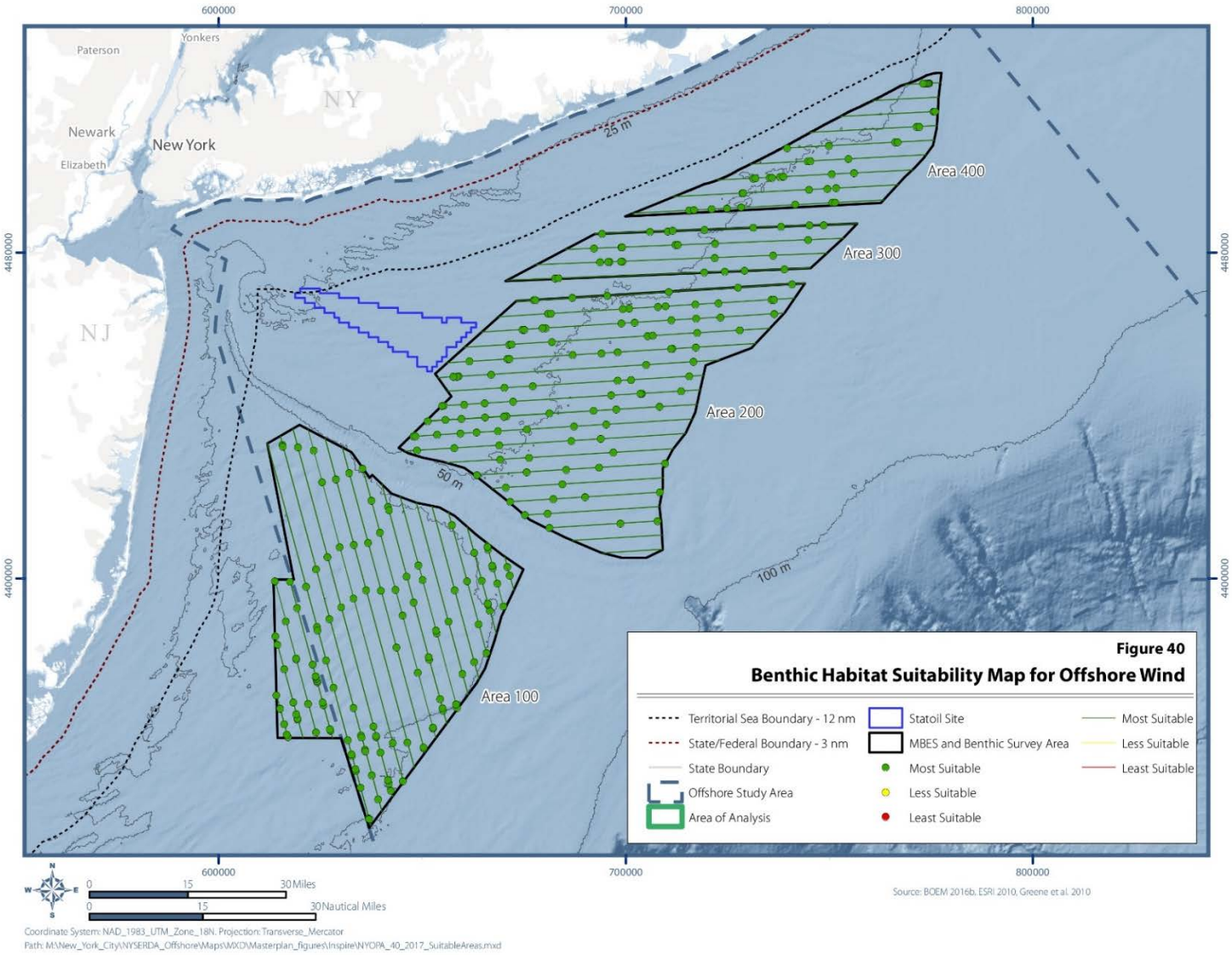


Figure 41. Benthic Habitat Suitability Example Images

Source: USGS 2017a, 2017b

A.

Image from this survey (Station 106-07) showing habitat type 'most suitable'.

B.

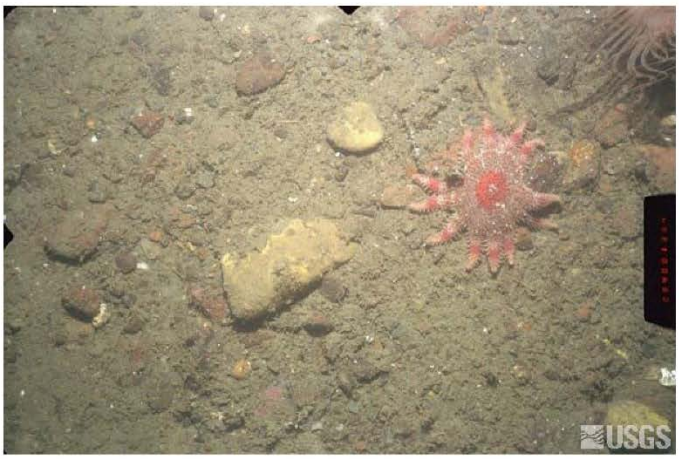


Image from Stellwagen Bank National Marine Sanctuary Region off Boston, Massachusetts showing habitat type 'less suitable'.

C.

Image from Stellwagen Bank National Marine Sanctuary Region off Boston, Massachusetts showing habitat type 'least suitable'.

Note: Benthic habitat types considered: A. Most suitable (green); B. Less suitable (yellow); and C.) Least suitable (red) for offshore wind planning.

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Appendix A. SPI/PV Station Locations

Station ID	Date	Time	Line Number	Area	XCoord_NAD83_UTM18N	YCoord_NAD83_UTM18N
101-01	7/17/2017	0:57:42	101	Area 100	616991.145	4361073.635
101-02	7/17/2017	1:10:10	101	Area 100	616810.9625	4361635.23
101-03	7/17/2017	1:37:44	101	Area 100	616142.4075	4364220.723
101-04	7/17/2017	2:10:04	101	Area 100	615112.3825	4368043.107
101-05	7/17/2017	2:39:17	101	Area 100	614224.815	4371285.098
102-01	7/15/2017	3:36:02	102	Area 100	613911.655	4385769.38
102-02	7/16/2017	23:42:54	102	Area 100	619471.8575	4365313.563
102-03	7/16/2017	23:53:37	102	Area 100	619391.2775	4365619.977
102-04	7/17/2017	0:10:55	102	Area 100	619096.8725	4366716.095
102-05	7/17/2017	3:14:05	102	Area 100	618326.53	4369533.508
102-06	7/17/2017	8:46:44	102	Area 100	616086.1825	4377794.053
102-07	7/17/2017	9:38:20	102	Area 100	614461.165	4383800.103
103-01	7/16/2017	22:54:11	103	Area 100	623944.045	4362236.545
103-02	7/17/2017	3:47:20	103	Area 100	622028.61	4369242.487
103-03	7/17/2017	7:57:50	103	Area 100	619071.415	4380167.05
103-04	7/17/2017	8:10:03	103	Area 100	619014.21	4380389.377
103-05	7/17/2017	10:25:45	103	Area 100	616553.3925	4389465.662
103-06	7/17/2017	12:03:06	103	Area 100	613905.465	4399266.593
104-01	7/16/2017	21:51:57	104	Area 100	627480.3475	4362607.152
104-02	7/16/2017	22:08:32	104	Area 100	627358.6175	4363016.947
104-03	7/17/2017	4:36:29	104	Area 100	625762.1825	4368876.068
104-04	7/17/2017	4:54:45	104	Area 100	625579.2075	4369563.885
104-05	7/17/2017	5:42:22	104	Area 100	624240.8425	4374515.322
104-06	7/17/2017	5:58:43	104	Area 100	624131.4525	4374861.11
104-07	7/17/2017	6:14:45	104	Area 100	623979.6525	4375480.148
104-08	7/17/2017	6:29:34	104	Area 100	623862.745	4375892.725
104-09	7/17/2017	6:42:07	104	Area 100	623830.41	4376056.982
104-10	7/17/2017	7:13:17	104	Area 100	623060.42	4378822.498
104-11	7/17/2017	11:05:55	104	Area 100	619276.1275	4392774.94
104-12	7/17/2017	14:19:12	104	Area 100	617535.3075	4399201.872
105-01	7/16/2017	17:45:16	105	Area 100	636879.915	4341131.715
105-02	7/16/2017	18:04:47	105	Area 100	636949.62	4340930.76
105-03	7/16/2017	18:59:51	105	Area 100	634881.5475	4348602.185
105-04	7/16/2017	19:35:37	105	Area 100	633759.8175	4352726.135
105-05	7/16/2017	19:49:42	105	Area 100	633625.56	4353230.505
105-06	7/16/2017	20:18:42	105	Area 100	632745.6875	4356448.742
105-07	7/16/2017	20:33:41	105	Area 100	632631.305	4356876.96

Station ID	Date	Time	Line Number	Area	XCoord_NAD83 _ UTM18N	YCoord_NAD83 _ UTM18N
105-08	7/16/2017	21:08:18	105	Area 100	631717.9425	4360362.03
105-09	7/17/2017	14:59:47	105	Area 100	621496.9	4397981.433
105-10	7/17/2017	16:20:51	105	Area 100	624150.325	4388128.842
105-11	7/17/2017	16:38:38	105	Area 100	624373.8625	4387284.982
105-12	7/17/2017	17:42:18	105	Area 100	626430.7775	4379854.223
105-13	7/17/2017	18:40:05	105	Area 100	628234.155	4373234.487
106-01	7/16/2017	14:03:21	106	Area 100	635003.6875	4361491.58
106-02	7/16/2017	14:18:10	106	Area 100	635149.565	4361002.73
106-03	7/16/2017	14:49:18	106	Area 100	635949.855	4358030.735
106-04	7/16/2017	15:03:52	106	Area 100	636058.6725	4357624.218
106-05	7/16/2017	15:56:54	106	Area 100	637645.15	4351673.805
106-06	7/16/2017	16:55:09	106	Area 100	639236.8425	4345811.77
106-07	7/17/2017	19:40:29	106	Area 100	633179.03	4368265.89
106-08	7/23/2017	1:51:03	106	Area 100	615682.79	4432800.523
106-09	7/23/2017	2:06:08	106	Area 100	615803.1125	4432386.955
106-10	7/26/2017	7:49:17	106	Area 100	623960.86	4402317.66
106-11	7/26/2017	9:05:28	106	Area 100	627268.905	4390089.595
107-01	7/16/2017	10:44:54	107	Area 100	642327.1575	4347868.327
107-02	7/16/2017	11:14:49	107	Area 100	641847.745	4349634.215
107-03	7/16/2017	11:36:41	107	Area 100	641592.2125	4350551.127
107-04	7/16/2017	12:36:02	107	Area 100	639772.925	4357263.627
107-05	7/16/2017	13:15:51	107	Area 100	638738.09	4361086.39
107-06	7/16/2017	13:30:13	107	Area 100	638675.17	4361317.13
107-07	7/17/2017	20:33:15	107	Area 100	638058.335	4363633.655
107-08	7/23/2017	2:44:35	107	Area 100	619477.735	4432228.183
107-09	7/26/2017	7:13:28	107	Area 100	626777.3375	4405304.443
107-10	7/26/2017	10:08:22	107	Area 100	630114.1375	4392944.803
108-01	7/16/2017	9:54:29	108	Area 100	645304.938	4350236.91
108-02	7/17/2017	21:21:13	108	Area 100	642790.095	4359584.26
108-03	7/23/2017	3:22:22	108	Area 100	623302.6125	4431474.713
108-04	7/23/2017	4:34:14	108	Area 100	625425.406	4423655.938
108-05	7/26/2017	6:36:37	108	Area 100	629745.37	4407725.678
108-06	7/26/2017	10:55:54	108	Area 100	633164.6425	4395092.61
109-01	7/17/2017	21:53:25	109	Area 100	646349.595	4359773.473
109-02	7/23/2017	5:08:16	109	Area 100	628842.0975	4424433.595
109-03	7/26/2017	6:00:05	109	Area 100	633217.24	4408239.578
109-04	7/26/2017	11:38:25	109	Area 100	636237.92	4397148.748
110-01	7/17/2017	22:27:16	110	Area 100	650395.2775	4358295.328
110-02	7/17/2017	22:41:59	110	Area 100	650340.4825	4358469.705

Station ID	Date	Time	Line Number	Area	XCoord_NAD83 _ UTM18N	YCoord_NAD83 _ UTM18N
110-03	7/23/2017	5:49:22	110	Area 100	632095.045	4425908.362
110-04	7/26/2017	5:22:39	110	Area 100	636718.0625	4408779.367
110-05	7/26/2017	12:18:40	110	Area 100	639900.6725	4396961.567
110-06	7/26/2017	17:18:50	110	Area 100	643668.49	4383093.575
111-01	7/17/2017	23:22:44	111	Area 100	652697.645	4363172.563
111-02	7/17/2017	23:38:15	111	Area 100	652634.2775	4363402.12
111-03	7/23/2017	6:21:20	111	Area 100	635421.375	4426960.873
111-04	7/23/2017	7:22:21	111	Area 100	637525.16	4419186.607
111-05	7/26/2017	4:26:19	111	Area 100	639654.9375	4411292.02
111-06	7/26/2017	12:58:03	111	Area 100	643456.4375	4397199.363
111-07	7/26/2017	16:26:41	111	Area 100	645166.4525	4390928.89
111-08	7/26/2017	18:20:22	111	Area 100	648952.6375	4376911.96
112-01	7/18/2017	0:18:35	112	Area 100	655136.6475	4367537.195
112-02	7/18/2017	0:37:39	112	Area 100	654975.7625	4368140.52
112-03	7/18/2017	1:03:12	112	Area 100	654364.4325	4370409.94
112-04	7/26/2017	2:55:23	112	Area 100	641618.655	4417618.61
112-05	7/26/2017	3:15:48	112	Area 100	641849.305	4416727.593
112-06	7/26/2017	13:49:14	112	Area 100	646195.02	4400507.105
112-07	7/26/2017	15:49:03	112	Area 100	647912.7275	4394140.91
112-08	7/26/2017	19:06:32	112	Area 100	651719.635	4380127.195
112-09	7/26/2017	19:22:36	112	Area 100	651574.7675	4380691.11
113-01	7/18/2017	3:11:16	113	Area 100	658554.4125	4368245.605
113-02	7/18/2017	3:27:28	113	Area 100	658332.675	4369105.348
113-03	7/26/2017	14:33:29	113	Area 100	649081.035	4403217.438
113-04	7/26/2017	15:06:43	113	Area 100	650057.53	4399600.555
113-05	7/26/2017	20:22:11	113	Area 100	653599.7475	4386577.738
113-06	7/26/2017	20:40:38	113	Area 100	653407.9375	4387243.523
114-01	7/18/2017	4:56:36	114	Area 100	659924.665	4376605.197
114-02	7/26/2017	21:18:11	114	Area 100	656446.2525	4389422.208
115-01	7/18/2017	5:39:32	115	Area 100	662765.5675	4379519.63
115-02	7/26/2017	22:13:08	115	Area 100	657981.0475	4397156.053
116-01	7/18/2017	6:17:54	116	Area 100	665796.445	4381719.505
116-02	7/18/2017	7:11:34	116	Area 100	663901.965	4388735.45
116-03	7/26/2017	22:53:26	116	Area 100	661028.12	4399334.57
116-04	7/27/2017	1:25:22	116	Area 100	657306.5675	4413111.255
117-01	7/18/2017	7:53:01	117	Area 100	666624.79	4392044.673
117-02	7/18/2017	8:15:28	117	Area 100	666231.0325	4393510.857
117-03	7/18/2017	8:30:26	117	Area 100	666133.5925	4393864.82
117-04	7/26/2017	23:30:50	117	Area 100	664661.7375	4399435.332
117-05	7/27/2017	0:22:51	117	Area 100	662773.4675	4406290.303

Station ID	Date	Time	Line Number	Area	XCoord_NAD83_UTM18N	YCoord_NAD83_UTM18N
118-01	7/18/2017	9:07:05	118	Area 100	669956.8375	4393140.24
118-02	7/18/2017	9:53:37	118	Area 100	668412.475	4398836.725
118-03	7/18/2017	11:46:25	118	Area 100	667398.575	4402558.718
118-04	7/18/2017	12:00:41	118	Area 100	667245.605	4403153.838
118-05	7/18/2017	12:35:30	118	Area 100	666180.9525	4407086.537
118-06	7/18/2017	12:51:04	118	Area 100	666005.8625	4407744.455
119-01	7/18/2017	10:33:44	119	Area 100	671539.42	4400741.04
119-02	7/18/2017	11:09:59	119	Area 100	670963.5225	4402847.592
203-01	7/18/2017	20:34:45	203	Area 200	681208.6775	4412425.833
203-02	7/18/2017	22:46:03	203	Area 200	698691.185	4413500.53
203-03	7/19/2017	0:21:43	203	Area 200	707855.525	4414087.643
204-01	7/27/2017	3:17:08	204	Area 200	675281.46	4415579.522
204-02	7/27/2017	4:03:37	204	Area 200	680811.99	4415916.67
205-01	7/19/2017	4:53:12	205	Area 200	671607.08	4418850.45
205-02	7/19/2017	7:17:58	205	Area 200	690087.09	4419982.51
205-03	7/19/2017	9:55:00	205	Area 200	708426.4125	4421128.688
205-04	7/27/2017	4:47:40	205	Area 200	682215.6175	4419511.577
206-01	7/27/2017	5:27:13	206	Area 200	684478.5475	4423167.705
206-02	8/9/2017	15:41:21	206	Area 200	670529.515	4422287.355
207-01	7/19/2017	15:33:36	207	Area 200	663434.23	4425351.04
207-02	7/19/2017	21:03:38	207	Area 200	709668.615	4428222.658
207-03	7/27/2017	6:02:43	207	Area 200	685371.39	4426722.787
207-04	7/27/2017	6:58:42	207	Area 200	693491.89	4427228.178
207-05	8/9/2017	16:35:20	207	Area 200	675676.805	4426109.335
208-01	7/27/2017	7:45:49	208	Area 200	696918.7875	4430922.438
208-02	8/9/2017	17:12:16	208	Area 200	676272.6875	4429654.86
208-03	8/9/2017	18:01:46	208	Area 200	669188.56	4429219.856
209-01	7/27/2017	8:27:02	209	Area 200	693876.645	4434262.34
209-02	7/27/2017	9:19:06	209	Area 200	686610.47	4433807.012
209-03	7/28/2017	18:04:16	209	Area 200	657901.9575	4432020.285
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209-05	8/9/2017	18:34:24	209	Area 200	668954.805	4432707.183
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210-02	7/27/2017	11:09:39	210	Area 200	695230.915	4437859.793
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210-04	7/28/2017	16:55:39	210	Area 200	663359.79	4435870.402
210-05	7/28/2017	17:30:30	210	Area 200	659416.5025	4435629.175
210-06	7/28/2017	19:33:07	210	Area 200	647834.8375	4434903.63
210-07	7/28/2017	19:49:53	210	Area 200	648384.55	4434938.657
210-08	7/28/2017	20:42:18	210	Area 200	653676.475	4435279.27

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211-04	7/28/2017	12:17:58	211	Area 200	681216.945	4440481.57
211-05	7/28/2017	13:59:17	211	Area 200	670660.34	4439820.91
211-06	7/28/2017	14:12:50	211	Area 200	670121.5425	4439787.33
211-07	7/28/2017	16:16:53	211	Area 200	659635.605	4439140.048
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211-09	7/28/2017	21:56:15	211	Area 200	655759.2675	4438913.445
211-10	8/9/2017	19:43:35	211	Area 200	665501.4575	4439507.388
212-01	7/5/2017	21:54:55	212	Area 200	704019.3925	4445427.82
212-02	7/5/2017	22:09:11	212	Area 200	703820.3775	4445411.47
212-03	7/5/2017	22:21:56	212	Area 200	703614.94	4445395.415
212-04	7/27/2017	12:20:08	212	Area 200	696434.675	4444956.283
212-05	7/28/2017	8:22:36	212	Area 200	713655.2575	4446015.143
212-06	7/28/2017	14:55:50	212	Area 200	665418.8425	4442998.11
212-07	7/28/2017	15:40:48	212	Area 200	660285.7975	4442686.178
212-08	7/28/2017	22:27:00	212	Area 200	655354.655	4442414.22
212-09	7/28/2017	22:39:04	212	Area 200	654930.7	4442371.94
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213-01	7/27/2017	12:57:26	213	Area 200	698012.6875	4448556.31
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214-06	8/10/2017	0:35:03	214	Area 200	657625.75	4449548.703
215-01	7/27/2017	15:03:17	215	Area 200	698065.335	4455554.255
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216-02	7/28/2017	2:58:01	216	Area 200	728052.165	4460934.613
216-03	8/7/2017	12:51:42	216	Area 200	705458.91	4459523.215
216-04	8/7/2017	13:10:33	216	Area 200	706635.485	4459597.305
216-05	8/7/2017	14:21:52	216	Area 200	717565.925	4460278.375
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217-01	7/27/2017	17:28:47	217	Area 200	680297.385	4461463.978
217-02	7/27/2017	2:58:01	217	Area 200	679598.8975	4461425.013
217-03	7/28/2017	12:51:42	217	Area 200	711218.0225	4463418.57
217-04	7/28/2017	13:10:33	217	Area 200	717285.78	4463764.563
217-05	7/28/2017	14:21:52	217	Area 200	723280.8925	4464141.43
217-06	8/7/2017	3:00:49	217	Area 200	698934.9325	4462627.888
217-07	8/7/2017	3:13:05	217	Area 200	702159.5525	4462827.5
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217-09	8/10/2017	3:51:14	217	Area 200	674693.4825	4461111.232
217-10	8/10/2017	4:04:04	217	Area 200	675075.5575	4461140.232
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218-02	7/27/2017	19:17:30	218	Area 200	681620.41	4465059.313
218-03	7/27/2017	23:25:31	218	Area 200	707919.495	4466697.105
218-04	7/27/2017	23:48:19	218	Area 200	709862.5025	4466807.13
218-05	8/7/2017	7:55:48	218	Area 200	722779.605	4467619.463
218-06	8/7/2017	8:42:07	218	Area 200	717133.3075	4467268.84
218-07	8/7/2017	10:33:11	218	Area 200	700858.7675	4466244.23
218-08	8/7/2017	11:02:09	218	Area 200	699252.9825	4466149.402
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218-10	8/7/2017	17:19:44	218	Area 200	736440.9575	4468455.287
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302-05	6/28/2017	4:08:28	302	Area 300	693676.71	4477625.973
302-06	8/7/2017	4:16:56	302	Area 300	721839.95	4478735.383
302-07	8/7/2017	19:27:14	302	Area 300	736278.255	4479316.775
303-01	6/28/2017	5:19:15	303	Area 300	692204.57	4481049.21
303-02	6/28/2017	6:18:59	303	Area 300	698910.02	4481294.938
303-03	6/28/2017	6:39:40	303	Area 300	699124.8275	4481319.537
303-04	8/7/2017	3:28:47	303	Area 300	721988.7325	4482246.502
303-05	8/7/2017	20:33:37	303	Area 300	744805.9025	4483165.202
303-06	8/10/2017	9:45:32	303	Area 300	712198.6425	4481871.848
303-07	8/10/2017	10:05:02	303	Area 300	712809.175	4481894.277
304-01	6/28/2017	7:40:26	304	Area 300	694228.7175	4484642.732
304-02	6/28/2017	9:04:56	304	Area 300	705984.14	4485133.4
304-03	6/28/2017	9:46:58	304	Area 300	710299.0475	4485248.703
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304-05	8/7/2017	0:04:45	304	Area 300	738144.9925	4486383.27
304-06	8/7/2017	1:18:06	304	Area 300	731387.4025	4486126.51
304-07	8/7/2017	2:51:04	304	Area 300	719377.0625	4485637.362
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401-01	6/28/2017	11:04:54	401	Area 400	715548.385	4490351.178
401-02	6/28/2017	11:29:11	401	Area 400	716794.9375	4490432.355
401-03	6/28/2017	12:13:25	401	Area 400	721128.39	4490683.395
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401-07	8/10/2017	14:00:09	401	Area 400	750764.1275	4492265.07
401-08	8/10/2017	14:21:52	401	Area 400	751455.875	4492285.183
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403-08	8/6/2017	20:19:43	403	Area 400	750580.805	4499262.728
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405-01	8/6/2017	16:50:10	405	Area 400	739641.57	4505676.395
405-02	8/6/2017	18:09:37	405	Area 400	749833.7875	4506209.19
405-03	8/10/2017	16:37:32	405	Area 400	766155.3875	4507115.787
405-04	8/10/2017	16:52:18	405	Area 400	766849.71	4507138.377
406-01	8/10/2017	17:36:23	406	Area 400	771459.535	4510873.933
406-02	8/10/2017	17:51:02	406	Area 400	772097.2775	4510907.2
407-01	8/10/2017	18:30:33	407	Area 400	775614.5775	4514598.22
407-02	8/10/2017	18:42:06	407	Area 400	775803.0525	4514627.678
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409-04	8/10/2017	20:12:32	409	Area 400	774179	4521479.158
409-05	8/10/2017	20:27:35	409	Area 400	773776.395	4521522.947
409-06	8/10/2017	20:40:19	409	Area 400	773378.2525	4521478.86
409-07	8/10/2017	20:48:54	409	Area 400	773067.95	4521471.105

Appendix B. SPI/PV Standard Operating Procedure

Standard Operating Procedure
for
SEDIMENT PROFILE and PLAN VIEW IMAGING
Sample Collection and Image Analysis

Prepared by:
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July 2017

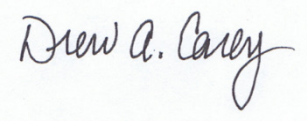
STANDARD OPERATING PROCEDURE FOR SEDIMENT PROFILE and PLAN VIEW IMAGING
Sample Collection and Image Analysis
REVISIONS AND APPROVAL

Prepared by: INSPIRE Environmental, 88 Silva Lane, Suite 4, Middletown, RI 02842

Revision Number: 1

Effective Date: July 7, 2017

Reviewed and Approved by:



Drew Carey, PhD, Managing Partner, INSPIRE Environmental

Record of Revision:

Revision Number	Effective Date	Comment
0	06/27/2017	
1	07/07/2017	

TABLE OF CONTENTS

Acronyms and Abbreviations

SPI	Sediment Profile Imaging
PV	Plan View
SOP	Standard Operating Procedure
cm	centimeter
DGPS	differential global positioning system
NEF	Nikon Electronic Format
USBL	ultra-short baseline
PSD	Photoshop Document
aRPD	apparent Redox Potential Discontinuity
eH	reduction potential
SOD	sediment oxygen demand

1.0 INTRODUCTION

Sediment profile and plan view imaging (SPI/PV) is a monitoring technique used to provide data on the physical characteristics of the seafloor and the status of the benthic biological community. This document describes the methods used and standard operating procedures (SOPs) followed when collecting and analyzing SPI/PV imaging.

This document, *Standard Operating Procedure (SOP) for Sediment Profile and Plan View Imaging Sample Collection and Image Analysis*, is organized to provide methods and SOPs as follows:

- Section 2 – SPI and PV Survey Methods.
- Section 3 – SPI and PV Survey Specifications and SOPs.
- Appendix A – SPI and PV Imaging Specifications and SOP Checklist.

2.0 SEDIMENT PROFILE AND PLAN VIEW IMAGING SURVEY METHODS

2.1 Station Locations and Navigation

SPI/PV images are taken at predetermined target locations. The survey work plan or field sampling plan specifies the SPI/PV survey design and sampling locations. In some cases, sampling locations may be modified during the survey due to site-specific conditions. Vessel navigation for SPI/PV surveys is accomplished using a positioning system that meets the project specifications for accuracy (e.g., differential global positioning system [DGPS], range azimuth). The positioning system may be interfaced to a computer or display to assist the vessel captain to navigate to target SPI/PV sampling locations. The actual sampling location is recorded by taking a position fix where the SPI/PV instrument is deployed. The water depth at the station is also recorded.

2.2 Sediment Profile Imaging Data Collection

SPI involves deploying an underwater camera system to photograph a cross section of the sediment-water interface. Acquisition of high-resolution sediment profile images is accomplished using a Nikon D7100 digital single-lens reflex camera with a 24.1 megapixel image sensor mounted inside an Ocean Imaging Model 3731 pressure housing system. The pressure housing sits atop a wedge-shaped prism with a glass front faceplate and back mirror, mounted at a 45° angle. The camera lens looks down at the mirror, which reflects the image from the faceplate. The prism has an internal strobe mounted inside at the back of the wedge to provide illumination for the image; this chamber is filled with distilled water so that the camera always has an optically clear path. As the prism penetrates the seafloor, a trigger activates a time-delay circuit that fires an internal strobe to obtain a cross-sectional image of the upper 15–20 centimeters (cm) of the sediment column (Figure 1). The camera remains on the seafloor for approximately 20 seconds to ensure that a successful image has been obtained. Visual checks and hand tightening checks of all nuts/bolts on the SPI/PV camera frame are conducted periodically to ensure nothing vibrates loose during the survey.

Test exposures of a color standard card are made on deck at the beginning of each survey to verify that all internal electronic systems are working to design specifications, to check camera focus, to check lighting balance, and to provide a color standard against which final images can be checked for proper color balance. Test images are also captured to confirm proper camera settings for site conditions. Images are checked periodically throughout the survey to confirm that the initial camera settings are still resulting in the highest quality images possible. All camera settings are recorded in a field log. Details of the camera settings (including shutter speed, lens aperture, and ISO-equivalent) for each digital image are available in the associated parameters file embedded in each electronic image file.

Whenever the camera is brought back on board (typically after every third to fifth station), the frame counter is checked to ensure that the requisite number of replicates has been obtained. In addition, a prism penetration depth indicator on the camera frame is checked to verify that the optical prism has penetrated the bottom to a sufficient depth. If images are missed or the penetration depth is insufficient, the camera frame stop collars are adjusted and/or weights are added or removed, and additional replicate images are taken. Frame counts, time of image acquisition, water depth (in feet or meters), frame stop-collar position, and the number of weights used are recorded in the field log for each replicate image. The use of mud doors is also recorded in the field log if their use is necessary.

Prior to field operations, the internal clock in the digital SPI system is synchronized with the vessel's positioning system. Each image is assigned a unique time stamp in the digital file attributes by the camera's data logger, and this time stamp is cross-checked with the time stamp in the navigational system's computer data file. Images are downloaded periodically to verify successful sample acquisition and/or to assess the type(s) of sediment and biota present at a given station. Digital image files are renamed with the appropriate station names immediately after downloading as a further quality assurance step.

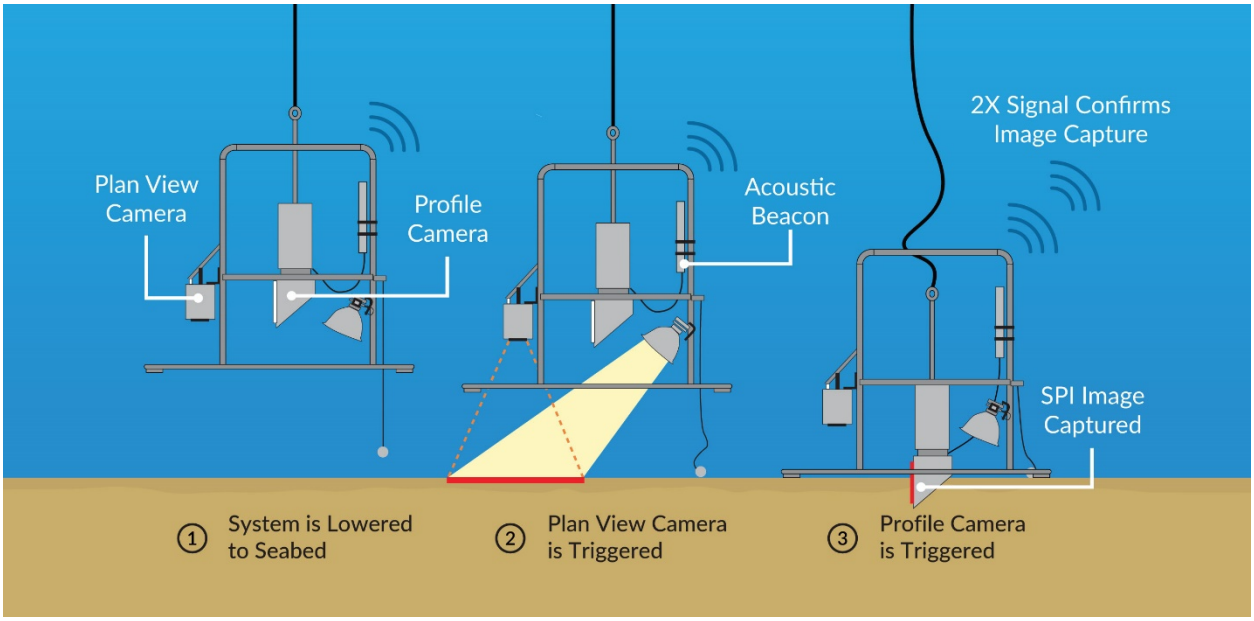


Figure 1. Schematic diagram of SPI/PV deployment

2.3 PV Underwater Camera Imaging Data Collection

An Ocean Imaging® Model DSC24000 PV underwater camera system with two Ocean Imaging® Model 400-37 Deep Sea Scaling lasers is attached to the sediment-profile camera frame and used to collect PV photographs of the seafloor surface. Both SPI and PV images are collected during each "drop" of the system. The PV underwater camera system consists of a Nikon® D-7100 SLR camera encased in an aluminum housing, a 24 volt DC autonomous power pack, a 500 watt strobe, and a bounce trigger. A weight is attached to the bounce trigger with a stainless steel cable so that the weight hangs below the camera frame. The scaling lasers project two red dots that are separated by a constant distance (26 cm) regardless of the field-of-view of the PV system. The field-of-view can be varied by increasing or decreasing the length of the trigger wire and, thereby, the camera height above the bottom when the picture is taken. As the SPI/PV camera system is lowered to the seafloor, the weight attached to the bounce trigger contacts the seafloor prior to the camera frame reaching the seafloor and triggers the PV camera (Figure 1). Visual checks and hand-tightening checks of all nuts/bolts on the SPI/PV camera frame are conducted periodically to ensure nothing vibrates loose during the survey.

During set up and testing of the PV underwater camera system, the positions of lasers on the PV camera are checked and calibrated to ensure separation of 26 cm. Test images are also captured to confirm proper camera settings for site conditions. Images are checked periodically throughout the survey to confirm that the initial camera settings are still resulting in the highest quality images possible. All camera settings are recorded in a field log. Details of the camera settings for each digital image are

available in the associated parameters file embedded in each electronic image file. Image storage is in compressed raw Nikon Electronic Format (NEF) files (approximately 30 megabytes each).

Prior to field operations, the internal clock in the digital PV system is synchronized with the internal clocks in the vessel's positioning system and the SPI camera. Each image is assigned a unique time stamp in the digital file attributes by the camera's data logger and cross-checked manually with the time stamp in the navigational system's computer data file. In addition, the field crew keeps redundant written sample logs. Throughout a survey, PV images are downloaded at the same time as SPI images and are evaluated for successful image acquisition and image clarity. Digital image files are renamed with the appropriate station names immediately after downloading as a further quality assurance step.

The ability of the PV camera to collect usable images is dependent on the clarity of the water column. To minimize the effects of turbid bottom waters, the bounce trigger cable may be shortened in order to decrease the distance between the camera focal plane and the seafloor. By limiting the distance between the camera lens port and the intended subject, picture clarity may be improved. One major drawback to the short trigger cable length and close distance between the PV camera and the seafloor is that the field-of-view of the PV system is decreased and a smaller area of the seafloor is photographed. Even with the short trigger cable, PV images may not be usable in highly turbid bottom waters. The length of the trigger cable and associated distance above the seafloor of the PV image will be adjusted for each survey depending on site-specific conditions.

2.4 Launch and Recovery Process

The SPI/PV camera system is a self-contained, self-powered imaging system and only requires basic handling to launch and recover.

Prior to deployment, SPI-trained personnel confirm the system is ready for launch, and all electronic systems are on and ready to record.

Two members of the deck crew with tag lines are sufficient (typically) to guide the system over the stern (or side). Once the system is clear of the transom, the tag lines are removed and the winch operator can lower the system to depth.

Depending upon water depth, progress is either tracked with a pinger, an ultra-short baseline (USBL) positioning system, or, in shallow waters, until cable/rope goes slack, indicating the frame is on the bottom.

Once on the seafloor, the prism is passively lowered into the seafloor (via weights integrated into the prism frame), the camera timing circuit waits a user-defined time interval (0, 5, 10, 15 [typical], or 20 seconds) to allow intended penetration and then takes an image. The SPI camera can also be programmed to collect two images per drop at user-defined intervals. The process can then be repeated by recovering the camera 5 to 10 meters above the seafloor, and repeating the lowering process.

Once the station is complete, the frame is recovered to the surface, taglines may be used to secure the system from swinging, and the SPI/PV system is maneuvered to the deck via winch and A-frame control.

2.5 Image Conversion and Calibration

Following completion of the field operations, the raw image files are color-calibrated in Adobe Camera Raw® by synchronizing the raw color profiles to a color card standard that was photographed with the SPI camera prior to field operations. The raw images are then converted to high-resolution Photoshop Document (PSD) format files using a lossless conversion file process, maintaining an Adobe RGB (1998) color profile. The PSD images are then calibrated and analyzed in Adobe Photoshop®. Image calibration is achieved by measuring the pixel length of a scale bar printed on the color card standard, which provides a pixel per centimeter calibration. This calibration information is applied to all SPI images analyzed. Linear and area measurements are recorded as the number of pixels and converted to scientific units using the calibration information.

2.6 SPI and PV Data Analysis

Computer-aided analysis of SPI/PV images provides a set of standard measurements to allow comparisons among different locations and surveys. Measured parameters for SPI and PV images are recorded in Microsoft Excel© spreadsheets. These data are subsequently checked by one of INSPIRE's senior scientists as an independent quality assurance/quality control review before final interpretation is performed. Spatial distributions of SPI/PV parameters are mapped using ArcGIS.

2.6.1 Sediment-Profile Image Analysis Parameters

The parameters discussed below may be assessed and/or measured for each replicate SPI image. Descriptive comments are also made for each replicate image.
Sediment Type – The sediment grain size major mode and range are estimated visually using a visual grain size comparator created at a similar scale. Results are reported using the phi scale. A table with a comparison of phi size classes, millimeter size ranges, and Udden-Wentworth size classes is provided as an Appendix in the report deliverable. The presence and thickness of dredged material may also be assessed.

Penetration Depth – The depth to which the camera penetrated the seafloor is measured to provide an indication of the bearing capacity and shear strength of the sediment. The penetration depth can range from a minimum of 0 cm (i.e., no penetration on hard substrata) to a maximum of 20 cm (full penetration of very soft substrata).

Surface Boundary Roughness – Surface boundary roughness is a measure of the vertical relief of features at the sediment-water interface. Surface boundary roughness is determined by measuring the vertical distance between the highest and lowest points of the sediment-water interface. The surface boundary roughness measured over the width of sediment-profile images typically ranges from 0 to 4 cm and may be related to physical structures (e.g., ripples, rip-up structures) or biogenic features (e.g., burrow openings, fecal mounds, foraging depressions).

Mud Clasts – When fine-grained, cohesive sediments are disturbed, either by physical bottom scour or faunal activity (e.g., decapod foraging) intact clumps of sediment are often scattered across the seafloor. The number of clasts observed at the sediment-water interface is counted and their oxidation state assessed. The detection of reduced mud clasts in an obviously aerobic setting suggests a recent origin (Germano 1983). Mud clasts that are artifacts of SPI sampling (mud clots can fall off the back of the prism or wiper blade) are not recorded in the analysis sheet but may be noted in the "Comments" field.

Apparent Redox Potential Discontinuity (aRPD) Depth – The aRPD depth provides a measure of the integrated time history of the balance between near-surface oxygen conditions and biological reworking of sediments. Oxidized surface sediments contain particles coated with ferric hydroxide (an olive or tan color when associated with particles) (Fenchel 1969; Lyle 1983). As the particles are buried or moved down by biological activity they are exposed to reducing oxygen concentrations in subsurface pore-waters and their oxic coating slowly changes color to dark gray or black (Fenchel 1969; Lyle 1983). The aRPD serves as a proxy for the RPD, the boundary between positive Eh and negative Eh regions of the sediment column (where Eh=0) that indicates a switch from dominantly aerobic to dominantly anaerobic processes. The mean aRPD measured in SPI has been shown to be a suitable proxy for the RPD with the depth of the actual Eh = 0 horizon generally either equal to or slightly shallower than the depth of the optical reflectance boundary (Rosenberg et al. 2001; Simone and Grant 2017). When biological activity is high, the aRPD depth increases; when it is low or absent, the aRPD depth decreases. The aRPD depth was measured by visually assessing color and reflectance boundaries within the images and, for each image, a mean aRPD was calculated.

Sediment Oxygen Demand – Sediment oxygen demand (SOD) represents the overall rate of oxygen consumption, biologically and chemically, by the sediment column. Organic loading to a system results in increased SOD and results in reduced sediments. The relative amount of organic enrichment is indicated by sediment color; darker coloration indicates that sediment is more reduced and has greater organic loading (Fenchel 1969; Rhoads 1974; Lyle 1983; Bull and Williamson 2001). SOD levels (i.e., none, low, medium, and high) are assessed for all images.

Low Dissolved Oxygen – Images in which dark gray or black reduced sediments are in contact with the water column across the entire length of the sediment-water interface are recorded as having low dissolved oxygen condition.

Sedimentary Methane – If organic loading is extremely high, pore-water sulfate is depleted and methanogenesis occurs. The process of methanogenesis is indicated by the appearance of methane bubbles in the sediment column. These gas-filled voids are readily discernable in SPI images because of their irregular, generally circular aspect and glassy texture (due to the reflection of the strobe off the gas bubble).

Thiophilic Bacteria (Beggiatoa) – The presence of sulfur-oxidizing bacterial colonies indicate hypoxic dissolved oxygen concentrations in the water column at the benthic boundary layer (Rosenberg and Diaz 1993). The presence and extent (e.g., threads, trace, patches, mat) of the *Beggiatoa* or *Beggiatoa*-like colonies are noted.

Infaunal Successional Stage – Infaunal successional stage is a measure of the biological community inhabiting the seafloor. Current theory holds that organism-sediment interactions in fine-grained sediments follow a predictable sequence of development after a major disturbance (e.g., dredged material disposal) (Pearson and Rosenberg 1978; Rhoads and Germano 1982; Rhoads and Boyer 1982). This continuum has been divided subjectively into four stages: Stage 0, indicative of a sediment column that is largely devoid of macrofauna, occurs immediately following a physical disturbance or in close proximity to an organic enrichment source; Stage 1 is the initial community of tiny, densely populated polychaete assemblages; Stage 2 is the start of the transition to head-down deposit feeders; and Stage 3 is the mature, equilibrium community of deep-dwelling, head-down deposit feeders (Figure 2). Successional stage is assigned by assessing the types of species or organism-related activities apparent in the images. Additional variables related to the infaunal community and their role in bioturbation are

often important to consider as bioturbation is related not only to sediment oxygen dynamics, but also nutrient and contaminant fluxes (Reible and Thibodeaux 1999). The minimum and maximum linear distance from the sediment surface to feeding voids and the maximum linear distance to the deepest feature of biological activity are measured.

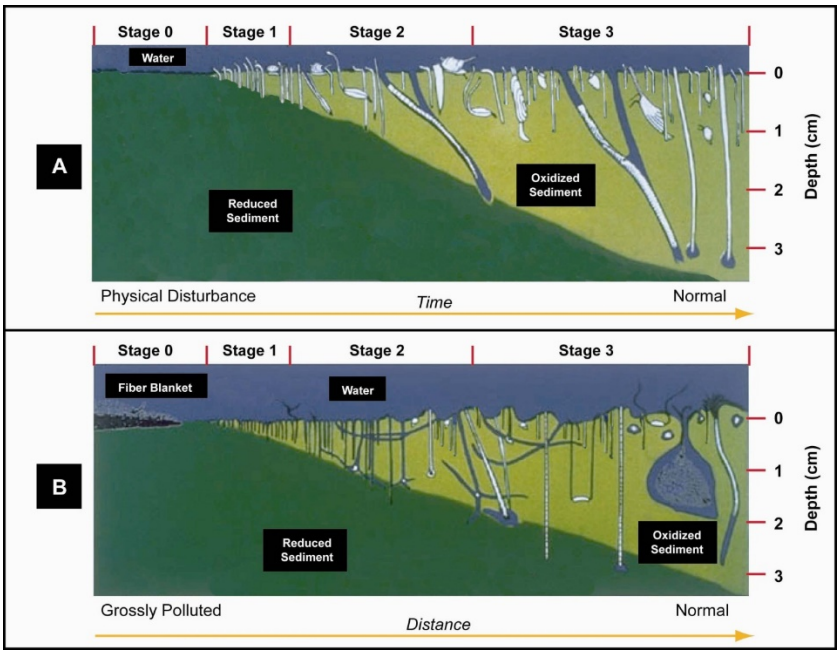


Figure 2. The stages of infaunal succession as a response of soft-bottom benthic communities to (A) physical disturbance or (B) organic enrichment.

Source: rom Rhoads and Germano (1982).

2.6.2 Plan-View Analysis Parameters

PV images provide a much larger field of view than SPI images and provide valuable information about the landscape ecology and sediment topography in the area where the pinpoint "optical core" of the sediment profile is taken. Unusual surface sediment layers, textures, or structures detected in any of the sediment-profile images can be interpreted considering the larger context of surface sediment features; i.e., is a surface layer or topographic feature a regularly occurring feature and typical of the seafloor in this general vicinity, or is it an isolated anomaly? The scale information provided by the underwater lasers allows accurate density counts of attached epifaunal colonies, sediment burrow openings, or larger macrofauna or fish that may have been missed in the sediment-profile cross section, as well as measurements of the percent cover of *Beggiatoa* colonies and other features of interest observable on the seafloor at the sampling location. Information on sediment transport dynamics and bedform wavelength are also available from PV image analysis.

For each replicate PV image, the field-of-view is calculated. Other measurements may include the sediment type, oxidation state of surface sediment, and presence and type of bedforms; presence and notes related to dredged material; estimations of the relative percent cover of burrows, tubes, tracks, and macrophytes; types of epifauna, flora, and debris; quantitative measures of *Beggiatoa* percent cover; number of fish; and descriptive comments.

3.0 SEDIMENT PROFILE AND PLAN VIEW SPECIFICATIONS AND STANDARD OPERATING PROCEDURES

3.1 Training

The users of this SOP should have the training provided by experienced SPI operators at INSPIRE or by the equipment manufacturer (Ocean Imaging Systems, North Falmouth, Massachusetts).

3.2 Equipment and Survey Vessel Specifications

1. Vessel navigation will be accomplished using a positioning system that meets the project's specifications to accurately measure and record vessel and sampling locations

2. The antenna of the positioning system or the point the positioning system is recording should be mounted above the SPI/PV deployment location. If not practicable, then offsets of the deployment location to the antenna should be measured and applied in real time to the vessel's positioning data. Before any job, the specifications of the planned winch and cable/synthetic rope is assessed for suitability to the job and INSPIRE or client's Health and Safety policies.

3. Confirm suitability of tracking equipment (USBL) and number of transponders (if required).

3.3 Survey Planning and Design

1. Typically, a minimum of three replicate camera drops should be made at each target station location. The number of replicates collected per station and the watch circle within which the replicates are collected are project-dependent and based on project data needs.

2. The camera wire angle should not exceed 20° off the vertical during deployment.

3. The production rate of SPI/PV image collection is dependent upon weather, water depth, winch speed, pilot skill, and station spacing.

3.4 Equipment Calibration and Data Acquisition Procedures

1. Fill prism with distilled water (assuming air temperatures are above freezing); ensure that no bubbles are adhering to lens port or faceplate prior to survey operations.

2. Measure offsets between the A-frame sheave and GPS antenna on installation or change of equipment if GPS antennae cannot be mounted on top of A-frame at deployment point.

3. The Nikon DSLR inside each camera housing should be set to record raw (NEF) files.

4. Format SD card(s) in both DSLRs prior to sealing the housing.

5. Check voltage output of both SPI and PV batteries to make sure they are at manufacturer's standard (12 V for SPI, 25 V for PV).

6. Check DGPS system accuracy at a known point if available. If two or more beacons are available, record and compare static positions using each beacon and compare positions.

7. Ensure lenses on each camera are taped to proper focal distance so that lens cannot rotate accidently during installation or due to camera vibration.

8. Photograph Color Calibration Chart through SPI camera before survey starts.

9. Check and calibrate position of lasers on PV camera to ensure separation of 26 cm.

10. Perform a daily frame count check of SPI camera at start and end of each survey day.

11. Conduct and process at least one SPI and PV image for proper ISO and f-stop setting; these will vary from location to location depending on sediment albedo (SPI) and water clarity (PV).

12. Check frame count on SPI internal LED display whenever camera is back on board (typically after every station) to ensure strobe has fired the requisite number of times.

13. Visual and hand tighten check of all nuts/bolts on SPI/PV camera frame to make sure nothing has vibrated loose during the survey.

3.5 Data Processing and Delivery Procedures

1. Adjust brightness levels of all raw (NEF) digital image files to maximize histogram in either Adobe Photoshop or Nikon Capture NX2 and re-save in high-resolution jpg format.

2. Convert all raw (NEF) digital image files to Adobe PSD format and save on external server for archive.

3. Calibrate image analysis software measurements to color card shot on SPI images or laser scaling dots on PV images.

4.0 REFERENCES

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Appendix A

SPI and PV Imaging Specifications and SOP Checklist

SPI and PV Imaging Specifications and SOP Checklist

This document summarizes Standard Operating Procedures followed during a SPI and PV Imaging Survey that must be followed prior to, during, and after a field survey is completed, to conform with the INSPIRE Environmental SOP.

Equipment and Survey Vessel Specifications	☐ Vessel equipped with DGPS navigation system. ☐ USBL system with transponders available (If applicable). ☐ Vessel winch and cable/synthetic rope is suitable to job.
Equipment and Survey Vessel Specifications	_____ Signature _____ Date Completed
Equipment Calibration and Data Acquisition SOP	☐ Fill prism with distilled water (assuming air temperature is above freezing). Ensure that no bubbles are adhering to lens port or faceplate prior to survey operations. ☐ Measure offsets between the A-frame sheave and GPS antenna on installation or change of equipment if GPS antennae cannot be mounted on top of A-frame at deployment point. ☐ Format SD card(s) in both DSLRs prior to sealing the housing. ☐ The Nikon DSLR inside each camera housing set to record raw (NEF) files. ☐ Check voltage output of both SPI and PV batteries to make sure they are at manufacturer's standard (12 V for SPI, 25 V for PV). ☐ Check DGPS system accuracy at a known point if available. If two or more beacons are available, record and compare static positions using each beacon and compare positions. ☐ Ensure lenses on each camera are taped to proper focal distance so that lenses cannot rotate accidently during installation or due to camera vibration. ☐ Photograph Color Calibration Chart through SPI camera before survey starts.

SPI and PV Imaging Specifications and SOP Checklist

	☐ Check and calibrate position of lasers on PV camera to ensure separation of 26 cm. ☐ Perform a daily frame count check of SPI camera at start and end of each survey day. ☐ Conduct and process at least one SPI and PV image for proper ISO and f-stop setting; these will vary from location to location depending on sediment albedo (SPI) and water clarity (PV). ☐ Check frame count on SPI internal LED display whenever camera is back on board (typically after every station) to ensure strobe has fired the requisite number of times. ☐ Visual and hand tighten check of all nuts/bolts on SPI/PV camera frame to make sure nothing has vibrated loose during survey.
Equipment Calibration and Data Acquisition SOP	_____ Signature _____ Date Completed
Survey Planning and Design	☐ A minimum of three replicate camera drops made at each target station location; replicate images obtained within a 7.5-meter radius of the target location. ☐ The camera wire angle did not exceed 20° off the vertical during deployment.
Survey Planning and Design	_____ Signature _____ Date Completed

SPI and PV Imaging Specifications and SOP Checklist

Data Processing and Delivery SOP	☐ Adjust brightness levels of all raw (NEF) digital image files to maximize histogram in either Adobe Photoshop or Nikon Capture NX2 and re-save in high-resolution jpg format. ☐ Convert all raw (NEF) digital image files to Adobe PSD format and save on external server for archive. ☐ Calibrate image analysis software measurements to color card shot on SPI images or laser scaling dots on PV images.
Data Processing and Delivery SOP	_____ Signature _____ Date Completed

Appendix C. SPI/PV Image Analysis Results

Line Number	StationID	Replicate	Date	Time	Stop Collar Setting (in)	# of Weights (per side)	Image Width (cm)	Grain Size Major Mode (phi)	Grain Size Minimum (phi)	Grain Size Maximum (phi)	Grain Size Range (phi)	Penetration Mean (cm)	Penetration Minimum (cm)	Penetration Maximum (cm)	Boundary Roughness (cm)	Boundary Roughness Type
101	101-01	A	7/17/2017	0:56:37	16	5	14.48	3 to 2	>4	1	>4 to 1	4.35	4.15	4.71	0.56	Biological
101	101-02	A	7/17/2017	1:09:03	16	5	14.48	3 to 2	>4	1	>4 to 1	3.01	2.59	3.52	0.93	Biological
101	101-03	A	7/17/2017	1:36:35	16	5	14.48	3 to 2	>4	2	>4 to 2	5.75	5.36	6.18	0.82	Biological
101	101-04	A	7/17/2017	2:08:57	16	5	14.48	3 to 2	>4	1	>4 to 1	5.22	4.97	5.5	0.53	Physical
101	101-05	A	7/17/2017	2:38:05	16	5	14.48	3 to 2	>4	1	>4 to 1	4.33	4.17	4.5	0.33	Biological
102	102-01	A	7/15/2017	3:34:28	16	5	14.48	3 to 2	>4	1	>4 to 1	4.83	4.21	5.39	1.17	Biological
102	102-02	A	7/16/2017	23:41:44	16	5	14.48	3 to 2	>4	1	>4 to 1	4.79	4.7	4.88	0.18	Physical
102	102-03	A	7/16/2017	23:52:15	16	5	14.48	3 to 2	>4	1	>4 to 1	4.08	3.61	4.9	1.29	Physical
102	102-04	A	7/17/2017	0:09:44	16	5	14.48	3 to 2	>4	1	>4 to 1	3.47	3.35	3.63	0.28	Biological
102	102-05	A	7/17/2017	3:12:50	16	5	14.48	2 to 1	>4	0	>4 to 0	5.71	5.49	6.06	0.57	Biological
102	102-06	A	7/17/2017	8:45:47	16	5	14.48	2 to 1	>4	0	>4 to 0	5.89	5.49	6.02	0.52	Physical
102	102-07	A	7/17/2017	9:37:22	16	5	14.48	2 to 1	>4	1	>4 to 1	5.47	5.33	5.81	0.48	Biological
103	103-01	A	7/16/2017	22:52:58	16	5	14.48	3 to 2	>4	1	>4 to 1	3.63	3.26	4	0.73	Biological
103	103-02	A	7/17/2017	3:46:12	16	5	14.48	2 to 1	>4	0	>4 to 0	5.65	5.38	6.06	0.68	Biological
103	103-03	A	7/17/2017	7:56:57	16	5	14.48	3 to 2	>4	0	>4 to 0	4.8	4.52	5.24	0.72	Biological
103	103-04	A	7/17/2017	8:09:15	16	5	14.48	2 to 1	>4	-2	>4 to -2	5.07	4.74	5.68	0.94	Physical
103	103-05	C	7/17/2017	10:26:19	16	5	14.48	2 to 1	>4	0	>4 to 0	4.78	4.32	4.99	0.67	Physical
103	103-06	A	7/17/2017	12:01:48	16	5	14.48	3 to 2	>4	1	>4 to 1	4.88	4.4	5.44	1.04	Biological
104	104-01	A	7/16/2017	21:50:49	16	5	14.48	3 to 2	>4	1	>4 to 1	4.32	4.05	4.49	0.44	Biological
104	104-02	A	7/16/2017	22:07:22	16	5	14.48	3 to 2	>4	1	>4 to 1	3.76	3.55	3.91	0.35	Biological
104	104-03	A	7/17/2017	4:35:23	16	5	14.48	3 to 2	>4	0	>4 to 0	5.45	5.02	5.99	0.97	Biological
104	104-04	A	7/17/2017	4:53:41	16	5	14.48	3 to 2	>4	1	>4 to 1	5.85	5.65	6.03	0.38	Biological
104	104-05	B	7/17/2017	5:42:12	16	5	14.48	3 to 2	>4	-3	>4 to -3	4.94	4.79	5.02	0.22	Physical
104	104-06	A	7/17/2017	5:57:47	16	5	14.48	3 to 2	>4	-3	>4 to -3	3.48	2.65	4.3	1.65	Physical
104	104-07	A	7/17/2017	6:13:46	16	5	14.48	3 to 2	>4	1	>4 to 1	5.51	5.18	6.04	0.85	Biological
104	104-08	A	7/17/2017	6:28:42	16	5	14.48	3 to 2	>4	1	>4 to 1	4.66	4.43	4.88	0.45	Biological
104	104-09	A	7/17/2017	6:41:10	16	5	14.48	2 to 1	>4	-3	>4 to -3	4.32	4.1	4.42	0.33	Physical
104	104-10	D	7/17/2017	7:14:34	16	5	14.48	0 to 1 / 2 to 1	>4	-2	>4 to -2	6.66	6.21	7	0.79	Physical
104	104-11	D	7/17/2017	11:07:27	16	5	14.48	-1 to -2	>4	-4	>4 to -4	4.64	4.09	5.72	1.63	Physical
104	104-12	A	7/17/2017	14:18:09	16	5	14.48	2 to 1	>4	-1	>4 to -1	4.71	4.3	5.13	0.83	Physical
105	105-01	C	7/16/2017	17:45:53	16	5	14.48	3 to 2	>4	0	>4 to 0	4.38	4.1	4.66	0.56	Biological
105	105-02	A	7/16/2017	18:03:32	16	5	14.48	4 to 3	>4	1	>4 to 1	2.27	2.03	2.82	0.79	Physical
105	105-03	A	7/16/2017	18:58:27	16	5	14.48	3 to 2	>4	0	>4 to 0	4.87	4.4	5.1	0.69	Biological
105	105-04	A	7/16/2017	19:34:27	16	5	14.48	3 to 2	>4	0	>4 to 0	3.57	3.12	4.19	1.07	Physical
105	105-05	A	7/16/2017	19:48:34	16	5	14.48	2 to 1	>4	0	>4 to 0	6.01	4.95	6.73	1.78	Physical
105	105-06	A	7/16/2017	20:17:26	16	5	14.48	3 to 2	>4	0	>4 to 0	3.87	3.32	4.33	1.02	Biological
105	105-07	A	7/16/2017	20:32:30	16	5	14.48	3 to 2	>4	0	>4 to 0	4.89	4.47	5.1	0.63	Biological
105	105-08	A	7/16/2017	21:07:05	16	5	14.48	3 to 2	>4	0	>4 to 0	5.31	4.18	5.81	1.62	Biological
105	105-09	A	7/17/2017	14:58:47	16	5	14.48	3 to 2	>4	0	>4 to 0	5.65	5.48	5.94	0.46	Biological

Line Number	StationID	Replicate	Date	Time	Stop Collar Setting (in)	# of Weights (per side)	Image Width (cm)	Grain Size Major Mode (phi)	Grain Size Minimum (phi)	Grain Size Maximum (phi)	Grain Size Range (phi)	Penetration Mean (cm)	Penetration Minimum (cm)	Penetration Maximum (cm)	Boundary Roughness (cm)	Boundary Roughness Type
105	105-10	B	7/17/2017	16:20:31	16	5	14.48	2 to 1	>4	-2	>4 to -2	5.41	5.21	5.57	0.35	Biological
105	105-11	A	7/17/2017	16:37:20	16	5	14.48	2 to 1	>4	0	>4 to 0	4.93	4.46	5.19	0.73	Physical
105	105-12	A	7/17/2017	17:40:50	16	5	14.48	3 to 2	>4	1	>4 to 1	5.3	5.12	5.5	0.38	Biological
105	105-13	A	7/17/2017	18:38:48	16	5	14.48	3 to 2	>4	1	>4 to 1	4.97	4.63	5.06	0.43	Biological
106	106-01	A	7/16/2017	14:02:17	16	5	14.48	2 to 1	>4	-1	>4 to -1	5.18	4.67	5.49	0.82	Physical
106	106-02	A	7/16/2017	14:17:14	16	5	14.48	2 to 1	>4	0	>4 to 0	5.29	5.07	5.47	0.4	Biological
106	106-03	A	7/16/2017	14:48:21	16	5	14.48	3 to 2	>4	1	>4 to 1	2.99	2.82	3.21	0.4	Biological
106	106-04	A	7/16/2017	15:02:52	16	5	14.48	3 to 2	>4	0	>4 to 0	2.73	2.36	3.17	0.81	Biological
106	106-05	B	7/16/2017	15:56:47	16	5	14.48	3 to 2	>4	0	>4 to 0	5.42	5.21	5.85	0.64	Biological
106	106-06	A	7/16/2017	16:54:05	16	5	14.48	2 to 1	>4	-1	>4 to -1	7.39	6.62	7.71	1.09	Physical
106	106-07	A	7/17/2017	19:39:05	16	5	14.48	3 to 2	>4	0	>4 to 0	6.58	6.38	6.75	0.37	Biological
106	106-08	A	7/23/2017	1:49:42	16	5	14.48	0 to 1	>4	-1	>4 to -1	5.38	4.37	6.39	2.03	Physical
106	106-09	A	7/23/2017	2:04:46	16	5	14.48	0 to 1	>4	-1	>4 to -1	3.85	3.57	3.95	0.38	Physical
106	106-10	A	7/26/2017	7:48:05	16	5	14.48	2 to 1	>4	0	>4 to 0	6.14	5.97	6.35	0.38	Biological
106	106-11	A	7/26/2017	9:04:14	16	5	14.48	2 to 1	>4	-2	>4 to -2	5.05	4.58	5.47	0.9	Physical
107	107-01	A	7/16/2017	10:43:51	16	5	14.48	3 to 2	>4	0	>4 to 0	4.73	4.6	5.14	0.54	Biological
107	107-02	A	7/16/2017	11:13:57	16	5	14.48	2 to 1	>4	0	>4 to 0	4.59	4.49	4.65	0.17	Biological
107	107-03	A	7/16/2017	11:35:51	16	5	14.48	2 to 1	>4	0	>4 to 0	3.96	3.5	4.38	0.88	Biological
107	107-04	A	7/16/2017	12:35:13	16	5	14.48	2 to 1	>4	0	>4 to 0	6.16	5.83	6.4	0.56	Biological
107	107-05	A	7/16/2017	13:15:04	16	5	14.48	3 to 2	>4	0	>4 to 0	5.33	5.14	5.54	0.4	Biological
107	107-06	A	7/16/2017	13:29:22	16	5	14.48	3 to 2	>4	0	>4 to 0	3.34	2.9	3.87	0.97	Biological
107	107-07	A	7/17/2017	20:31:52	16	5	14.48	3 to 2	>4	0	>4 to 0	4.84	4.65	4.93	0.28	Biological
107	107-08	A	7/23/2017	2:43:19	16	5	14.48	3 to 2	>4	1	>4 to 1	5.84	5.65	5.99	0.34	Biological
107	107-09	A	7/26/2017	7:12:13	16	5	14.48	2 to 1	>4	0	>4 to 0	5.84	5.31	6.2	0.89	Physical
107	107-10	A	7/26/2017	10:07:05	16	5	14.48	3 to 2	>4	1	>4 to 1	5.66	5.56	5.81	0.25	Biological
108	108-01	A	7/16/2017	9:52:26	16	5	14.48	3 to 2	>4	1	>4 to 1	3.71	3.21	4.1	0.88	Biological
108	108-02	B	7/17/2017	21:21:00	16	5	14.48	2 to 1	>4	1	>4 to 1	4.87	4.78	5.05	0.27	Biological
108	108-03	A	7/23/2017	3:21:07	16	5	14.48	2 to 1	>4	-2	>4 to -2	3.58	2.92	4.17	1.25	Physical
108	108-04	A	7/23/2017	4:32:17	16	5	14.48	3 to 2	>4	1	>4 to 1	5.3	3.95	5.89	1.94	Physical
108	108-05	A	7/26/2017	6:35:22	16	5	14.48	3 to 2	>4	1	>4 to 1	5.66	5.3	5.95	0.65	Biological
108	108-06	B	7/26/2017	10:55:28	16	5	14.48	2 to 1	>4	-1	>4 to -1	5.81	5.57	6.1	0.52	Physical
109	109-01	A	7/17/2017	21:52:10	16	5	14.48	3 to 2	>4	1	>4 to 1	2.39	1.52	3.28	1.76	Biological
109	109-02	A	7/23/2017	5:06:54	16	5	14.48	3 to 2	>4	1	>4 to 1	4.88	4.59	5.1	0.51	Biological
109	109-03	A	7/26/2017	5:58:59	16	5	14.48	2 to 1	>4	-1	>4 to -1	5.78	5.47	6.25	0.77	Biological
109	109-04	A	7/26/2017	11:37:03	16	5	14.48	3 to 2	>4	1	>4 to 1	5.23	5.01	5.41	0.4	Biological
110	110-01	A	7/17/2017	22:26:01	16	5	14.48	3 to 2	>4	1	>4 to 1	3.74	3.13	4.37	1.24	Biological
110	110-02	A	7/17/2017	22:40:40	16	5	14.48	3 to 2	>4	1	>4 to 1	3.17	3	3.5	0.51	Biological
110	110-03	A	7/23/2017	5:47:56	16	5	14.48	2 to 1	>4	-2	>4 to -2	5.26	4.71	5.63	0.93	Physical
110	110-04	A	7/26/2017	5:21:19	16	5	14.48	2 to 1	>4	-1	>4 to -1	4.79	4.48	5.02	0.54	Physical

Line Number	StationID	Replicate	Date	Time	Stop Collar Setting (in)	# of Weights (per side)	Image Width (cm)	Grain Size Major Mode (phi)	Grain Size Minimum (phi)	Grain Size Maximum (phi)	Grain Size Range (phi)	Penetration Mean (cm)	Penetration Minimum (cm)	Penetration Maximum (cm)	Boundary Roughness (cm)	Boundary Roughness Type
110	110-05	A	7/26/2017	12:17:25	16	5	14.48	2 to 1	>4	-1	>4 to -1	6.83	6.32	7.12	0.8	Physical
110	110-06	C	7/26/2017	17:19:24	16	5	14.48	2 to 1	>4	-2	>4 to -2	5.69	5.49	5.94	0.44	Biological
111	111-01	A	7/17/2017	23:21:29	16	5	14.48	3 to 2	>4	1	>4 to 1	4.72	4.45	4.91	0.46	Biological
111	111-02	A	7/17/2017	23:37:00	16	5	14.48	3 to 2	>4	1	>4 to 1	3.92	3.82	4.07	0.25	Biological
111	111-03	A	7/23/2017	6:20:01	16	5	14.48	4 to 3	>4	1	>4 to 1	10.43	9.93	10.81	0.88	Biological
111	111-04	A	7/23/2017	7:21:01	16	5	14.48	0 to 1	>4	-3	>4 to -3	7.25	6.47	7.78	1.31	Physical
111	111-05	B	7/26/2017	4:25:47	16	5	14.48	2 to 1	>4	-1	>4 to -1	5.39	4.97	5.8	0.83	Physical
111	111-06	A	7/26/2017	12:56:43	16	5	14.48	2 to 1	>4	-1	>4 to -1	4.62	4.14	5.68	1.53	Physical
111	111-08	A	7/26/2017	18:19:02	16	5	14.48	2 to 1	>4	-2	>4 to -2	5.67	5.28	5.99	0.71	Biological
112	112-01	A	7/18/2017	0:17:19	16	5	14.48	3 to 2	>4	0	>4 to 0	2.73	2.29	3.22	0.92	Biological
112	112-04	C	7/26/2017	2:56:00	16	5	14.48	2 to 1	>4	-2	>4 to -2	4.62	4.29	4.88	0.59	Biological
112	112-05	B	7/26/2017	3:15:28	16	5	14.48	-1 to -2	2	-4	2 to -4	1.97	0.98	2.48	1.49	Physical
112	112-06	C	7/26/2017	13:49:48	16	5	14.48	2 to 1	>4	0	>4 to 0	4.89	4.61	5.07	0.46	Physical
112	112-07	B	7/26/2017	15:48:40	16	5	14.48	2 to 1	>4	-1	>4 to -1	5.14	4.72	5.47	0.75	Biological
112	112-08	A	7/26/2017	19:05:10	16	5	14.48	2 to 1	>4	-1	>4 to -1	4.59	4.37	4.78	0.41	Physical
112	112-09	A	7/26/2017	19:21:19	16	5	14.48	0 to 1	>4	-1	>4 to -1	4.4	4.18	4.73	0.54	Physical
113	113-01	A	7/18/2017	3:09:59	16	5	14.48	3 to 2	>4	0	>4 to 0	4.68	4.43	4.97	0.54	Physical
113	113-02	A	7/18/2017	3:26:29	16	5	14.48	2 to 1	>4	0	>4 to 0	4.96	4.66	5.38	0.72	Physical
113	113-03	A	7/26/2017	14:32:13	16	5	14.48	2 to 1	>4	0	>4 to 0	4.73	4.43	4.89	0.46	Physical
113	113-04	B	7/26/2017	15:06:22	16	5	14.48	2 to 1	>4	-4	>4 to -4	4.34	3.96	4.55	0.59	Physical
113	113-05	A	7/26/2017	20:20:35	16	5	14.48	2 to 1	>4	0	>4 to 0	6.87	6.67	7.08	0.41	Biological
113	113-06	A	7/26/2017	20:39:21	16	5	14.48	2 to 1	>4	0	>4 to 0	7.7	6.61	8.26	1.65	Physical
114	114-01	A	7/18/2017	4:55:36	16	5	14.48	2 to 1	>4	0	>4 to 0	6.77	6.49	6.93	0.44	Physical
114	114-02	A	7/26/2017	21:16:42	16	5	14.48	2 to 1	>4	0	>4 to 0	4.71	4.12	5.61	1.49	Physical
115	115-01	A	7/18/2017	5:38:29	16	5	14.48	2 to 1	>4	-2	>4 to -2	5.44	4.85	5.84	0.99	Physical
115	115-02	A	7/26/2017	22:11:45	16	5	14.48	0 to 1	>4	-1	>4 to -1	5.83	5.39	6.24	0.86	Physical
116	116-01	A	7/18/2017	6:16:54	16	5	14.48	2 to 1	>4	-1	>4 to -1	5.56	5.31	5.63	0.32	Physical
116	116-02	A	7/18/2017	7:10:32	16	5	14.48	0 to 1	>4	-2	>4 to -2	6.02	4.45	7.34	2.89	Physical
116	116-03	A	7/26/2017	22:52:03	16	5	14.48	2 to 1	>4	0	>4 to 0	4.16	3.74	5.06	1.32	Physical
116	116-04	A	7/27/2017	1:23:53	16	5	14.48	2 to 1	>4	0	>4 to 0	5.11	4.55	5.43	0.88	Physical
117	117-01	A	7/18/2017	7:51:57	16	5	14.48	2 to 1	>4	-2	>4 to -2	6.33	6.06	6.72	0.66	Biological
117	117-02	A	7/18/2017	8:14:35	16	5	14.48	2 to 1	>4	-2	>4 to -2	6.57	6.23	6.86	0.64	Biological
117	117-03	A	7/18/2017	8:29:26	16	5	14.48	2 to 1	>4	-1	>4 to -1	3.59	3.36	3.82	0.46	Physical
117	117-04	A	7/26/2017	23:29:25	16	5	14.48	2 to 1	>4	0	>4 to 0	5.47	5.16	5.7	0.54	Physical
117	117-05	A	7/27/2017	0:21:28	16	5	14.48	2 to 1	>4	-5	>4 to -5	5.34	4.13	5.96	1.82	Physical
118	118-01	A	7/18/2017	9:06:06	16	5	14.48	2 to 1	>4	0	>4 to 0	5.55	5.13	6.2	1.08	Biological
118	118-02	B	7/18/2017	9:53:28	16	5	14.48	2 to 1	>4	-6	>4 to -6	2.51	2.16	2.86	0.69	Physical
118	118-03	A	7/18/2017	11:45:03	16	5	14.48	3 to 2	>4	0	>4 to 0	2.3	1.88	2.85	0.98	Biological

Line Number	StationID	Replicate	Date	Time	Stop Collar Setting (in)	# of Weights (per side)	Image Width (cm)	Grain Size Major Mode (phi)	Grain Size Minimum (phi)	Grain Size Maximum (phi)	Grain Size Range (phi)	Penetration Mean (cm)	Penetration Minimum (cm)	Penetration Maximum (cm)	Boundary Roughness (cm)	Boundary Roughness Type
118	118-04	A	7/18/2017	11:59:18	16	5	14.48	3 to 2	>4	-2	>4 to -2	3.71	3.24	4.31	1.07	Physical
118	118-05	A	7/18/2017	12:34:00	16	5	14.48	2 to 1	>4	-5	>4 to -5	4.13	3.56	4.37	0.8	Physical
118	118-06	A	7/18/2017	12:49:41	16	5	14.48	2 to 1	>4	-2	>4 to -2	3.49	2.98	3.93	0.96	Biological
119	119-01	A	7/18/2017	10:32:35	16	5	14.48	2 to 1	>4	0	>4 to 0	5.51	5.2	5.83	0.63	Biological
119	119-02	A	7/18/2017	11:08:36	16	5	14.48	3 to 2	>4	-5	>4 to -5	3	2.39	3.37	0.98	Biological
203	203-01	A	7/18/2017	20:33:26	16	5	14.48	2 to 1	>4	0	>4 to 0	7.01	6.7	7.32	0.62	Biological
203	203-02	A	7/18/2017	22:44:51	16	5	14.48	2 to 1	>4	-5	>4 to -5	3.15	2.28	3.6	1.32	Physical
203	203-03	A	7/19/2017	0:20:28	16	5	14.48	2 to 1	>4	-2	>4 to -2	3.23	3.04	3.42	0.38	Biological
204	204-01	A	7/27/2017	3:15:36	16	5	14.48	2 to 1	>4	-2	>4 to -2	4.34	4.2	4.53	0.33	Biological
204	204-02	A	7/27/2017	4:02:11	16	5	14.48	2 to 1	>4	-2	>4 to -2	3.97	3.81	4.16	0.35	Biological
205	205-01	A	7/19/2017	4:51:52	16	5	14.48	2 to 1	>4	0	>4 to 0	6.06	5.72	6.3	0.58	Biological
205	205-02	A	7/19/2017	7:16:39	16	5	14.48	2 to 1	>4	0	>4 to 0	6.84	6.01	7.7	1.69	Physical
205	205-03	A	7/19/2017	9:53:31	16	5	14.48	2 to 1	>4	-2	>4 to -2	5.4	5.29	5.57	0.28	Physical
205	205-04	B	7/27/2017	4:47:20	16	5	14.48	2 to 1	>4	-1	>4 to -1	4.88	4.47	5.29	0.81	Physical
206	206-01	A	7/27/2017	5:25:59	16	5	14.48	2 to 1	>4	0	>4 to 0	4.94	4.46	5.26	0.8	Physical
206	206-02	A	8/9/2017	15:39:49	16	5	14.48	2 to 1	>4	-1	>4 to -1	3.89	3.55	4.47	0.91	Physical
207	207-01	A	7/19/2017	15:32:18	16	5	14.48	2 to 1	>4	-1	>4 to -1	6.9	5.43	7.78	2.35	Physical
207	207-02	A	7/19/2017	21:02:21	16	5	14.48	2 to 1	>4	0	>4 to 0	2.9	2.48	2.98	0.5	Physical
207	207-03	B	7/27/2017	6:02:27	16	5	14.48	2 to 1	>4	0	>4 to 0	2.96	1.81	4.03	2.22	Biological
207	207-04	A	7/27/2017	6:57:35	16	5	14.48	2 to 1	>4	0	>4 to 0	5.91	5.54	6.25	0.71	Physical
207	207-05	A	8/9/2017	16:33:49	16	5	14.48	2 to 1	>4	0	>4 to 0	5.1	4.84	5.36	0.53	Physical
208	208-01	A	7/27/2017	7:44:40	16	5	14.48	2 to 1	>4	0	>4 to 0	5.11	4.04	5.89	1.85	Physical
208	208-02	D	8/9/2017	17:13:42	16	5	14.48	2 to 1	>4	-2	>4 to -2	4.6	4.03	5.09	1.07	Physical
208	208-03	A	8/9/2017	17:59:25	16	5	14.48	0 to 1 / 2 to 1	>4	-3	>4 to -3	4.03	3.71	4.24	0.53	Physical
209	209-01	A	7/27/2017	8:25:53	16	5	14.48	3 to 2	>4	1	>4 to 1	4.05	3.85	4.24	0.39	Biological
209	209-02	B	7/27/2017	9:18:47	16	5	14.48	2 to 1	>4	0	>4 to 0	7.17	6.21	8.35	2.14	Physical
209	209-03	A	7/28/2017	18:02:56	16	5	14.48	2 to 1	>4	0	>4 to 0	6.49	5.87	6.69	0.81	Physical
209	209-04	B	7/28/2017	19:01:53	16	5	14.48	3 to 2	>4	1	>4 to 1	5.14	4.32	5.87	1.55	Biological
209	209-05	A	8/9/2017	18:32:50	16	5	14.48	2 to 1	>4	-1	>4 to -1	5.46	5.25	5.65	0.41	Physical
210	210-01	A	7/27/2017	9:54:31	16	5	14.48	2 to 1	>4	-1	>4 to -1	4.22	3.97	4.45	0.49	Biological
210	210-02	B	7/27/2017	11:09:19	16	5	14.48	3 to 2	>4	0	>4 to 0	2.89	2.12	3.23	1.11	Biological
210	210-03	A	7/28/2017	13:12:27	16	5	14.48	3 to 2	>4	0	>4 to 0	3.64	3.4	4	0.61	Biological
210	210-04	A	7/28/2017	16:54:09	16	5	14.48	0 to 1	>4	-1	>4 to -1	3.77	2.83	4.31	1.47	Physical
210	210-05	A	7/28/2017	17:29:10	16	5	14.48	2 to 1	>4	-1	>4 to -1	4.81	4.44	5.38	0.94	Physical
210	210-06	A	7/28/2017	19:31:42	16	5	14.48	3 to 2	>4	0	>4 to 0	6.21	5.96	6.42	0.46	Biological
210	210-07	A	7/28/2017	19:48:30	16	5	14.48	3 to 2	>4	0	>4 to 0	5.51	5.19	5.94	0.75	Biological
210	210-08	A	7/28/2017	20:41:04	16	5	14.48	2 to 1	>4	-1	>4 to -1	5.57	4.73	5.94	1.21	Physical
210	210-09	B	8/9/2017	19:06:32	16	5	14.48	2 to 1	>4	-1	>4 to -1	4.19	3.82	4.44	0.62	Physical
211	211-01	A	7/27/2017	11:47:16	16	5	14.48	2 to 1	>4	0	>4 to 0	4.92	4.21	5.52	1.32	Biological

Line Number	StationID	Replicate	Date	Time	Stop Collar Setting (in)	# of Weights (per side)	Image Width (cm)	Grain Size Major Mode (phi)	Grain Size Minimum (phi)	Grain Size Maximum (phi)	Grain Size Range (phi)	Penetration Mean (cm)	Penetration Minimum (cm)	Penetration Maximum (cm)	Boundary Roughness (cm)	Boundary Roughness Type
211	211-02	A	7/28/2017	9:16:46	16	5	14.48	2 to 1	>4	0	>4 to 0	5.5	5.23	6.15	0.92	Physical
211	211-03	A	7/28/2017	11:01:38	16	5	14.48	2 to 1	>4	0	>4 to 0	4.38	3.83	4.73	0.9	Biological
211	211-04	A	7/28/2017	12:16:54	16	5	14.48	2 to 1	>4	-1	>4 to -1	4.82	4.64	5.06	0.42	Physical
211	211-05	A	7/28/2017	13:58:08	16	5	14.48	3 to 2	>4	-1	>4 to -1	4.67	3.71	5.82	2.11	Biological
211	211-06	A	7/28/2017	14:11:42	16	5	14.48	3 to 2	>4	0	>4 to 0	5.17	4.57	5.51	0.94	Biological
211	211-07	A	7/28/2017	16:15:25	16	5	14.48	3 to 2	>4	0	>4 to 0	4.91	4.58	5.63	1.05	Physical
211	211-08	B	7/28/2017	21:14:43	16	5	14.48	0 to 1	>4	-2	>4 to -2	9.7	9.36	10.07	0.71	Physical
211	211-09	A	7/28/2017	21:54:50	16	5	14.48	3 to 2	>4	0	>4 to 0	4.95	4.46	5.26	0.8	Biological
211	211-10	A	8/9/2017	19:42:04	16	5	14.48	2 to 1	>4	-1	>4 to -1	5.8	5.65	5.95	0.3	Physical
212	212-01	A	7/5/2017	21:53:43	16	5	14.48	3 to 2	>4	0	>4 to 0	4.5	4.25	4.68	0.43	Physical
212	212-02	A	7/5/2017	22:07:59	16	5	14.48	3 to 2	>4	0	>4 to 0	4.37	4.06	4.56	0.5	Biological
212	212-03	B	7/5/2017	22:21:41	16	5	14.48	2 to 1	>4	0	>4 to 0	4.84	4.42	5.06	0.64	Biological
212	212-04	A	7/27/2017	12:18:58	16	5	14.48	2 to 1	>4	0	>4 to 0	4.99	4.6	5.57	0.98	Biological
212	212-05	A	7/28/2017	8:21:32	16	5	14.48	3 to 2	>4	1	>4 to 1	3.98	3.34	4.36	1.02	Biological
212	212-06	A	7/28/2017	14:54:43	16	5	14.48	2 to 1	>4	-1	>4 to -1	4.9	4.76	5.03	0.27	Physical
212	212-07	A	7/28/2017	15:39:40	16	5	14.48	2 to 1	>4	-1	>4 to -1	5.91	5.78	6.06	0.28	Physical
212	212-08	A	7/28/2017	22:25:40	16	5	14.48	2 to 1	>4	-2	>4 to -2	3.92	3.13	4.48	1.35	Physical
212	212-09	A	7/28/2017	22:37:40	16	5	14.48	3 to 2	>4	-2	>4 to -2	6.07	5.69	6.28	0.59	Biological
212	212-10	A	8/9/2017	20:45:57	16	5	14.48	2 to 1	>4	-1	>4 to -1	5.39	4.84	5.91	1.06	Physical
213	213-01	C	7/27/2017	12:58:00	16	5	14.48	2 to 1	>4	-1	>4 to -1	7.19	7.12	7.32	0.2	Biological
213	213-02	A	7/27/2017	13:30:15	16	5	14.48	2 to 1	>4	1	>4 to 1	5.53	4.46	6.15	1.69	Physical
213	213-03	A	7/28/2017	7:31:20	16	5	14.48	3 to 2	>4	1	>4 to 1	3.23	2.99	3.44	0.45	Biological
213	213-04	A	8/9/2017	21:32:18	16	5	14.48	2 to 1	>4	1	>4 to 1	4.85	4.69	4.95	0.26	Biological
213	213-05	A	8/9/2017	22:23:00	16	5	14.48	2 to 1	>4	0	>4 to 0	6.58	6.2	6.94	0.75	Biological
214	214-01	A	7/27/2017	14:09:46	16	5	14.48	4 to 3	>4	2	>4 to 2	4.95	4.77	5.12	0.35	Biological
214	214-02	D	7/28/2017	6:55:21	16	5	14.48	4 to 3	>4	2	>4 to 2	4.08	3.71	4.46	0.74	Biological
214	214-03	A	8/9/2017	23:00:15	16	5	14.48	2 to 1	>4	0	>4 to 0	5.29	4.87	5.81	0.93	Physical
214	214-04	A	8/10/2017	0:03:09	16	5	14.48	2 to 1	>4	1	>4 to 1	5.15	4.77	5.3	0.53	Physical
214	214-05	A	8/10/2017	0:16:30	16	5	14.48	3 to 2	>4	2	>4 to 2	4.55	3.96	5.73	1.77	Biological
214	214-06	A	8/10/2017	0:33:30	16	5	14.48	3 to 2	>4	2	>4 to 2	6.31	6.01	6.52	0.51	Biological
215	215-01	A	7/27/2017	15:02:11	16	5	14.48	3 to 2	>4	2	>4 to 2	3.86	3.4	4.47	1.08	Biological
215	215-02	A	7/27/2017	15:43:45	16	5	14.48	3 to 2	>4	2	>4 to 2	4.6	4.15	4.73	0.58	Biological
215	215-03	C	7/27/2017	16:42:09	16	5	14.48	3 to 2	>4	2	>4 to 2	2.46	1.69	3.21	1.52	Biological
215	215-04	A	7/28/2017	4:32:43	16	5	14.48	2 to 1	>4	0	>4 to 0	5.59	5.41	5.82	0.42	Biological
215	215-05	A	7/28/2017	5:30:04	16	5	14.48	3 to 2	>4	0	>4 to 0	4.62	4.18	4.9	0.72	Biological
215	215-06	B	7/28/2017	6:04:43	16	5	14.48	2 to 1	>4	-3	>4 to -3	5.38	5.15	5.49	0.33	Biological
215	215-07	A	8/10/2017	1:14:02	16	5	14.48	0 to 1 / 3 to 2	>4	-2	>4 to -2	5.93	5.76	6.11	0.35	Physical
215	215-08	C	8/10/2017	2:16:02	16	5	14.48	3 to 2	>4	0	>4 to 0	5.1	4.79	5.49	0.69	Biological
215	215-09	A	8/10/2017	2:27:11	16	5	14.48	3 to 2	>4	0	>4 to 0	4.67	3.94	5.33	1.39	Physical

Line Number	StationID	Replicate	Date	Time	Stop Collar Setting (in)	# of Weights (per side)	Image Width (cm)	Grain Size Major Mode (phi)	Grain Size Minimum (phi)	Grain Size Maximum (phi)	Grain Size Range (phi)	Penetration Mean (cm)	Penetration Minimum (cm)	Penetration Maximum (cm)	Boundary Roughness (cm)	Boundary Roughness Type
216	216-01	A	7/27/2017	17:27:24	16	5	14.48	3 to 2	>4	0	>4 to 0	6.46	6.03	6.69	0.66	Biological
216	216-02	A	7/28/2017	2:56:38	16	5	14.48	2 to 1	>4	0	>4 to 0	4.77	4.68	4.92	0.24	Physical
216	216-03	A	8/7/2017	12:50:23	16	5	14.48	2 to 1	>4	0	>4 to 0	5.35	5.05	5.51	0.46	Physical
216	216-04	A	8/7/2017	13:09:09	16	5	14.48	2 to 1	>4	0	>4 to 0	5.04	4.54	5.75	1.21	Physical
216	216-05	A	8/7/2017	14:20:24	16	5	14.48	2 to 1	>4	-1	>4 to -1	5.11	4.51	5.56	1.05	Biological
216	216-06	C	8/10/2017	3:01:10	16	5	14.48	0 to 1	>4	-3	>4 to -3	6.21	5.89	6.62	0.72	Physical
216	216-07	A	8/10/2017	3:11:43	16	5	14.48	-2 / 2 to 1	>4	-3	>4 to -3	6.2	5.6	6.49	0.9	Physical
217	217-01	A	7/27/2017	18:12:04	16	5	14.48	3 to 2	>4	1	>4 to 1	5.11	4.72	5.26	0.54	Biological
217	217-02	A	7/27/2017	18:27:04	16	5	14.48	0 to 1	>4	-3	>4 to -3	4.17	3.53	4.76	1.22	Physical
217	217-03	A	7/28/2017	0:25:34	16	5	14.48	3 to 2	>4	1	>4 to 1	5.23	5.11	5.29	0.18	Biological
217	217-04	A	7/28/2017	1:20:25	16	5	14.48	3 to 2	>4	1	>4 to 1	6.09	5.76	6.54	0.79	Biological
217	217-05	A	7/28/2017	2:07:20	16	5	14.48	2 to 1	>4	-2	>4 to -2	5.56	5.28	6.02	0.73	Physical
217	217-06	A	8/7/2017	11:36:37	16	5	14.48	3 to 2	>4	1	>4 to 1	4.44	3.97	4.9	0.93	Biological
217	217-07	A	8/7/2017	12:08:42	16	5	14.48	3 to 2	>4	1	>4 to 1	5.26	5.03	5.49	0.46	Physical
217	217-08	A	8/7/2017	16:28:33	16	5	14.48	2 to 1	>4	0	>4 to 0	6.24	5.5	6.47	0.97	Physical
217	217-09	A	8/10/2017	3:49:35	16	5	14.48	3 to 2	>4	0	>4 to 0	3.28	1.86	4.33	2.47	Physical
217	217-10	A	8/10/2017	4:02:15	16	5	14.48	2 to 1	>4	0	>4 to 0	5.02	4.69	5.43	0.74	Physical
218	218-01	A	7/27/2017	19:02:58	16	5	14.48	2 to 1	>4	-5	>4 to -5	4.02	3.6	4.39	0.8	Physical
218	218-02	A	7/27/2017	19:16:10	16	5	14.48	3 to 2	>4	1	>4 to 1	4.62	3.87	4.97	1.11	Biological
218	218-03	A	7/27/2017	23:23:58	16	5	14.48	0 to 1 / 2 to 1	>4	-2	>4 to -2	4.67	4.34	5.06	0.71	Biological
218	218-04	A	7/27/2017	23:46:47	16	5	14.48	2 to 1	>4	0	>4 to 0	5.82	5.65	6.02	0.37	Biological
218	218-05	C	8/7/2017	7:56:18	16	5	14.48	2 to 1	>4	-1	>4 to -1	5.21	5.05	5.34	0.29	Biological
218	218-06	A	8/7/2017	8:40:46	16	5	14.48	2 to 1	>4	-1	>4 to -1	5.14	4.48	5.81	1.33	Physical
218	218-07	A	8/7/2017	10:31:42	16	5	14.48	3 to 2	>4	-1	>4 to -1	5.93	5.73	6.18	0.45	Biological
218	218-08	A	8/7/2017	11:00:42	16	5	14.48	2 to 1	>4	-1	>4 to -1	5.71	5.24	6.42	1.18	Physical
218	218-09	A	8/7/2017	17:03:15	16	5	14.48	2 to 1	>4	0	>4 to 0	4.65	4.22	5.1	0.88	Biological
218	218-10	A	8/7/2017	17:18:07	16	5	14.48	3 to 2	>4	1	>4 to 1	4.41	4.13	4.77	0.64	Biological
219	219-01	A	7/27/2017	20:00:14	16	5	14.48	3 to 2	>4	0	>4 to 0	4.97	4.76	5.26	0.51	Biological
219	219-02	A	7/27/2017	21:01:15	16	5	14.48	3 to 2	>4	1	>4 to 1	5.07	4.98	5.15	0.17	Biological
219	219-03	A	7/27/2017	22:43:52	16	5	14.48	2 to 1	>4	0	>4 to 0	5.84	5.66	6.01	0.35	Physical
219	219-04	A	8/7/2017	7:04:09	16	5	14.48	2 to 1	>4	-1	>4 to -1	4.23	4.13	4.4	0.27	Biological
219	219-05	A	8/7/2017	18:04:39	16	5	14.48	4 to 3	>4	1	>4 to 1	8.02	7.64	8.38	0.74	Biological
219	219-06	A	8/10/2017	5:07:22	16	5	14.48	2 to 1	>4	-1	>4 to -1	5.55	4.82	6.14	1.32	Physical
219	219-07	A	8/10/2017	5:22:44	16	5	14.48	2 to 1	>4	-1	>4 to -1	5.62	5.17	5.97	0.8	Biological
301	301-01	A	8/7/2017	4:53:30	16	5	14.48	2 to 1	>4	-2	>4 to -2	5.62	5.89	6.91	1.02	Physical
301	301-02	A	8/7/2017	5:35:21	16	5	14.48	2 to 1	>4	-1	>4 to -1	4.63	4.25	4.81	0.56	Physical
301	301-03	A	8/7/2017	6:19:31	16	5	14.48	2 to 1	>4	-1	>4 to -1	6.1	4.47	7.23	2.76	Physical
301	301-04	A	8/7/2017	18:47:00	16	5	14.48	4 to 3	>4	2	>4 to 2	5.08	4.76	5.24	0.49	Biological
301	301-05	A	8/10/2017	6:25:13	16	5	14.48	3 to 2	>4	0	>4 to 0	5.13	4.76	5.44	0.67	Physical

Line Number	StationID	Replicate	Date	Time	Stop Collar Setting (in)	# of Weights (per side)	Image Width (cm)	Grain Size Major Mode (phi)	Grain Size Minimum (phi)	Grain Size Maximum (phi)	Grain Size Range (phi)	Penetration Mean (cm)	Penetration Minimum (cm)	Penetration Maximum (cm)	Boundary Roughness (cm)	Boundary Roughness Type
301	301-06	B	8/10/2017	6:43:00	16	5	14.48	3 to 2	>4	0	>4 to 0	5.37	5.01	5.76	0.75	Physical
302	302-01	A	6/28/2017	2:12:47	16	5	14.48	2 to 1	>4	-2	>4 to -2	6.75	5.34	7.42	2.08	Physical
302	302-02	A	6/28/2017	2:27:22	16	5	14.48	2 to 1	>4	-1	>4 to -1	4.91	4.54	5.11	0.57	Physical
302	302-03	A	6/28/2017	3:16:54	16	5	14.48	3 to 2	>4	0	>4 to 0	5.69	4.97	6.41	1.44	Physical
302	302-04	A	6/28/2017	3:32:16	16	5	14.48	3 to 2	>4	-1	>4 to -1	3.74	3.45	3.92	0.47	Physical
302	302-05	A	6/28/2017	4:07:15	16	5	14.48	2 to 1	>4	-2	>4 to -2	6.18	5.33	6.8	1.47	Physical
302	302-06	A	8/7/2017	4:15:18	16	5	14.48	2 to 1	>4	-2	>4 to -2	5.3	4.92	5.88	0.96	Physical
302	302-07	A	8/7/2017	19:25:44	16	5	14.48	2 to 1	>4	-2	>4 to -2	5.59	4.74	6.1	1.36	Physical
303	303-01	A	6/28/2017	5:18:09	16	5	14.48	2 to 1	>4	-2	>4 to -2	5.6	5.1	6.66	1.57	Physical
303	303-02	A	6/28/2017	6:18:15	16	5	14.48	3 to 2	>4	0	>4 to 0	4.48	4.26	4.73	0.48	Physical
303	303-03	A	6/28/2017	6:38:46	16	5	14.48	3 to 2	>4	0	>4 to 0	4.58	3.79	5.03	1.23	Physical
303	303-04	A	8/7/2017	3:27:20	16	5	14.48	3 to 2	>4	0	>4 to 0	3.82	3.68	4.01	0.33	Biological
303	303-05	B	8/7/2017	20:33:09	16	5	14.48	3 to 2	>4	0	>4 to 0	4.28	3.85	4.58	0.73	Biological
303	303-06	A	8/10/2017	9:44:07	16	5	14.48	2 to 1	>4	-1	>4 to -1	5.97	5.7	6.31	0.61	Biological
303	303-07	B	8/10/2017	10:04:33	16	5	14.48	0 to 1 / 2 to 1	>4	-1	>4 to -1	6.04	5.49	6.21	0.72	Biological
304	304-01	A	6/28/2017	7:39:18	16	5	14.48	3 to 2	>4	0	>4 to 0	3.43	2.89	4.1	1.21	Physical
304	304-02	C	6/28/2017	9:06:12	16	5	14.48	2 to 1	>4	-1	>4 to -1	5.22	4.57	5.85	1.28	Physical
304	304-03	A	6/28/2017	9:45:33	16	5	14.48	2 to 1	>4	-1	>4 to -1	3.82	3.64	3.97	0.33	Physical
304	304-04	A	6/28/2017	10:06:52	16	5	14.48	2 to 1	>4	-2	>4 to -2	3.88	2.69	4.73	2.04	Physical
304	304-05	A	8/7/2017	0:03:14	16	5	14.48	3 to 2	>4	0	>4 to 0	3.08	2.48	3.88	1.4	Physical
304	304-06	A	8/7/2017	1:16:36	16	5	14.48	3 to 2	>4	0	>4 to 0	4.88	4.39	5.56	1.17	Biological
304	304-07	A	8/7/2017	2:49:32	16	5	14.48	2 to 1	>4	0	>4 to 0	4.41	4.13	4.77	0.64	Physical
304	304-08	A	8/7/2017	21:03:35	16	5	14.48	2 to 1	>4	-1	>4 to -1	7.29	7.01	7.78	0.76	Physical
304	304-09	A	8/7/2017	21:42:08	16	5	14.48	2 to 1	>4	-1	>4 to -1	5.3	4.03	6.79	2.76	Physical
401	401-01	A	6/28/2017	11:03:41	16	5	14.48	3 to 2	>4	0	>4 to 0	5.81	5.08	6.65	1.57	Physical
401	401-02	A	6/28/2017	11:28:15	16	5	14.48	2 to 1	>4	0	>4 to 0	4.56	3.65	4.97	1.32	Physical
401	401-03	A	6/28/2017	12:12:31	16	5	14.48	2 to 1	>4	0	>4 to 0	4.92	4.21	5.47	1.26	Physical
401	401-04	A	6/28/2017	12:51:41	16	5	14.48	2 to 1	>4	-1	>4 to -1	6.14	5.64	7.08	1.44	Physical
401	401-05	A	6/28/2017	13:28:43	16	5	14.48	4 to 3	>4	0	>4 to 0	9.31	8.84	9.68	0.84	Biological
401	401-06	B	8/6/2017	23:04:39	16	5	14.48	2 to 1	>4	0	>4 to 0	5.37	3.95	6.6	2.66	Physical
401	401-07	B	8/10/2017	13:59:41	16	5	14.48	3 to 2	>4	0	>4 to 0	5.48	4.87	6.25	1.38	Physical
401	401-08	A	8/10/2017	14:20:32	16	5	14.48	0 to 1	>4	-1	>4 to -1	5.85	5.05	6.59	1.54	Physical
402	402-01	A	6/28/2017	14:15:40	16	5	14.48	3 to 2	>4	0	>4 to 0	5.12	4.68	5.31	0.63	Biological
402	402-02	A	6/28/2017	14:26:41	16	5	14.48	4 to 3	>4	0	>4 to 0	4.49	3.79	5.07	1.28	Biological
402	402-03	A	8/6/2017	20:54:40	16	5	14.48	2 to 1	>4	0	>4 to 0	3.48	3.21	3.8	0.59	Biological
402	402-04	A	8/6/2017	21:29:16	16	5	14.48	2 to 1	>4	0	>4 to 0	5.38	2.85	7.01	4.17	Physical
402	402-05	A	8/6/2017	22:13:17	16	5	14.48	3 to 2	>4	0	>4 to 0	4.3	3.98	4.77	0.79	Biological
403	403-01	B	6/28/2017	15:13:02	16	5	14.48	2 to 1	>4	-1	>4 to -1	4.75	4.2	5.01	0.81	Physical
403	403-02	A	6/28/2017	15:27:08	16	5	14.48	2 to 1	>4	-2	>4 to -2	4.87	4.47	5.53	1.06	Physical

Line Number	StationID	Replicate	Date	Time	Stop Collar Setting (in)	# of Weights (per side)	Image Width (cm)	Grain Size Major Mode (phi)	Grain Size Minimum (phi)	Grain Size Maximum (phi)	Grain Size Range (phi)	Penetration Mean (cm)	Penetration Minimum (cm)	Penetration Maximum (cm)	Boundary Roughness (cm)	Boundary Roughness Type
403	403-03	B	6/28/2017	16:07:03	16	5	14.48	3 to 2	>4	-1	>4 to -1	2.58	2.05	3.45	1.39	Physical
403	403-04	A	6/28/2017	16:51:49	16	5	14.48	2 to 1	>4	-1	>4 to -1	5.09	4.55	5.39	0.84	Physical
403	403-05	B	6/28/2017	17:19:12	16	5	14.48	3 to 2 / 2 to 1	>4	-1	>4 to -1	7.37	6.73	7.84	1.11	Biological
403	403-06	A	6/28/2017	17:37:46	16	5	14.48	3 to 2	>4	-1	>4 to -1	4.07	3.61	4.73	1.12	Biological
403	403-07	A	8/6/2017	19:30:19	16	5	14.48	0 to 1	>4	-1	>4 to -1	9.45	9.1	10.03	0.93	Physical
403	403-08	A	8/6/2017	20:18:07	16	5	14.48	2 to 1	>4	0	>4 to 0	6.03	5.39	6.56	1.17	Physical
404	404-01	C	6/28/2017	18:42:15	16	5	14.48	0 to 1 / 2 to 1	>4	-1	>4 to -1	6.41	5.36	7.11	1.75	Physical
404	404-02	C	6/28/2017	19:01:59	16	5	14.48	0 to 1	>4	-1	>4 to -1	6.68	6.17	6.93	0.76	Physical
404	404-03	A	8/6/2017	18:55:45	16	5	14.48	2 to 1	>4	0	>4 to 0	4.17	3.47	4.65	1.18	Physical
405	405-01	A	8/6/2017	16:48:29	16	5	14.48	3 to 2	>4	1	>4 to 1	4.15	3.91	4.25	0.34	Biological
405	405-02	A	8/6/2017	18:08:07	16	5	14.48	0 to 1	>4	-1	>4 to -1	6.43	5.75	6.73	0.98	Physical
405	405-03	A	8/10/2017	16:36:00	16	5	14.48	0 to 1	>4	-4	>4 to -4	4.43	3.76	5.08	1.32	Physical
405	405-04	A	8/10/2017	16:50:47	16	5	14.48	0 to 1	>4	-4	>4 to -4	6.06	5.88	6.22	0.34	Physical
406	406-01	B	8/10/2017	17:35:53	16	5	14.48	2 to 1	>4	1	>4 to 1	5.2	4.72	5.77	1.05	Physical
406	406-02	B	8/10/2017	17:50:29	16	5	14.48	2 to 1	>4	1	>4 to 1	3.76	2.62	4.56	1.94	Physical
407	407-01	A	8/10/2017	18:29:03	16	5	14.48	4 to 3	>4	2	>4 to 2	8.42	8.07	8.76	0.68	Biological
407	407-02	A	8/10/2017	18:40:30	16	5	14.48	3 to 2	>4	2	>4 to 2	10.52	10.33	10.78	0.45	Biological
407	407-03	B	8/10/2017	18:54:10	16	5	14.48	3 to 2	>4	2	>4 to 2	6.83	5.94	7.32	1.38	Biological
409	409-01	A	8/10/2017	19:45:24	16	5	14.48	3 to 2	>4	1	>4 to 1	7.09	6.52	7.62	1.1	Biological
409	409-02	A	8/10/2017	19:54:19	16	5	14.48	3 to 2	>4	1	>4 to 1	9.19	8.93	9.66	0.73	Biological
409	409-03	A	8/10/2017	20:02:25	16	5	14.48	-1	>4	-2	>4 to -2	6.79	5.21	7.91	2.7	Physical
409	409-04	A	8/10/2017	20:11:01	16	5	14.48	4 to 3	>4	2	>4 to 2	9.83	7.96	12.11	4.15	Physical
409	409-05	A	8/10/2017	20:26:04	16	5	14.48	3 to 2	>4	2	>4 to 2	7.77	7.51	8.19	0.68	Biological
409	409-06	A	8/10/2017	20:38:54	16	5	14.48	2 to 1	>4	0	>4 to 0	6.26	5.86	6.78	0.92	Physical
409	409-07	A	8/10/2017	20:47:28	16	5	14.48	4 to 3	>4	1	>4 to 1	10.24	9.48	10.53	1.05	Biological

Line Number	StationID	Replicate	Bedforms	Substrate Type	Methane Present?	CMECS Biotic Subclass	Sensitive Taxa Present?	Epifauna
101	101-01	A	None	Firm, fine sand	No	Soft Sediment	No	Sand dollars
101	101-02	A	None	Firm, very fine sand	No	Soft Sediment	No	Sand dollars
101	101-03	A	None	Firm, very fine sand	No	Soft Sediment	No	None
101	101-04	A	Ripple	Firm, fine sand	No	Soft Sediment	No	None
101	101-05	A	None	Firm, fine sand	No	Soft Sediment	No	Sand dollars
102	102-01	A	None	Firm, fine sand	No	Soft Sediment	No	None
102	102-02	A	Ripple	Firm, very fine sand	No	Soft Sediment	No	None
102	102-03	A	Ripple	Firm, fine sand	No	Soft Sediment	No	Sand dollar
102	102-04	A	None	Firm, fine sand	No	Soft Sediment	No	Sand dollars
102	102-05	A	None	Firm, medium sand	No	Soft Sediment	No	Sand dollars
102	102-06	A	Ripple	Firm, medium sand	No	Soft Sediment	No	None
102	102-07	A	None	Firm, fine sand	No	Soft Sediment	No	Sand dollars
103	103-01	A	None	Firm, very fine sand	No	Soft Sediment	No	Sand dollars
103	103-02	A	None	Firm, medium sand	No	Soft Sediment	No	Sand dollars
103	103-03	A	None	Firm, fine sand	No	Soft Sediment	No	Sand dollars
103	103-04	A	None	Firm, medium sand	No	Soft Sediment	No	Sand dollars
103	103-05	C	None	Firm, medium sand	No	Soft Sediment	No	None
103	103-06	A	None	Firm, fine sand	No	Soft Sediment	No	Sand dollars
104	104-01	A	None	Firm, fine sand	No	Soft Sediment	No	Sand dollars
104	104-02	A	None	Firm, fine sand	No	Soft Sediment	No	Sand dollars
104	104-03	A	None	Firm, fine sand	No	Soft Sediment	No	None
104	104-04	A	None	Firm, fine sand	No	Soft Sediment	No	Sand dollars
104	104-05	B	None	Firm, fine sand	No	Soft Sediment	No	None
104	104-06	A	None	Firm, fine sand	No	Soft Sediment	No	None
104	104-07	A	None	Firm, fine sand	No	Soft Sediment	No	Sand dollars
104	104-08	A	None	Firm, fine sand	No	Soft Sediment	No	None
104	104-09	A	None	Firm, medium sand	No	Soft Sediment	No	None
104	104-10	D	None	Firm, coarse and medium sand	No	Soft Sediment	No	Sand dollar
104	104-11	D	Ripple	Firm, very fine pebbles	No	Soft Sediment	No	None
104	104-12	A	None	Firm, medium sand	No	Soft Sediment	No	None
105	105-01	C	None	Firm, fine sand	No	Soft Sediment	No	Sand dollars
105	105-02	A	None	Firm, very fine sand	No	Soft Sediment	No	None
105	105-03	A	None	Firm, fine sand	No	Soft Sediment	No	Sand dollars
105	105-04	A	None	Firm, fine sand	No	Soft Sediment	No	Sand dollars
105	105-05	A	Ripple	Firm, medium and fine sand	No	Soft Sediment	No	None
105	105-06	A	None	Firm, very fine sand	No	Soft Sediment	No	None
105	105-07	A	None	Firm, fine sand	No	Soft Sediment	No	Sand dollars
105	105-08	A	None	Firm, fine sand	No	Soft Sediment	No	Gastropod, sand dollars
105	105-09	A	None	Firm, fine sand	No	Soft Sediment	No	None
105	105-10	B	Ripple	Firm, medium sand	No	Soft Sediment	No	None

Line Number	StationID	Replicate	Bedforms	Substrate Type	Methane Present?	CMECS Biotic Subclass	Sensitive Taxa Present?	Epifauna
105	105-11	A	None	Firm, medium sand	No	Soft Sediment	No	None
105	105-12	A	None	Firm, fine sand	No	Soft Sediment	No	Sand dollars
105	105-13	A	None	Firm, fine sand	No	Soft Sediment	No	Sand dollars
106	106-01	A	Ripple	Firm, medium sand	No	Soft Sediment	No	None
106	106-02	A	None	Firm, fine sand	No	Soft Sediment	No	None
106	106-03	A	None	Firm, very fine sand	No	Soft Sediment	No	None
106	106-04	A	None	Firm, fine sand	No	Soft Sediment	No	Sand dollars, hermit crab
106	106-05	B	None	Firm, fine sand	No	Soft Sediment	No	Sand dollars
106	106-06	A	None	Firm, medium sand	No	Soft Sediment	No	Sand dollar
106	106-07	A	None	Firm, fine sand	No	Soft Sediment	No	Sand dollars
106	106-08	A	None	Firm, coarse sand	No	Soft Sediment	No	None
106	106-09	A	None	Firm, coarse sand	No	Soft Sediment	No	None
106	106-10	A	None	Firm, medium sand	No	Soft Sediment	No	Sand dollars
106	106-11	A	Ripple	Firm, medium sand	No	Soft Sediment	No	None
107	107-01	A	None	Firm, fine sand	No	Soft Sediment	No	Sand dollar
107	107-02	A	None	Firm, medium sand	No	Soft Sediment	No	Sand dollars
107	107-03	A	None	Firm, medium sand	No	Soft Sediment	No	Sand dollars
107	107-04	A	None	Firm, medium sand	No	Soft Sediment	No	Sand dollars
107	107-05	A	None	Firm, fine sand	No	Soft Sediment	No	Sand dollars
107	107-06	A	None	Firm, fine sand	No	Soft Sediment	No	Sand dollars
107	107-07	A	None	Firm, fine sand	No	Soft Sediment	No	Sand dollars
107	107-08	A	None	Firm, fine sand	No	Soft Sediment	No	None
107	107-09	A	Ripple	Firm, medium sand	No	Soft Sediment	No	None
107	107-10	A	None	Firm, fine sand	No	Soft Sediment	No	Sand dollars
108	108-01	A	None	Firm, fine sand	No	Soft Sediment	No	None
108	108-02	B	None	Firm, medium sand	No	Soft Sediment	No	Sand dollars
108	108-03	A	Ripple	Firm, medium sand	No	Soft Sediment	No	None
108	108-04	A	IND	Firm, fine sand	No	Soft Sediment	No	Sand dollar
108	108-05	A	None	Firm, fine sand	No	Soft Sediment	No	None
108	108-06	B	Ripple	Firm, medium sand	No	Soft Sediment	No	None
109	109-01	A	None	Firm, fine sand	No	Soft Sediment	No	Sand dollar
109	109-02	A	None	Firm, fine sand	No	Soft Sediment	No	None
109	109-03	A	None	Firm, medium sand	No	Soft Sediment	No	Sand dollars
109	109-04	A	None	Firm, fine sand	No	Soft Sediment	No	Sand dollars
110	110-01	A	None	Firm, very fine sand	No	Soft Sediment	No	Sand dollars
110	110-02	A	None	Firm, very fine sand	No	Soft Sediment	No	None
110	110-03	A	None	Firm, medium sand	No	Soft Sediment	No	None
110	110-04	A	Ripple	Firm, medium sand	No	Soft Sediment	No	None
110	110-05	A	None	Firm, medium sand	No	Soft Sediment	No	None
110	110-06	C	None	Firm, medium sand	No	Soft Sediment	No	Sand dollars

Line Number	StationID	Replicate	Bedforms	Substrate Type	Methane Present?	CMECS Biotic Subclass	Sensitive Taxa Present?	Epifauna
111	111-01	A	None	Firm, very fine sand	No	Soft Sediment	No	Sand dollars
111	111-02	A	None	Firm, very fine sand	No	Soft Sediment	No	Sand dollars
111	111-03	A	None	Soft, very fine sand	No	Soft Sediment	No	None
111	111-04	A	Ripple	Firm, coarse sand	No	Soft Sediment	No	None
111	111-05	B	None	Firm, medium sand	No	Soft Sediment	No	None
111	111-06	A	Ripple	Firm, medium sand	No	Soft Sediment	No	Sand dollars
111	111-08	A	None	Firm, medium sand	No	Soft Sediment	No	Sand dollars
112	112-01	A	None	Firm, fine sand	No	Soft Sediment	No	None
112	112-04	C	None	Firm, fine sand	No	Soft Sediment	No	Gastropod
112	112-05	B	Ripple	Firm, very fine pebbles	No	Soft Sediment	No	None
112	112-06	C	Ripple	Firm, fine sand	No	Soft Sediment	No	None
112	112-07	B	None	Firm, medium sand	No	Soft Sediment	No	Sand dollars
112	112-08	A	None	Firm, medium sand	No	Soft Sediment	No	None
112	112-09	A	None	Firm, medium sand	No	Soft Sediment	No	None
113	113-01	A	Ripple	Firm, fine sand	No	Soft Sediment	No	Sand dollars
113	113-02	A	Ripple	Firm, fine sand	No	Soft Sediment	No	None
113	113-03	A	Ripple	Firm, medium sand	No	Soft Sediment	No	None
113	113-04	B	Ripple	Firm, medium sand	No	Soft Sediment	No	None
113	113-05	A	None	Firm, medium sand	No	Soft Sediment	No	None
113	113-06	A	Ripple	Firm, medium sand	No	Soft Sediment	No	Sand dollars
114	114-01	A	Ripple	Firm, medium sand	No	Soft Sediment	No	Sand dollars
114	114-02	A	Ripple	Firm, medium sand	No	Soft Sediment	No	Sand dollars
115	115-01	A	None	Firm, medium sand	No	Soft Sediment	No	None
115	115-02	A	Ripple	Firm, medium sand	No	Soft Sediment	No	Sand dollars
116	116-01	A	None	Firm, medium sand	No	Soft Sediment	No	Sand dollars
116	116-02	A	Ripple	Firm, coarse sand	No	Soft Sediment	No	None
116	116-03	A	None	Firm, medium sand	No	Soft Sediment	No	None
116	116-04	A	Ripple	Firm, medium sand	No	Soft Sediment	No	None
117	117-01	A	None	Firm, medium sand	No	Soft Sediment	No	None
117	117-02	A	None	Firm, medium sand	No	Soft Sediment	No	None
117	117-03	A	None	Firm, medium sand	No	Soft Sediment	No	None
117	117-04	A	None	Firm, medium sand	No	Soft Sediment	No	None
117	117-05	A	None	Firm, medium sand	No	Soft Sediment	No	None
118	118-01	A	None	Firm, medium sand	No	Soft Sediment	No	None
118	118-02	B	None	Firm, medium sand	No	Soft Sediment	No	None
118	118-03	A	None	Firm, fine sand	No	Soft Sediment	No	Hermit crab
118	118-04	A	None	Firm, fine sand	No	Soft Sediment	No	None
118	118-05	A	None	Firm, medium sand	No	Soft Sediment	No	None
118	118-06	A	None	Firm, fine sand	No	Soft Sediment	No	None
119	119-01	A	None	Firm, medium sand	No	Soft Sediment	No	None

Line Number	StationID	Replicate	Bedforms	Substrate Type	Methane Present?	CMECS Biotic Subclass	Sensitive Taxa Present?	Epifauna
119	119-02	A	None	Firm, fine sand	No	Soft Sediment	No	None
203	203-01	A	None	Firm, medium sand	No	Soft Sediment	No	None
203	203-02	A	None	Firm, medium sand	No	Soft Sediment	No	None
203	203-03	A	None	Firm, medium sand	No	Soft Sediment	No	None
204	204-01	A	None	Firm, medium sand	No	Soft Sediment	No	None
204	204-02	A	None	Firm, medium sand	No	Soft Sediment	No	None
205	205-01	A	None	Firm, fine sand	No	Soft Sediment	No	None
205	205-02	A	None	Firm, medium sand	No	Soft Sediment	No	Sand dollars
205	205-03	A	None	Firm, medium sand	No	Soft Sediment	No	None
205	205-04	B	None	Firm, medium sand	No	Soft Sediment	No	None
206	206-01	A	None	Firm, medium sand	No	Soft Sediment	No	Sand dollar
206	206-02	A	Ripple	Firm, medium sand	No	Soft Sediment	No	Sand dollar
207	207-01	A	Ripple	Firm, medium sand	No	Soft Sediment	No	None
207	207-02	A	None	Firm, fine sand	No	Soft Sediment	No	None
207	207-03	B	None	Firm, fine sand	No	Soft Sediment	No	None
207	207-04	A	None	Firm, medium sand	No	Soft Sediment	No	None
207	207-05	A	None	Firm, medium sand	No	Soft Sediment	No	None
208	208-01	A	None	Firm, medium sand	No	Soft Sediment	No	None
208	208-02	D	None	Firm, medium sand	No	Soft Sediment	No	None
208	208-03	A	None	Firm, medium/coarse sand	No	Soft Sediment	No	None
209	209-01	A	None	Firm, fine sand	No	Soft Sediment	No	Sand dollars
209	209-02	B	Ripple	Firm, medium sand	No	Soft Sediment	No	Sand dollars
209	209-03	A	None	Firm, medium sand	No	Soft Sediment	No	Sand dollars
209	209-04	B	None	Firm, fine sand	No	Soft Sediment	No	None
209	209-05	A	None	Firm, medium sand	No	Soft Sediment	No	None
210	210-01	A	None	Firm, fine sand	No	Soft Sediment	No	None
210	210-02	B	None	Firm, fine sand	No	Soft Sediment	No	None
210	210-03	A	None	Firm, fine sand	No	Soft Sediment	No	None
210	210-04	A	None	Firm, medium sand	No	Soft Sediment	No	None
210	210-05	A	Ripple	Firm, medium sand	No	Soft Sediment	No	None
210	210-06	A	None	Firm, fine sand	No	Soft Sediment	No	Sand dollars
210	210-07	A	None	Firm, very fine sand	No	Soft Sediment	No	None
210	210-08	A	None	Firm, medium sand	No	Soft Sediment	No	Sand dollars
210	210-09	B	None	Firm, medium sand	No	Soft Sediment	No	None
211	211-01	A	None	Firm, medium sand	No	Soft Sediment	No	None
211	211-02	A	None	Firm, medium sand	No	Soft Sediment	No	None
211	211-03	A	None	Firm, medium sand	No	Soft Sediment	No	None
211	211-04	A	None	Firm, medium sand	No	Soft Sediment	No	None
211	211-05	A	None	Firm, fine sand	No	Soft Sediment	No	Sand dollars
211	211-06	A	None	Firm, fine sand	No	Soft Sediment	No	None

Line Number	StationID	Replicate	Bedforms	Substrate Type	Methane Present?	CMECS Biotic Subclass	Sensitive Taxa Present?	Epifauna
211	211-07	A	Ripple	Firm, medium sand	No	Soft Sediment	No	Sand dollars
211	211-08	B	None	Firm, coarse sand	No	Soft Sediment	No	Sand dollars
211	211-09	A	None	Firm, fine sand	No	Soft Sediment	No	Sand dollars
211	211-10	A	None	Firm, medium sand	No	Soft Sediment	No	Sand dollars
212	212-01	A	Ripple	Firm, fine sand	No	Soft Sediment	No	None
212	212-02	A	None	Firm, fine sand	No	Soft Sediment	No	None
212	212-03	B	None	Firm, medium sand	No	Soft Sediment	No	Sand dollar
212	212-04	A	None	Firm, medium sand	No	Soft Sediment	No	None
212	212-05	A	None	Firm, very fine sand	No	Soft Sediment	No	None
212	212-06	A	None	Firm, medium sand	No	Soft Sediment	No	None
212	212-07	A	None	Firm, medium sand	No	Soft Sediment	No	Sand dollars
212	212-08	A	Ripple	Firm, medium sand	No	Soft Sediment	No	Sand dollars
212	212-09	A	None	Firm, fine sand	No	Soft Sediment	No	Gastropod, sand dollars
212	212-10	A	None	Firm, medium sand	No	Soft Sediment	No	None
213	213-01	C	None	Firm, medium sand	No	Soft Sediment	No	Sand dollars
213	213-02	A	Ripple	Firm, fine sand	No	Soft Sediment	No	Sand dollars
213	213-03	A	None	Firm, fine sand	No	Soft Sediment	No	None
213	213-04	A	None	Firm, fine sand	No	Soft Sediment	No	Sand dollars
213	213-05	A	None	Firm, medium sand	No	Soft Sediment	No	Sand dollars
214	214-01	A	None	Soft, very fine sand	No	Soft Sediment	No	Sea stars
214	214-02	D	None	Very fine sand	No	Soft Sediment	No	None
214	214-03	A	None	Firm, medium sand	No	Soft Sediment	No	None
214	214-04	A	None	Firm, fine sand	No	Soft Sediment	No	Hermit crab
214	214-05	A	None	Firm, very fine sand	No	Soft Sediment	No	Gastropod, sand dollars
214	214-06	A	None	Firm, very fine sand	No	Soft Sediment	No	None
215	215-01	A	None	Firm, very fine sand	No	Soft Sediment	No	None
215	215-02	A	None	Firm, very fine sand	No	Soft Sediment	No	None
215	215-03	C	None	Firm, very fine sand	No	Soft Sediment	No	Sea star
215	215-04	A	None	Firm, fine sand	No	Soft Sediment	No	None
215	215-05	A	None	Firm, fine sand	No	Soft Sediment	No	None
215	215-06	B	None	Firm, medium sand	No	Soft Sediment	No	None
215	215-07	A	None	Firm, coarse and fine sand	No	Soft Sediment	No	Sand dollars
215	215-08	C	None	Firm, fine sand	No	Soft Sediment	No	Sand dollars
215	215-09	A	Ripple	Firm, fine sand	No	Soft Sediment	No	Sand dollars
216	216-01	A	None	Firm, fine sand	No	Soft Sediment	No	None
216	216-02	A	None	Firm, medium sand	No	Soft Sediment	No	Sand dollars
216	216-03	A	None	Firm, medium sand	No	Soft Sediment	No	Sand dollars
216	216-04	A	None	Firm, medium sand	No	Soft Sediment	No	Sand dollars
216	216-05	A	None	Firm, medium sand	No	Soft Sediment	No	None
216	216-06	C	None	Firm, coarse and fine sand	No	Soft Sediment	No	Sand dollars

Line Number	StationID	Replicate	Bedforms	Substrate Type	Methane Present?	CMECS Biotic Subclass	Sensitive Taxa Present?	Epifauna
216	216-07	A	None	Firm, coarse and medium sand	No	Soft Sediment	No	Sand dollars
217	217-01	A	None	Firm, very fine sand	No	Soft Sediment	No	Sand dollars
217	217-02	A	Ripple	Firm, coarse and medium sand	No	Soft Sediment	No	None
217	217-03	A	None	Firm, fine sand	No	Soft Sediment	No	Sand dollar
217	217-04	A	None	Firm, fine sand	No	Soft Sediment	No	Sand dollars
217	217-05	A	None	Firm, medium sand	No	Soft Sediment	No	Sand dollars
217	217-06	A	None	Firm, fine sand	No	Soft Sediment	No	Sand dollars
217	217-07	A	Ripple	Firm, fine sand	No	Soft Sediment	No	None
217	217-08	A	Ripple	Firm, medium sand	No	Soft Sediment	No	Sand dollar
217	217-09	A	Ripple	Firm, medium sand	No	Soft Sediment	No	Sand dollars
217	217-10	A	None	Firm, medium sand	No	Soft Sediment	No	Sand dollars
218	218-01	A	None	Firm, medium sand	No	Soft Sediment	No	None
218	218-02	A	None	Firm, fine sand	No	Soft Sediment	No	Sand dollars, shrimp
218	218-03	A	None	Firm, coarse and medium sand	No	Soft Sediment	No	None
218	218-04	A	None	Firm, medium sand	No	Soft Sediment	No	Sand dollars
218	218-05	C	None	Firm, medium sand	No	Soft Sediment	No	Sand dollars
218	218-06	A	Ripple	Firm, medium sand	No	Soft Sediment	No	Sand dollars
218	218-07	A	None	Firm, fine sand	No	Soft Sediment	No	Sand dollars
218	218-08	A	None	Firm, medium sand	No	Soft Sediment	No	None
218	218-09	A	None	Firm, fine sand	No	Soft Sediment	No	None
218	218-10	A	None	Firm, very fine sand	No	Soft Sediment	No	Sea star
219	219-01	A	None	Firm, fine sand	No	Soft Sediment	No	Sand dollars
219	219-02	A	None	Firm, fine sand	No	Soft Sediment	No	Sand dollars
219	219-03	A	None	Firm, medium sand	No	Soft Sediment	No	Sand dollar
219	219-04	A	None	Firm, coarse sand	No	Soft Sediment	No	None
219	219-05	A	None	Soft, very fine sand	No	Soft Sediment	No	Sea star
219	219-06	A	None	Firm, medium sand	No	Soft Sediment	No	Sand dollar
219	219-07	A	None	Firm, medium sand	No	Soft Sediment	No	None
301	301-01	A	None	Firm, medium sand	No	Soft Sediment	No	None
301	301-02	A	None	Firm, medium sand	No	Soft Sediment	No	Sand dollar
301	301-03	A	None	Firm, medium sand	No	Soft Sediment	No	None
301	301-04	A	None	Very fine sand	No	Soft Sediment	No	Sea star
301	301-05	A	None	Firm, fine sand	No	Soft Sediment	No	Sand dollars
301	301-06	B	None	Firm, fine sand	No	Soft Sediment	No	Sand dollars
302	302-01	A	Ripple	Firm, coarse sand	No	Soft Sediment	No	Sand dollars
302	302-02	A	Ripple	Firm, medium sand	No	Soft Sediment	No	Sand dollars
302	302-03	A	Ripple	Firm, fine sand	No	Soft Sediment	No	Sand dollars
302	302-04	A	Ripple	Firm, medium sand	No	Soft Sediment	No	Sand dollars
302	302-05	A	Ripple	Firm, coarse and medium sand	No	Soft Sediment	No	Sand dollars
302	302-06	A	None	Firm, medium sand	No	Soft Sediment	No	Corymorpha

Line Number	StationID	Replicate	Bedforms	Substrate Type	Methane Present?	CMECS Biotic Subclass	Sensitive Taxa Present?	Epifauna
302	302-07	A	None	Firm, medium sand	No	Soft Sediment	No	None
303	303-01	A	Ripple	Firm, coarse and medium sand	No	Soft Sediment	No	Sand dollars
303	303-02	A	None	Firm, fine sand	No	Soft Sediment	No	Sand dollars
303	303-03	A	Ripple	Firm, fine sand	No	Soft Sediment	No	Sand dollars, Shrimp
303	303-04	A	None	Firm, fine sand	No	Soft Sediment	No	None
303	303-05	B	None	Firm, fine sand	No	Soft Sediment	No	Sand dollars
303	303-06	A	None	Firm, medium sand	No	Soft Sediment	No	Sand dollar
303	303-07	B	None	Firm, coarse and medium sand	No	Soft Sediment	No	Sand dollars
304	304-01	A	Ripple	Firm, fine sand	No	Soft Sediment	No	Sand dollars
304	304-02	C	None	Firm, medium sand	No	Soft Sediment	No	Sand dollars
304	304-03	A	Ripple	Firm, medium sand	No	Soft Sediment	No	Sand dollars
304	304-04	A	Ripple	Firm, medium sand	No	Soft Sediment	No	Sand dollars
304	304-05	A	None	Firm, fine sand	No	Soft Sediment	No	None
304	304-06	A	None	Firm, fine sand	No	Soft Sediment	No	Sea star
304	304-07	A	None	Firm, medium sand	No	Soft Sediment	No	Sand dollars
304	304-08	A	None	Firm, coarse and medium sand	No	Soft Sediment	No	Sand dollars
304	304-09	A	Ripple	Firm, medium sand	No	Soft Sediment	No	None
401	401-01	A	Ripple	Firm, fine sand	No	Soft Sediment	No	Sand dollars
401	401-02	A	Ripple	Firm, medium sand	No	Soft Sediment	No	Sand dollars
401	401-03	A	Ripple	Firm, medium sand	No	Soft Sediment	No	None
401	401-04	A	Ripple	Firm, coarse sand	No	Soft Sediment	No	None
401	401-05	A	None	Firm, very fine sand	No	Soft Sediment	No	None
401	401-06	B	Ripple	Firm, medium sand	No	Soft Sediment	No	None
401	401-07	B	None	Firm, coarse sand	No	Soft Sediment	No	None
401	401-08	A	None	Firm, coarse sand	No	Soft Sediment	No	None
402	402-01	A	None	Firm, fine sand	No	Soft Sediment	No	None
402	402-02	A	None	Firm, fine sand	No	Soft Sediment	No	None
402	402-03	A	None	Firm, medium sand	No	Soft Sediment	No	Sand dollars
402	402-04	A	Ripple	Firm, fine sand	No	Soft Sediment	No	None
402	402-05	A	None	Firm, fine sand	No	Soft Sediment	No	Sea star
403	403-01	B	Ripple	Firm, medium sand	No	Soft Sediment	No	None
403	403-02	A	None	Firm, medium sand	No	Soft Sediment	No	Sea star
403	403-03	B	Ripple	Firm, fine sand	No	Soft Sediment	No	Orange-yellow sponges
403	403-04	A	None	Firm, medium sand	No	Soft Sediment	No	None
403	403-05	B	None	Firm, coarse sand	No	Soft Sediment	No	Orange-yellow sponges
403	403-06	A	None	Firm, fine sand	No	Soft Sediment	No	None
403	403-07	A	None	Firm, coarse sand	No	Soft Sediment	No	Sand dollars
403	403-08	A	None	Firm, medium sand	No	Soft Sediment	No	Sand dollars
404	404-01	C	Ripple	Firm, coarse and medium sand	No	Soft Sediment	No	Sand dollars
404	404-02	C	Ripple	Firm, coarse sand	No	Soft Sediment	No	Sand dollars

Line Number	StationID	Replicate	Bedforms	Substrate Type	Methane Present?	CMECS Biotic Subclass	Sensitive Taxa Present?	Epifauna
404	404-03	A	None	Firm, medium sand	No	Soft Sediment	No	None
405	405-01	A	None	Firm, fine sand	No	Soft Sediment	No	None
405	405-02	A	None	Firm, coarse sand	No	Soft Sediment	No	Sand dollars
405	405-03	A	None	Firm, coarse sand	No	Soft Sediment	No	None
405	405-04	A	None	Firm, coarse sand	No	Soft Sediment	No	Shrimp
406	406-01	B	None	Firm, fine sand	No	Soft Sediment	No	None
406	406-02	B	None	Firm, fine sand	No	Soft Sediment	No	Sand dollars
407	407-01	A	None	Soft, very fine sand	No	Soft Sediment	No	None
407	407-02	A	None	Soft, very fine sand	No	Soft Sediment	No	None
407	407-03	B	None	Soft, very fine sand	No	Soft Sediment	No	None
409	409-01	A	None	Soft, fine sand	No	Soft Sediment	No	None
409	409-02	A	None	Soft, very fine sand	No	Soft Sediment	No	None
409	409-03	A	None	Firm, very coarse sand	No	Soft Sediment	No	None
409	409-04	A	None	Soft, very fine sand and silt/clay	No	Soft Sediment	No	None
409	409-05	A	None	Fine sand	No	Soft Sediment	No	None
409	409-06	A	Ripple	Firm, medium sand	No	Soft Sediment	No	None
409	409-07	A	None	Soft, very fine sand and silt/clay	No	Soft Sediment	No	None

Line Number	StationID	Replicate	Comments
101	101-01	A	Pale tan fine sand, firm, mostly quartzite with few black grains. Sediment appears washed, with only slight color change deep in sediment. Sand dollars and short tubes at SWI.
101	101-02	A	Pale tan very fine sand, firm, shallow penetration. Slight color change due to detrital fines in upper 2cm. Gray clay clasts on SWI, also visible in PV. Shell fragments at SWI. Sand dollars in far and midfield.
101	101-03	A	Tan very fine sand, firm, with high silt/clay content. Sediment structure shows burrowing. Small nematodes visible in sediment just below SWI (thin white threads. Dense amphipod tubes at SWI - amphiod visible against faceplate just below SWI at left. Amphipod fecal strands at SWI.
101	101-04	A	Tan fine sand, firm, small patches of dark sediment near penetration maximum. Slight wave visible at SWI, ripple. Few short tubes present at SWI.
101	101-05	A	Tan fine sand, firm, no color change between SWI and penetration maximum. Shallow penetration. Small patch of brown sediment. Many sand dollars at SWI.
102	102-01	A	Tan fine sand, firm, subtle color change to more gray near base of penetration. Shell fragments over SWI and in sediment column. Large streak on prism faceplate. Small tubes visible in far field at SWI.
102	102-02	A	Tan very fine sand, firm, with few small black particles. No color change through sediment column, appears washed. Prism may have intersected ripple trough axially. SWI is very flat with rise in far field. Small shell fragments in sediment column and at SWI in low density.
102	102-03	A	Tan fine sand, firm, slight color change to darker grains near middle of visible penetration area. Few fines present. Short tubes at SWI. Sand dollar in far field. Slight rippling visible at SWI.
102	102-04	A	Tan fine sand, firm, very subtle color change to more gray near penetration maximum. Shallow penetration. Few black grains near SWI. Short tubes at SWI in very low density. Many sand dollars.
102	102-05	A	Tan medium sand, firm, well sorted, few black particles. Small shell hash fragments mixed into sediment and on SWI. Very slight darker color at SWI. Patch of dark gray sediment at mid depth on left edge. SWI may slope downward in far field, cannot tell if it is a shadow or a ripple. Short tubes and sand dollars.
102	102-06	A	Tan medium sand, firm, well sorted, few black particles. No perceptible color change in sediment column. Slight slope in SWI to far field.
102	102-07	A	Light tan fine sand, firm, moderately sorted with small black particles and shell hash fragments. Slight color change due to detrital fines at SWI, very thin. Slightly uneven SWI. Sand dollars present.
103	103-01	A	Light brown very fine sand, firm, moderately sorted. Slight color change to dark gray at penetration maximum. Thin drape of detrital fines at SWI. Steep slope in midfield left suggests rippling or mounds (seen in PV). Sand dollars and small tubes at SWI.
103	103-02	A	Tan medium sand, firm, well sorted with few black particles. No color change in sediment column. Short tubes and sand dollars at SWI.
103	103-03	A	Tan fine sand, firm, moderately sorted with black particles and shell fragments. Small patch of black sediment near penetration maximum. Slightly orange-brown detrital layer below SWI, subtle transition to tan color. SWI has thin dusting of detrital fines. Small pellets, short tubes, and sand dollars at SWI.
103	103-04	A	Orange-tan medium sand, firm, poorly sorted. No color change in sediment column. Few short tubes at SWI. Two sand dollars.
103	103-05	C	Tan medium sand, firm, slight color change where sediment darkens at penetration maximum. Small black particles. Medium sized tubes at SWI.
103	103-06	A	Pale tan fine sand, firm, small black particles. Well sorted sediment. Slight darkening of color at penetration maximum. SWI is slightly organically enriched by detritus, forming a rusty brown patchy drape. SWI is slightly wavy, may be from current or tracks. Short tubes and sand dollars at SWI.
104	104-01	A	Orange-tan fine sand, firm, with gradual change in color to dark brown/gray. Long burrow halo visible to left edge of sediment column. Small shell fragments at SWI. Sand dollars at SWI.
104	104-02	A	Tan fine sand, firm, moderately sorted, black particles in sediment. Slightly darker at pen max, slightly orange at SWI. SWI has thin layer of detrital fines. Small shell fragments at SWI. Sand dollars present.
104	104-03	A	Tan fine sand, firm, slightly orange at upper 2cm of SWI. Black particles in sediment column. Fine black patch of decomposing organics visible in sediment. Small shell fragments at SWI. Few short tubes at SWI,
104	104-04	A	Tan and gray fine sand, firm. Slight darker band of sediment running through sediment column about 4cm deep. Small orange burrow halos visible. Sand dollar at SWI,
104	104-05	B	Tan fine sand, firm, poorly sorted with fines admixed and pebbles at SWI. Small shell fragments at SWI and mixed into sediment.
104	104-06	A	Tan fine sand, firm, poorly sorted with fines admixed and pebbles at SWI. Small shell fragments at SWI and mixed into sediment.
104	104-07	A	Tan fine sand, firm, small black particles in sediment. Slightly orange drape and halos in top of sediment column. Low mounds at SWI. Short tubes present. Small ctenophore or tunicate? in water column attached to sediment surface. Three sand dollars.
104	104-08	A	Tan fine sand, firm, with ~2cm thick orange-brown layer at SWI, black particles present in sediment column. Small shell fragments in sediment and on SWI. SWI is very flat. Small, short tubes present at SWI, single thicker tube or fecal mound.
104	104-09	A	Brown-tan medium sand, firm, poorly sorted with shell hash and pebbles at SWI, fines near pen maximum. Short tubes present.
104	104-10	D	Tan medium and coarse sands, firm, with high percentage of sub-angular coarse sand, especially at SWI and at mid-depths. Sand dollars and sand dollar test visible at SWI. Few small tubes.
104	104-11	D	Tan, firm, poorly sorted very fine pebbles, coarse sand, and fines. Sloping SWI and far field indicate rippling is occurring in bedform. Sand dollar tests and shell fragments at SWI.
104	104-12	A	Pale tan, firm, moderately sorted medium sand. Small shell fragments in sediment column. Sediment appears to lower and raise slightly in mid and far field (ripple?). Short tubes at SWI.
105	105-01	C	Tan, firm, fine sand with black particles and small shell hash pieces. ~2-3cm thick band of rusty-orange detrital fines and sand at SWI. Oxidized burrow halos visible in sediment column. Very thin drape of detrital fines at SWI. Sand dollars and few short tubes at SWI.
105	105-02	A	Brown, firm, very fine sand with many small fragments of shell hash. Very limited penetration.
105	105-03	A	Tan, firm, fine sand with black particles and small shell hash pieces. ~2-3cm thick band of rusty-orange detrital fines and sand at SWI. Oxidized burrow halos visible in sediment column. Very thin drape of detrital fines at SWI. Sand dollars and few short tubes at SWI.

Line Number	StationID	Replicate	Comments
105	105-04	A	Tan, firm, fine sand with small black particles. Well sorted grains. No color change in visible sediment column. Slight raise and trough in mid and far field - pockmarked areas of surface in PV. Sand dollars, small shell fragments at SWI.
105	105-05	A	Tan, firm, fine sand with medium sand near SWI, slightly orange at SWI. Small black particles and shell fragments in sediment column. Small pink object transected by prism. SWI slopes to left, with far field visible in distance indicating rippling.
105	105-06	A	Pale tan and gray very fine sand, firm, with small black particles and band of orange-brown sediment at SWI. Orange-brown band made up of sand and detrital fines, about 1-2cm thick. Crushed shell streaking sediment profile. Small patch of black fines to are left. Short tubes at SWI.
105	105-07	A	Tan, firm, fine sand with small black particles. Sediment column becomes slightly orange at depth. Small burrow structure visible under SWI. Long, thin oxidation halos in sediment column. Sand dollars at SWI. Sand dollar being pushed into sediment by prism contact.
105	105-08	A	Tan, firm, fine sand. Sediment column is slightly gray near pen max and slightly orange near SWI. Detrital fines in upper sediment column and draping in thin sheet at SWI. Small shell fragments at SWI and admixed into sediment structure. Gastropod (w eye stalk tentacles visible) and sand dollars at SWI.
105	105-09	A	Tan, firm, fine sand with small black particles. Subtle color change (orange to tan to gray) as sediment column deepens. SWI dips in midfield and rises in far field. Few short tubes at SWI.
105	105-10	B	Orange-brown, firm, medium sand with high portion of coarser grains, especially near SWI. Sediment surface rolls down in midfield and rises in far field indicating a ripple. Many short, irregularly shaped tubes at SWI.
105	105-11	A	Orange-brown, firm, medium sand with portion of coarser, sub angular, grains near SWI. Slight color change between SWI and underlying material. Few tubes at SWI.
105	105-12	A	Tan, firm, fine sand with small black particles and slightly darker gray color near penetration max. Diffuse patches of darker fines deep in visible area. Very small tubes at SWI in low density. Sand dollars at SWI
105	105-13	A	Dark tan, firm, fine sand with black particles. Streaks of organic oxidized fines originating from SWI. Sand dollars and mounds made from sand dollar movement at SWI.
106	106-01	A	Tan, firm, medium sand with black particles. Well sorted, with sub-angular larger size grains near SWI. SWI appears washed, with no color change throughout sediment column (few fines in matrix). Sediment surface lowers and rises again in far field indicating a ripple. Few short tubes at SWI.
106	106-02	A	Dark tan, firm, fine sand with black particles and interstitial fines near SWI forming a ~2cm thick dark orange band. Small shell fragments abundant in upper sediment column and at SWI. Short tubes visible on sediment surface.
106	106-03	A	Dark brown very fine sand, firm, with ~2cm deep layer of rusty orange detrital fines and sand. Small shell particles in sediment column. Very limited penetration. Thin dusting of detrital fines at SWI. Sand dollars in midfield.
106	106-04	A	Tan, firm, fine sand. No color change in limited visible penetration area. Small patch of tan fines in lower left. Slight dusting of detrital fines at SWI. Large shell fragments in far field. Small shell pieces at SWI. Sand dollars and hermit crab at SWI. Few short tubes.
106	106-05	B	Tan, firm, fine sand with small black particles and ~2cm thick band of orange-brown fine sand and detrital fines. Small shell fragments in sediment and at SWI. Short tubes at SWI. Sand dollars at SWI.
106	106-06	A	Tan, firm , sand with black particles and sparse shell hash. Thin and subtle color change to orangish near SWI due to presence of detrital fines. SWI is not visible in mid or far field. Single sand dollar at SWI.
106	106-07	A	Tan, firm , fine sand with black particles. Sediment has slightly darker patch near penetration maximum. Few small shell fragments visible in sediment column. SWI is not visible in far or midfield (ripple crest?). Short tubes at SWI. Sand dollars present.
106	106-08	A	Pale tan, firm, coarse sand with limited penetration. Black patch in sediment column. ~1-2cm thick orange-brown layer at SWI. SWI is sloping downward to the right and into far field. Rippling. Small tubes at SWI.
106	106-09	A	Pale tan, firm, coarse sand with interstitial fines. Detrital fines forming orange-brown layer ~2cm thick at SWI and below. Thin drape of detrital fines at SWI. Sediment surface ripples into far field. Amphipod strand and short tubes at SWI.
106	106-10	A	Pale tan, firm, medium sand with small black particles and ~2cm thick band of orange-brown at SWI. Polychaete deep in visible portion of sediment column. Sand dollars at SWI. Scallop shells at SWI.
106	106-11	A	Pale tan, firm, medium sand. Sediment is moderately sorted, with coarser material deposited near upper portion of sediment column. Slight color shift from orangish to pale tan as sediment deepens. Rolling ripples visible in far and midfield. Short tubes at SWI.
107	107-01	A	Tan, firm, fine sand with black particles. ~2cm thick band of fine sand and detrital fines at SWI, orange-brown in color. Sparse shell hash over SWI and mixed into sediment column. SWI rolls slightly into far field (ripple?). Single sand dollar in far field. Few short tubes in foreground.
107	107-02	A	Tan, firm, medium sand with small black particles and low density of shell pieces in sediment and at SWI. Sediment column is slightly more orange-brown in color near SWI. Few small thin tubes at SWI. Sand dollars.
107	107-03	A	Tan, firm, medium sand with slight dusting of detrital fines at SWI. Low density shell hash at SWI. Small patches of gray fines in sediment column. Sediment column shows admixed orange-brown detrital fines near SWI. Few sand dollars visible.
107	107-04	A	Tan, firm, medium sand with only slight color change after upper detrital layer. Sediment surface may be rippled but it is not visible past nearfield. Short tubes and two sand dollars.
107	107-05	A	Pale tan, firm, fine sand with high portion of black particles. ~2cm band of fine sand and detrital fines just below SWI, orange-brown in color. Small shell fragments at SWI and admixed into sediment column. Sand dollars and short tubes at SWI.
107	107-06	A	Tan, firm, fine sand. Very low penetration. Slight color change throughout visible portion of sediment column represented by band of admixed detrital fines. Small shell fragments on SWI. Sand dollars present.
107	107-07	A	Orange-brown, firm, fine sand. Dark band at upper 2cm of sediment column. Long burrow halos visible in sediment structure. Polychaete in sediment column. Many sand dollars at SWI. Small tubes at SWI.
107	107-08	A	Pale tan, firm, fine sand with small black particles and ~2cm thick band of orange-brown detrital fines and fine sand at SWI. Long brown burrow halos visible in sediment column. Short tubes at SWI. SWI disappears behind slope in midfield.

Line Number	StationID	Replicate	Comments
107	107-09	A	Tan, firm, medium sand. Moderately sorted with few sub-angular coarse grains throughout sediment column. Few fines. Small crest visible in SWI at center of image.
107	107-10	A	Tan, firm, fine sand with black particles. Subtle color shift where detrital fines shift to underlying material in upper cm of sediment column. Small black patches in sediment column. Sand dollars at SWI.
108	108-01	A	Tan, firm, fine sand well sorted. Slight color shift in upper 3cm of sediment column. Large shell fragments at SWI. Slightly uneven SWI. Short tubes at sediment surface.
108	108-02	B	Dark tan, firm, medium sand, well sorted. Slight color shift between upper 2cm and lower portion of sediment column. Small shell particles in sediment structure and at SWI. Sand dollars at SWI.
108	108-03	A	Orange-brown, firm, medium sand. Moderately sorted with small pebbles at SWI and in sediment column. Sediment surface dips down and up in mid and far field indicating ripples or mounds.
108	108-04	A	Pale tan, firm, fine sand with black particles and slightly darker band at SWI. Darker band is approx. 2cm thick and contains organic detrital fines, slightly orange. SWI slopes on right edge of image, may be ripples or biogenic depression. Short tubes at SWI. Sand dollar at SWI.
108	108-05	A	Tan, firm, fine sand with black particles. Scant crushed shell in sediment. Slight darker color to sediment at top 1cm of sediment column. Short tubes at SWI.
108	108-06	B	Tan, firm, medium sand. Sediment grain size is mostly consistent throughout visible area. Well sorted. Small shell fragments at SWI and admixed into sediment column. SWI ripples into far field.
109	109-01	A	Dark brown and gray very fine sand, firm. Shell fragments at SWI and in sediment column. Very little penetration. Dark brown layer at surface present. Sand dollar and tests at SWI.
109	109-02	A	Tan, firm, fine sand with small black particles and scant bits of shell. Slight darker color in upper 5mm of sediment column. SWI has a slightly hummocky surface (ripple?).
109	109-03	A	Tan, firm, medium sand grading coarser to finer as depth increases. Scant shell fragments admixed into sediment column. Sand dollars at SWI.
109	109-04	A	Tan, firm, fine sand with small black particles. Sediment is slightly darker near SWI, few darker patches at depth. Small burrow structures visible in upper portion of sediment column. Sand dollars at SWI.
110	110-01	A	Dark brown and gray, firm, very fine sand with silt/clay present. Upper 2 cm of sediment column is dark brown in color, with a stark t transition to dark gray sediment. Small shell particles in sediment column. Thin drape of pale tan fines at SWI. Sand dollars at SWI. Few short tubes present.
110	110-02	A	Pale tan, firm, very fine sand. Fines mixed into sandy sediment. Very low penetration. No color change throughout sediment column. Small shell fragments at SWI. Short tubes at SWI.
110	110-03	A	Tan, firm, medium sand. Grains of different color, mostly black and orange. Well sorted. SWI dips to right and to far field.
110	110-04	A	Tan, firm, medium sand. Slightly darker color sediment near SWI. Small shell fragments in sediment column. Very thin drape of detrital fines at SWI. Slight rippling at SWI.
110	110-05	A	Tan, firm, medium sand. Sand is slightly finer near bottom of visible area. Well sorted. SWI is slightly rippled into far field.
110	110-06	C	Tan, firm, medium sand. Sand is slightly finer near bottom of visible area. Well sorted. Abundant small shell fragments at SWI. Sand dollars at SWI.
111	111-01	A	Rusty brown and gray, firm, very fine sand. 2cm darker color band at SWI. Detrital fines at SWI and mixed into sediment. Small shell particles. Sand dollars at SWI.
111	111-02	A	Rusty brown and gray, firm, very fine sand. 2cm darker color band at SWI. Detrital fines at SWI and mixed into sediment. Small shell particles and larger shell fragments (razor clam) at SWI. Sand dollars at SWI.
111	111-03	A	Pale tan, soft, very fine sand with silt/clay. Slight color change after aRPD. Long burrow halos extend into reduced sediment. Polychaete visible deep in sediment column. Abundant amphipod tubes at SWI, amphipods visible at top of many.
111	111-04	A	Orange and tan, firm, coarse sand. Sediment is moderately sorted with fine sand and small pebbles. SWI dips down at SWI and is not visible in far or midfield.
111	111-05	B	Tan, firm, medium sand with few black grains. No color change in sediment column. Slightly uneven SWI.
111	111-06	A	Tan, firm, medium sand with few black grains and small shell fragments. No color change at SWI. Well sorted sediment. Slightly rippled SWI. Sand dollars.
111	111-08	A	Tan, firm, fine sand with coarser sediment (coarse sand and small pebbles) at SWI. Small shell fragments abundant at SWI. No color change at SWI. Sand dollars at SWI.
112	112-01	A	Tan, firm, fine sand with ~2cm deep band of dark brown sediment below SWI. Very limited penetration. Very thin drape of pale tan fines at SWI. Short tubes at SWI.
112	112-04	C	Tan, firm, fine sand with larger small pebbles and coarse sand grains mixed into sediment column. No color change in sediment. Very thin drape of fines at SWI. Shallow ripples visible in far field. Short tubes at SWI. Gastropod.
112	112-05	B	Very poorly sorted sands and pebbles. Medium and coarse sand with surface covered with pebbles. Rippled sediment surface.
112	112-06	C	Tan, firm, fine sand with small patches of rusty brown dragged into sediment column from just below SWI. SWI is rippled in mid and far field. Small shell fragments at SWI.
112	112-07	B	Pale tan, firm, medium sand with 2-3 cm thick band of rusty brown below SWI. Small shell fragments at SWI and admixed into sediment column. Sand dollars at SWI.
112	112-08	A	Tan, firm, medium sand with slight darkening of sediment at SWI and immediately below. Small shell fragments at SWI and admixed into sand. Few short tubes at SWI.
112	112-09	A	Tan, firm, medium sand with coarse sand near SWI. Small shell fragments at SWI.
113	113-01	A	Tan, firm, fine sand. Image is out of focus, sand grains against faceplate of prism are very blurry. Small shell fragments at SWI. Slight rippling. Sand dollars at SWI.
113	113-02	A	Tan, firm, fine sand. Image is out of focus, sand grains against faceplate of prism are very blurry. Small shell fragments at SWI. Slight rippling.
113	113-03	A	Tan, firm, medium sand with small black particles and scant shell fragments. Long fecal stack at SWI. Short tubes at SWI. SWI ripples into far field.
113	113-04	B	Tan, firm, medium sand with pebbles at SWI. Small shell fragments at SWI and buried in sediment column. SWI ripples into far field. Few short tubes at SWI. Sand dollar test in farfield on left.
113	113-05	A	Tan, firm, medium sand, becoming coarser at penetration maximum. Small black particles in sediment. Small mounds at SWI. No color change in sediment column. Short tubes at SWI.

Line Number	StationID	Replicate	Comments
113	113-06	A	Tan, firm, medium sand with black particles and small shell fragments admixed into sediment column. No color change in sediment column. SWI is washed and rippled - PV confirms long ripple through image. Sand dollars and test at SWI.
114	114-01	A	Tan, firm, medium sand with black particles and small shell fragments admixed into sediment column. No color change in sediment column. SWI is washed and rippled (long form ripple in PV). Sand dollars at SWI.
114	114-02	A	Tan, firm, medium sand with black particles and small shell fragments admixed into sediment column. Small patches soft brown fines dragged into sediment column. Sand dollars at SWI. Sediment surface ripples into far field, visible in PV too.
115	115-01	A	Tan, firm medium sand with black grains and small shell hash fragments admixed into sediment column. Well sorted with few fines. No color change throughout visible area. Fairfield is not visible.
115	115-02	A	Tan, firm medium sand with black grains, slightly coarser near SWI but otherwise well sorted. Small patch of black fines in sediment. SWI dips to left and back, indicating rippling. Sand dollars and burrow mound/edge of sand dollar track visible at SWI.
116	116-01	A	Tan, firm, medium sand with black grains and scant shell hash fragments. Sediment column is slightly finer and darker in color near SWI, due to presence of detrital fines. Thin drape of detrital fines at SWI. Sand dollars at SWI. Short tubes are scant at SWI.
116	116-02	A	Tan, firm, coarse sand. Sediment is well sorted and sloping down to the left indicating a ripple (also clear in PV)
116	116-03	A	Tan, firm, medium sand with small black grains and scant shell hash. Scant detrital fines at SWI. Slight waveform at SWI, too small to indicate rippling, and none in PV. Short tubes at SWI.
116	116-04	A	Tan, firm, medium sand with upper ~2cm containing detrital fines. Upper layer is slightly more rusty brown than the underlying tan sediment. Patches of black fines deep in sediment. Organism visible at penetration maximum, appears severed by prism. SWI dips down in midfield and rises in far field (could be near pit of scallop from PV). Organic growth visible in midfield.
117	117-01	A	Tan, firm, medium sand with black grains mixed into sediment column. Small shell hash particles. Several pebbles at SWI. Thin brown drape of detrital fines at SWI. Short tubes at SWI.
117	117-02	A	Tan, firm, medium sand with black grains mixed into sediment column. Thin brown drape of detrital fines at SWI. Short tubes at SWI.
117	117-03	A	Tan, firm, medium sand with coarser particles admixed into sediment column. Small pebbles at SWI. Short tubes and organic growth at SWI.
117	117-04	A	Tan, firm, medium sand with small black particles and ~2cm thick band of rusty-brown sediment containing detrital fines. SWI is hummocked slightly and dips down and up into distance (PV is hummocky too). Small shell and sand dollar test fragments at SWI. Short tubes at SWI.
117	117-05	A	Tan, firm, poorly sorted medium sand and pebbles. Shell fragments at SWI and in sediment column. Short tubes at SWI.
118	118-01	A	Tan, firm, sand mixed with fines and small shell particles. Very thin drape of detrital fines at SWI, and smeared against faceplate from camera action in a patchy distribution. Small polychaete 3cm below SWI. Short tubes at SWI.
118	118-02	B	Tan, firm, medium sand with very little penetration. Large shell fragments at SWI. Cobbles and pebbles in midfield at SWI.
118	118-03	A	Tan, firm, fine sand. Low penetration. Slight rippling to SWI, not full ripple. Small shell fragments at SWI. Hermit crab in midfield.
118	118-04	A	Tan, firm, fine sand with small black particles. Small shell fragments at SWI and mixed into sediment column. Pebbles at SWI. Short tubes at SWI.
118	118-05	A	Tan, firm, medium sand with pebbles at SWI. Large shell fragments at SWI. Sediment is moderately sorted. Organics in sediment column, possibly transected organism.
118	118-06	A	Tan, firm, fine sand with patches of dark colored fines in sediment column. Low penetration. Pebbles at SWI. Small shell fragments at SWI. Short tubes at SWI.
119	119-01	A	Tan, firm, medium sand with fines. Small shell pieces ta SWI and mixed into sediment column. Very slight color change due to detrital fines at upper cm of sediment column. Short tubes at SWI. Possible mound in distance (several visible in PV).
119	119-02	A	Tan, firm fine sand, poorly sorted with pebbles in sediment column and thin layer of detrital fines at SWI. Shell fragments at SWI. Many small tubes at SWI.
203	203-01	A	Tan, firm, medium sand (lots of orange grains) with 2cm layer of darker orange-brown fines mixed into upper sediment column. Burrow halos visible in sediment column. Tubes covering SWI.
203	203-02	A	Tan, firm medium sand, poorly sorted with coarse sand and pebbles at SWI. Shallow penetration. Gray fines in long narrow patch at SWI dragged into sediment. Sand dollar tests at SWI. Few tubes at SWI.
203	203-03	A	Tan, firm, medium sand, moderately sorted with coarse sand and small pebbles at SWI, pebbles in far field. Shallow penetration. Small shell fragments at SWI.
204	204-01	A	Tan, firm, medium sand with dark brown fines in upper 2cm of sediment column. Small shell particles at SWI. Detrital fines at SWI. Short tubes at SWI.
204	204-02	A	Tan, firm, medium sand with coarser sediment near SWI. Large and small shell fragment at SWI and mixed into sediment column.
205	205-01	A	Tan, firm, fine sand with upper ~2cm including dark brown detrital fines. Patches of dark gray to black fines in sediment column. Shell fragments admixed into sediment column. Thin drape of detrital fines at SWI. Short tubes at SWI.
205	205-02	A	Tan, firm, medium sand. No color change throughout sediment column. Two sand dollars at SWI,
205	205-03	A	Tan, firm, medium sand with small black particles and small shell fragments at SWI and in sediment matrix. Large shell fragments at SWI. Slight color change at SWI and ~2cm below. Small tubes at SWI.
205	205-04	B	Tan, firm, medium sand with slight color change near SWI. Small shell fragments and sand dollar test fragments at SWI. Slight mounds at SWI, also visible in PV. Short tubes present.
206	206-01	A	Tan, firm, medium sand with small black particles and scant shell fragments. Sand dollar at SWI.
206	206-02	A	Tan, firm, medium sand with fines at SWI and dragged into sediment column. Shell fragments at SWI and dragged down by prism. SWI is rippled, rising into far field. Sand dollar in far field.
207	207-01	A	Tan, firm, medium sand with small black patch deep in sediment column. 1-2cm thick band of dark brown where detrital fines are mixed with sand. Small shell particles at SWI and in sediment. SWI is rippled and dips down to left edge of image.

Line Number	StationID	Replicate	Comments
207	207-02	A	Tan, firm, medium sand with many small shell fragments at SWI. Very shallow penetration.
207	207-03	B	Tan, firm, fine sand with limited penetration. Pocket of gray fines in sediment column. Small shell fragments at SWI. Large shell half with attached tubes in far field at SWI. Based on PV - SWI BR is from scallop pit.
207	207-04	A	Tan, firm, medium sand with small black patches of fines in sediment. Small shell fragments at SWI and in sediment column. ~1.5 cm thick band of fines and sand, dark brown, near SWI. Few short tubes at SWI. Shell half at SWI.
207	207-05	A	Tan, firm, medium sand with slight color change in upper 2cm of sediment column where detrital fines mix with sand.
208	208-01	A	Tan, firm, medium sand with slight color change near SWI and band of gray fines near penetration maximum. Shell fragments, large and small, at SWI. SWI is rippled from mounds visible in PV. Small tubes present.
208	208-02	D	Tan, firm, medium sand, moderately sorted with pebbles and fines in sediment column and at SWI. Patches of slightly pale material near SWI and in sediment column. Shell fragments at SWI and in sediment.
208	208-03	A	Tan, firm, coarse and medium sand, poorly sorted with sand and pebbles. Coarsest sediment near SWI. Slight color change as sediment becomes finer after upper 2-3cm.
209	209-01	A	Pale tan, firm, fine sand with 1-2cm band of sand and detrital fines near SWI. SWI is slightly hummocky with tracks and burrow mounds. Short tubes. Sand dollars at SWI.
209	209-02	B	Tan, firm, medium sand with 2-3 cm thick band of sand and detrital fines under SWI. Long burrow halos extending to penetration maximum. Shell fragments mixed into sediment column. Sand dollars and tubes on rippled surface. Ripples confirmed in PV.
209	209-03	A	Tan, firm, medium sand with slightly color change near SWI, coarsest sediment at SWI. Small shell fragments at SWI. SWI is mostly flat with sand dollars in midfield and far field.
209	209-04	B	Pale tan, firm, fine sand with patches of gray fines and slightly darker color sediment near SWI. Long burrow halos visible in sediment column. Mound visible in midfield. Many thick tubes on sediment column.
209	209-05	A	Pale tan, firm, medium sand, small shell fragments and black particles. Slightly darker layer of sand and detrital fines near SWI, irregular in depth. Coarse sand and pebbles at SWI. Scant short tubes at SWI.
210	210-01	A	Tan, firm, fine sand with 2cm thick layer of dark brown silty sand at SWI. Few pebbles at SWI. Small shell fragments at SWI. Short tubes at SWI.
210	210-02	B	Tan, firm, fine sand. Shallow penetration. Slight color change about 2cm under SWI. Small shell fragments are scant at SWI. Small mounds in farfield. Short tubes present.
210	210-03	A	Tan, firm, fine sand with small black particles. SWI is loose and fluffy with detrital fines. Detrital fines mixed into upper sediment column, rusty brown in color. Small shell fragments at SWI. Short tubes at SWI.
210	210-04	A	Tan, firm, medium sand with no color change visible. Shallow penetration. Sediment dips and rises into distance forming ripple - irregular ripples confirmed in PV.
210	210-05	A	Tan, firm, medium sand with slightly darker sediment transitioning into pale tan near SWI. Sparse shell fragments at SWI. Few short tubes. Slight rippling into far field.
210	210-06	A	Tan, firm, fine sand with slightly darker band of sediment containing detrital fines in upper 2cm of sediment column. Small black particles and shell fragments in sediment. Possible ripple. Sand dollars at SWI. Short tubes are sparse at SWI.
210	210-07	A	Pale tan, very fine sand with three distinct layers: upper organic oxidized layer (rusty brown), pale tan very fine sand, underlying layer of near black fines. Shell hash and organics mixed into upper sediment column; loosely packed. Thin drape of mud over SWI. Short tubes at SWI.
210	210-08	A	Tan, firm, medium sand with slight color change near SWI where detrital fines mix with sand. Sediment surface appears to dip down into midfield. Three large sand dollars at SWI.
210	210-09	B	Tan, firm, medium sand with black particles in sediment column and small shell fragments at SWI and in sediment structure. No color change throughout sediment column. Well sorted
211	211-01	A	Pale tan, firm, fine sand with slight color change near SWI where detrital fines mix with sand. Small patches of gray sediment near penetration maximum. Small burrow transected in center of image, near bottom of frame. Small shell fragments in sediment column. Slight bulge to SWI. Few short tubes present.
211	211-02	A	Tan, firm, medium sand with gradual color change throughout sediment column, orange-tan at SWI, pale tan near penetration maximum. Small shell fragments at SWI and mixed into sediment column. Mound at sediment surface (couple visible in PV). Short tubes at SWI.
211	211-03	A	Tan, firm, medium sand with large patch of black, organic rich fines in lower left corner of image. Small shell fragments at SWI. Thin drape of detrital fines on SWI. Short tubes at SWI.
211	211-04	A	Tan, firm, medium sand mixed with small shell fragments and black particles. Gradual orange-brown transition near SWI. Very short tubes at SWI.
211	211-05	A	Tan, firm, fine sand with black grains and ~2cm band of rusty-brown sand and detrital fines below SWI. Small shell fragments at SWI. Sand dollars at SWI. SWI slopes to right, possibly slight ripple to sediment.
211	211-06	A	Pale tan, firm, fine sand with black grains and small shell fragments admixed into sediment column. Small black patch in sediment. ~2cm darker band near SWI.
211	211-07	A	Tan, firm, medium sand with 1-2cm thick band of oxidized sediment and detrital fines near SWI; burrow halos extending from darker band. Small shell fragments at SWI. Slight ripple to SWI. Sand dollars at SWI.
211	211-08	B	Tan, firm, coarse sand; poorly sorted sediment with many very coarse sand grains. Dense sand dollars at SWI.
211	211-09	A	Pale tan, firm, fine sand with small black particles. ~2cm thick band of detrital fines and sand. Small burrow halos visible in sediment structure. Small shell fragments at SWI. Sand dollars at SWI.
211	211-10	A	Pale tan, firm, medium sand with a gradual transition from rusty-brown at about 1-2cm below SWI. Burrow halos extending from SWI into sediment. Dense small shell fragments at SWI. Small sand dollars at SWI. SWI rises into distance.
212	212-01	A	Tan, firm, fine sand with subtle color change from rusty-orange to tan sand. Sediment is well sorted. Small shell fragments at SWI. Slight ripple at SWI inro farfield- irregular ripples confirmed in PV.
212	212-02	A	Tan, firm, fine sand with no color change in sediment. Small shell fragments at SWI. Short tubes at SWI. SWI is slightly hummocky.
212	212-03	B	Tan, firm, medium sand with small black patch in lower left corner. Very slight color change from dark to light with depth. Few small shell fragments at SWI. Sand dollar tipped against prism faceplate. Few tubes at SWI.

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212	212-04	A	Tan, firm, medium sand with small black patch in sediment. Small mound transected at SWI. Light brown band of fines and sand below SWI. Short tubes at SWI.
212	212-05	A	Pale tan, firm, very fine sand, moderately sorted. Patch of black fines at penetration maximum. Sediment in upper 2cm is slightly darker, with burrows of darker sediment deeper in sediment column. Sediment surface is hummocky. Short tubes at SWI.
212	212-06	A	Pale tan, firm, medium sand with slight color change below SWI. Black sediment and small shell fragments in sediment column. Sand dollar test at SWI. Few very small tubes at SWI.
212	212-07	A	Pale tan, firm, medium sand with slightly darker band of orange-brown sediment in upper 2cm of sediment column. Small black sediment grains in sediment column. Small shell fragments at SWI. Small sand dollars at SWI, test against faceplate,
212	212-08	A	Pale tan, firm, medium sand with coarser grains with slightly darker sediment near SWI. Sediment is moderately sorted. Shell fragments at SWI and admixed into sediment column. Few sand dollars at SWI. SWI ripples into far field.
212	212-09	A	Pale tan fine sand with small black and shell particles in sediment column. Dark orange-brown sand and detrital fines in upper 2cm of sediment column with long burrow halos extending below it. Sand dollars and gastropods at SWI. SWI is slightly loose and fluffy.
212	212-10	A	Pale tan, firm, medium sand with black and orange particles and small shell fragments admixed into sediment column. ~2cm band of rusty-brown sediment at SWI. Long narrow burrow halos deep in sediment column. SWI has thin drape of detrital fines and small shell fragments. Short tubes at SWI and part of polychaete visible at mid-depths on right.
213	213-01	C	Tan, firm, medium sand with small black particles in sediment column. Shell fragments are sparse in sediment and at SWI. Small patches of dark gray and black fines in sediment column. Sand dollar at SWI.
213	213-02	A	Tan, firm, fine sand with ~1.5cm thick layer of detrital fines forming dark brown layer with sand at SWI. Small shell fragments and black sand in sediment column. SWI is slightly mounded in image, dipping to far field (shallow ripples in PV). Short tubes and sand dollars at SWI.
213	213-03	A	Tan, firm, fine sand; poorly sorted with fines and coarse sand. SWI is slightly darker in 1-2cm below SWI. Thin mud drape at SWI. Shallow penetration. Many small tubes at SWI. Ridged orange shell at SWI - Astarte?.
213	213-04	A	Tan, firm, fine sand with gradual change in color near SWI, sediment is slightly darker. Black particles in sediment column. Small shell fragments in sediment column and at SWI. Sand dollars at SWI Few small tubes present.
213	213-05	A	Tan, firm, medium sand with black particles and small shell fragments in sediment column. Dark brown band of sediment in upper 1-2 cm of sediment column, long burrow halos extending deep into sediment column. Sand dollars at SWI,
214	214-01	A	Tan, soft very fine sand and silt/clay. Small black particles in sediment column. Sediment column changes color gradually from brown to tan in deeper sediment. SWI is loose and fluffy with short tubes present. Sea stars at SWI.
214	214-02	D	Pale tan, very fine sand with fines smeared a bit by faceplate; slightly darker sediment streaking down from SWI. Loose, fluffy sediment at SWI. Tubes and shell fragments at SWI. Small organisms in sediment column.
214	214-03	A	Pale tan, firm, medium sand with black grains. 1-2 cm thick band of darker detrital fines and sand at SWI, clear distinction between this and underlying layer. Scant tubes at SWI.
214	214-04	A	Tan, firm, fine sand with small black particles. Thin band of slightly darker sediment near SWI. Pink object in sediment column. Fines in sedimentary matrix. Hermit crab at SWI.
214	214-05	A	Pale tan, firm, very fine sand with patches of gray silt/clay. Detrital fines scant at SWI and dragged into sediment. Small shell fragments at SWI. Two sand dollars. Gastropod in far field.
214	214-06	A	Gray-tan, firm, very fine sediment. ~2cm layer of brown detrital fines at and below SWI. Burrow halos in sediment column. SWI is loose and fluffy with pellets and small shell fragments. Few short tubes.
215	215-01	A	Pale tan, firm, very fine sand. Shallow penetration. Small burrow mound transected. Slightly darker sediment at SWI and dragged into sediment column. Small tubes at SWI.
215	215-02	A	Tan, firm, very fine sand with slightly darker color change near SWI. Small patches of dark gray in sediment column. Polychaetes visible in sediment column. SWI is fairly even. Short tubes at SWI.
215	215-03	C	Pale tan, firm, very fine sand with rusty orange-brown band in upper 2 cm of sediment. Shallow penetration. Small shell fragments at SWI. SWI is fluffy and loose with small fecal pellets at left. Tubes at SWI and attached to shells at left side of image Large sea star in far field.
215	215-04	A	Tan, firm, fine sand, well sorted. Small shell fragments crushed and admixed into sediment column. Thin drape of fines at SWI. Sediment column shows a dark band ~2cm deep below SWI. Short tubes at SWI.
215	215-05	A	Tan, fine, fine sand with small black particle and pockets of silt/clay fines. Slightly darker band of sediment about 2cm deep below SWI. Tuebs and fecal pellets at SWI. Polychaetes visible in sediment column. Short tubes are scant at SWI.
215	215-06	B	Tan, firm, medium sand with many black patches in sediment column. ~2cm orange-brown sand below SWI. Thin drape of depositional fines at SWI. Small shells, small Astarte?, and shell fragments at SWI. Short tubes and mound at SWI.
215	215-07	A	Pale tan, firm, fine sand with small black fragments and shell particles admixed into sediment. Upper 2cm of sediment column is a band of rusty brown coarse sand and detrital fines. Sand dollars at SWI.
215	215-08	C	Pale tan, firm, fine sand with small black particles and ~1cm thick layer of rusty-brown detrital fines and sand at SWI. Long burrow halos in sediment structure. Slight rise to right side of SWI. Sand dollars at SWI.
215	215-09	A	Pale tan, firm, fine sand with small black particles and shell fragments admixed into sediment column. 2-3cm thick layer of gradually transitioning dark brown sediment below SWI. SWI slopes to the right and ripples into distance. Short tubes at SWI. Abundant sand dollars.
216	216-01	A	Pale tan, firm, fine sand with small black particles. Upper 1-2 cm of sediment column is slightly darker. Slightly darker gray patches deep in sediment. Sand dollar in dragdown and transected in sediment column by prism. Short tubes at SWI.
216	216-02	A	Orange-tan, firm, medium sand, well sorted with no color change through sediment column. Small shell fragments and sand dollar tests at SWI. Sand dollars at SWI.

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216	216-03	A	Pale tan, firm, medium sand with 1-2 cm orange-brown sand and detrital fines below SWI. Polychaete in sediment column at far left. Large shell fragments at SWI. Sand dollars at SWI. Small tubes and fecal pellets are scant at SWI.
216	216-04	A	Pale tan, firm, medium sand with ~2cm deep band of brown sand at SWI. Short tubes and small thin worms at SWI.
216	216-05	A	Tan, firm, medium sand with 1-2cm thick band of detrital fines and sand. Long burrow and polychaete visible in sediment column. Black fines in lower left corner of sediment. Two burrow mounds at SWI.
216	216-06	C	Pale tan, firm, coarse and fine sand, coarse sand at upper part with 1-2 cm band of rusty-brown sediment at SWI. Small pebbles at SWI. Small black patches of fines in sediment column. Sand dollars at SWI.
216	216-07	A	Pale tan, firm, coarse and medium sand with pebbles at SWI, grading finer towards penetration maximum. Sand dollar at SWI. SWI ripples into far field.
217	217-01	A	Pale tan, firm, very fine sand with small black particles and 1-2cm thick band of dark brown sediment near SWI. Sand dollars at SWI.
217	217-02	A	Pale tan, firm, coarse and medium sand with 1-2cm thick layer of orange-brown sand at SWI. Sediment is moderately sorted. Shallow penetration. SWI is uneven and rippled.
217	217-03	A	Pale tan, firm, fine sand with small particles of black sediment and very small shell fragments at SWI and admixed into sediment column. ~2cm thick band of orange-brown sand in sediment column, near SWI. Thin burrow halos in sediment. Small gray-black patch of fines at penetration maximum. Very small tubes at SWI. Single sand dollar in far field.
217	217-04	A	Pale tan, firm, fine sand with small patch of dark gray sediment and 1-2cm thick band of rusty-brown fines and sand at SWI. Short tubes at SWI. Sand dollars at SWI. Small gastropod shell at SWI.
217	217-05	A	Tan, firm, medium sand, moderately sorted, with band of slightly darker sediment near SWI, pale gray finer sediment near penetration maximum. Small fragments of shell in sediment column ad at SWI. Short tubes at SWI. Sand dollars in far field.
217	217-06	A	Pale tan, firm, fine sand with slightly dark-brown band of sediment near SWI. SWI is covered with lightly coarser sediment. Abundant small shell fragments at SWI, some in dragdown and in sediment column. Tube or fecal column(?) of coarse grains at SWI. Small short tubes at SWI. Sand dollars present.
217	217-07	A	Tan, firm, fine sand with orange-brown sand near SWI, gradually transitioning to pale tan sand. Sediment column is high in shell content. SWI is slightly undulating with ripple in far field.
217	217-08	A	Tan, firm, medium sand, well sorted, with slightly rusty-brown sediment near SWI, about 2cm thick. SWI rises and dips slightly,irregular ripples/mound in PV. Sand dollar and short tubes at SWI,
217	217-09	A	Tan, firm, medium sand with small black particles in sediment column. SWI has slightly dark brown band below SWI. Abundant sand dollars at SWI.
217	217-10	A	Pale tan, firm, medium sand, moderately sorted, with slight patchy color change to darker brown near SWI; very thin. Small shell fragments at SWI. Sand dollars in far field.
218	218-01	A	Gray-black, firm, medium sand, poorly sorted with pebbles at SWI and mixed/dragged into sediment column. Sediment is mostly reduced with thin drape of oxidized material at SWI.
218	218-02	A	Pale tan, firm, fine sand with small black particles and ~2cm band of rusty-brown sand below SWI. Abundant sand dollars at SWI. Small shrimp at SWI
218	218-03	A	Tan, firm, coarse and medium sand with slightly darker band of sediment near SWI and darker material near penetration maximum. Moderately sorted sediment . Short tubes scant at SWI.
218	218-04	A	Tan, firm, medium sand with thin band of orange-brown sediment near SWI. Sand dollars and short tubes at SWI.
218	218-05	C	Tan, firm, medium sand with three distinct layers each becoming finer and paler with depth. Upper, dark brown, band of sediment is loose and fluffy with coarse sand, detrital fines, and dense shell fragments. SWI is covered with thin drape of fines. Shell fragments at SWI, including scallop shell. Sand dollars and short tubes at SWI.
218	218-06	A	Tan, firm, medium sand with slightly coarser dark bacterial in upper 1.5cm. SWI is rippled with ridge visible in far field. Small black pocket in sediment column. Few shells at SWI. Sand dollars and short tubes at SWI.
218	218-07	A	Pale tan, firm, fine sand with small black particles, few shell fragments, and band of dark brown fines and sand in upper 2cm. Small patch of black fines in sediment. SWI is draped with thin layer of fines. Dense, near total, cover of sand dollars at SWI.
218	218-08	A	Pale tan, firm, medium sand with 2cm thick band of orange-brown sediment below SWI. Coarse sediment near SWI. Short tubes at SWI.
218	218-09	A	Pale tan, firm, fine sand with slightly darker, gradual color change, near SWI. Sediment is streaked with burrows extending from SWI into pale gray material. Mounds on seafloor surface visible from SWI into distance (context from PV). Small shell fragments at SWI. Short tubes scant at SWI - thick tube by faceplate may be amphipod tube.
218	218-10	A	Pale tan, firm, very fine sand with medium black sand grains. SWI is slightly darker in patchy distribution near SWI, with streaks and burrows extending deep into sediment column. SWI shows small burrow mounds and small tubes. Sea star in far field on left; shell? on right.
219	219-01	A	Pale tan, firm, fine sand with slight color change to dark brown in upper 2cm of sediment. Small streaks of black in sediment column. Small burrow mounds and sand dollars at SWI. Pebbles at SWI,
219	219-02	A	Pale tan, firm, fine sand with distinct boundary between upper dark brown band and underlying pale tan sediment. Sand dollars abundant at SWI.
219	219-03	A	Orange-tan, firm, medium sand with even color throughout sediment column. Relatively few fines make up sediment column. Well sorted. Shell fragments at SWI. Single sand dollar.
219	219-04	A	Pale tan, firm, coarse sand with 1-2 cm band of darker material below SWI. Thin drape of fines at SWI. Short tubes at SWI.
219	219-05	A	Pale tan, soft, very fine sand and medium black particles. Upper sediment column has 2cm thick band of dark brown sediment. SWI is draped with thin layer of fines. Abundant small, thin, tubes at SWI. Sea star at SWI.
219	219-06	A	Pale tan, firm, medium sad with small black particles and shell hash admixed into sediment column. Upper sediment column is slightly darker brown gradually transitioning to pale tan. Small shell and sand dollar test fragments at SWI. Sand dollar and very small tubes at SWI.
219	219-07	A	Pale tan, firm, medium sand with three distinct layers; upper layer is 2cm thick and dark brown, middle layer is pale tan, lower 2cm is dark gray. Small patches of dense shell hash admixed into sediment column. SWI is scattered with small shell fragments in low density. Tests and possible scallop shell at SWI. Short tubes at SWI.
301	301-01	A	Tan, firm, medium sand with slightly darker sediment in upper 2cm of sediment column. SWI is draped with thin layer of detrital fines. Small pebbles at SWI. Sand dollars at SWI.

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301	301-02	A	Tan, firm medium sand with gradual and slight color change at SWI to dark brown. Very thin drape of pale tan fines at SWI. Small shell fragments are scarce at SWI. Sand dollar and few short tubes at SWI.
301	301-03	A	Tan, firm, medium sand with very slight change in color at about 3cm under SWI. Polychaete visible in sediment. SPI captures mound or depression in irregular surface visible in PV. Few short tubes at SWI.
301	301-04	A	Pale tan, soft, silt/clay with fine black grains. Sediment column has slight color change near SWI. Polychaetes visible in sediment. Dense short thin tubes at SWI. Buried sea star visible under mud drape (visible in PV too).
301	301-05	A	Pale tan fine sand with black sand particles. Upper 1-2 cm of sediment column is a band of dark brown sand and detrital fines. Many sand dollars at SWI.
301	301-06	B	Pale tan, firm, fine sand with fluffy and loose dark brown layer in upper 2cm. Shell fragments at SWI and admixed into sediment column. Patches of dark gray fines in sediment. Dense sand dollars at SWI,
302	302-01	A	Tan firm, well sorted coarse sand. Ripple, multiple sand dollars at SWI. Shell fragments in lens below ripple crest. SWI appears washed.
302	302-02	A	Tan , well sorted medium sand with well defined aRPD. Minor fines/detritus at SWI and upper sediment column. Bedform, Sand dollars and sand dollar shell fragments. aRPD appears to be a mix of detritus and hydraulic oxygenation.
302	302-03	A	Tan well sorted fine sand over dark gray silty fine sand. Bedform at SWI. Multiple sand dollars and small sand tubes in SWI foreground. Strong aRPD contrast and minor but significant inventory of fines and organics at depth,
302	302-04	A	Tan to light gray slightly silty medium sand. Sand appears to be well sorted with a subsequent deposition of fine grained detritus at the SWI and admixed into the upper sediment column. Strong aRPD contrast due to admixed fines. Detritus appears to biogenically aggregated. Sand dollars and sand dollar test fragments at SWI. Image appears to be on a bedform whose wavelength is greater than prism width.
302	302-05	A	Light tan to tan, firm, moderately sorted, slightly gravelly coarse sand with medium sand at depth. Sand is mature and mostly quartzic. Patch of fines at SWI in right background. Sand dollars and sand dollar fragments.
302	302-06	A	Tan firm, moderately well sorted medium sand with few gravelly particles throughout visible sediment column. Medium sand contains admixed fines. Thin layer of detrital fines at SWI. Underlying layer of well sorted dark, highly organic, fines. Long waveform in sediment surface is apparent by dip and raise in far field SWI - PV doesn't show rippling. Corymorpha in midfield.
302	302-07	A	Light tan firm, well moderately well sorted medium sand with covering of orange-brown detrital fines and dusting of pale tan very fine material at SWI. Underlying patches of gray silt/clay fines. Few rounded gravels near SWI. Long oxygenated halos in sediment. SWI has many small thin tubes/strands over entire visible area.
303	303-01	A	Light tan to tan, firm, quartzic medium to coarse sand that is moderately sorted. Many sand dollars at the SWI. Ripple - irregular ripples and mounding in PV.
303	303-02	A	Tan to light gray compact, moderately sorted, compact slightly silty fine sand. Aggregates thin blanket of detritus at SWI that persists 1-2 cm into sediment column. Well defined aRPD and it is related to hydraulic forcing and the extent of detrital material. The extent, form and binding of detrital material is influencing surficial sediment dynamics.
303	303-03	A	Tan to light gray, compact, fine to medium sand. Scattered thin patches of detrital material at the SWI. Minor amounts of detrital material in the upper sediment column. Sand dollars at SWI and shrimp in background. Slight ripple visible, PV has some mounding and hummocks
303	303-04	A	Tan fine sand with orange-brown rust colored layer of detritus mixed into upper centimeters of SWI. Very thin dusting of fines at SWI. Small patch of fines below orange detrital layer to far left of image. Small shell particles admixed into sediment. Small tubes at SWI along with fecal pellets. Thin halos of oxidized orange material extending from SWI.
303	303-05	B	Tan to light gray fine sand; moderately well sorted with pockets of gray fines. Thin drape of fine deposition at SWI. Thicker orange-brown depositional layer near SWI is about 2 cm thick. Small shell particles present. Sand dollars and sand dollar tests visible on SWI.
303	303-06	A	Tan to dark gray medium sand, mostly quartzite, with 2cm thick rust colored layer of detritus at SWI. Small black patch deep in sediment. Small shell fragments at SWI. Single sand dollar to left edge of image.
303	303-07	B	Light tan and orange medium sand with coarser particles throughout sediment column with more near SWI. aRPD is made up organic rich detritus in upper portion of SWI and is either very deep or poorly visible against quartzite sand. Small shell fragments at SWI. Few sand dollars and tests visible.
304	304-01	A	Tan well sorted fine sand over dark gray silty fine sand. Bedform at SWI - irregular ripples and mounding visible in PV. Strong aRPD contrast and minor but significant inventory of fines and organics at depth.
304	304-02	C	Tan to light gray, compact, moderately sorted medium to coarse sand. Dense carpet of sand dollars in foreground. Some fine gravels and sand dollar shell fragments in sediment column. Very thin dusting of detrital material at SWI. Possible eggs on raised piece of material in center foreground.
304	304-03	A	Tan to light gray, compact, moderately sorted medium to coarse sand. Few sand dollars. Some fine gravels and sand dollar shell fragments in sediment column. Very thin dusting of detrital material at SWI. Egg in center foreground.
304	304-04	A	Tan. Firm, well sorted medium sand. Bedform - irregular ripples in PV. Sand dollar at right and a few in foreground. Very little fines.
304	304-05	A	Tan and black fine sand with orange-brown detrital layer at SWI and large patch of black fine sand to right. Penetration is very shallow. Small shell fragments buried in sediment matrix. Small thin tubes visible in midfield.
304	304-06	A	Tan, firm, fine sand with few black particles. Silty gray fines visible in underlying layer. Upper portion of sediment column is rusty-orange in color with admixed detrital fines. Thin drape of fines over SWI. Fecal pellets and small thin tubes at SWI. Sea star visible in far field.
304	304-07	A	Pale tan medium sand, mostly rounded quartzite, with rusty-orange detrital layer near SWI (about 2cm thick). Small black patch in sediment near pen maximum. Small shell fragments mixed into sediment. Few small sand dollars at SWI.
304	304-08	A	Tan coarse sand, rounded and mature grains, with ~2cm layer of dark-brown detrital fines admixed into upper layer of sediment. Crushed shell mixed/dragged into lower portion of sediment column. Sand dollar tests visible in midfield. Few small, thin tubes in far field.
304	304-09	A	Tan medium sand with sub-rounded particles. Patch of underlying gray fines (silt/clay). Small shell fragments in sediment column. Orange-brown detrital fines in upper 2cm of sediment column. Thin drape of fines at SWI, small thin tubes and fecal pellets at SWI. Long wave ripple is visible in SWI slope - also visible at left edge of PV

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401	401-01	A	Tan to light gray, firm sorted fine sand with faint bedform trace at SWI - slight irregular rippling in PV. Minor dusting of detrital material at SWI. Sand dollars in far field.
401	401-02	A	Tan. Firm, well sorted medium sand. Bedform- irregular rippling in PV. Sand dollars at SWI. Minor but visible dusting of light brown detrital material at SWI.
401	401-03	A	Tan, firm, well sorted medium sand. Bedform, axial view - irregular ripples and depressions in PV. Polychaete in center of sediment column. A few small low sand crusted tubes in foreground. Biogenic mound in far foreground.
401	401-04	A	Tan, firm, well sorted medium to coarse sand. Bedform, axial view - hummocky surface in PV. Polychaete in center of sediment column. Small gray reduced mud clasts at left, one buried in sediment column. Tubes/sand crusted fecal strands at SWI.
401	401-05	A	Tan to medium gray, slightly silty to silty very fine sand. Multiple polychaetes at depth. Strong aRPD contrast. Several tubes at SWI. Thin light brown detrital layer at SWI.
401	401-06	B	Tan, firm, medium sand with small black grains in a mostly quartzite matrix, few fines admixed into moderately well sorted grains. ~1-2 cm of orange-brown detrital material near SWI, long halos of drag down/burrow structure visible. Small pink infauna about 2cm below SWI to left side of image. SWI is sloping - long form ripple in PV.
401	401-07	B	Poorly sorted medium sand with coarse grains and admixed fines, mostly tan with underlying fine layer of gray silt/clay, and overlying layer of dark brown fines and quartzite sand. Thin drape of tan fines over SWI. SWI is sloped downwards toward camera prism. Crushed shell visible in sediment. Fecal coil and small tubes at SWI.
401	401-08	A	Moderately sorted coarse sand, firm, tan, mostly quartzite with few black particles. Grains of sand are sub-angular to sub-rounded. Small shell fragments. Tube structures visible at SWI. Fairfield and midfield are not visible behind SWI.
402	402-01	A	Tan to light gray, firm, silty fine to medium sand. Polychaete in left center of the sediment column, tubes at SWI as well as sand encrusted fecal castings. Light brown thin veneer of recent detritus at SWI.
402	402-02	A	Tan to dark gray, firm, silty fine sand. Polychaetes in right center of the sediment column, tubes at SWI as well as sand encrusted fecal castings. Light brown thin veneer of recent detritus at SWI. Clot of dark sediment in lower center. SWI appears to be rippled in background - PV shows biogenic mounds, tracks, and pits.
402	402-03	A	Tan, firm, medium sand with admixed fines. Sand is mostly tan with few black grains. Patches of pale-tan fines near SWI. ~2cm thick detrital layer of orange-brown sediment at SWI. Several live sand dollars visible at SWI. Small tube and burrow mound structures visible in midfield.
402	402-04	A	Tan firm sand with patches of gray-tan fines and ~1-2cm thick layer of orange-brown detritus and medium sand just below SWI. Ripples apparent in sediment as long ridge that extends right and into far field. Small tubes at SWI.
402	402-05	A	Tan, firm, fine sand, mostly quartzite with small black grains and admixed fines. Upper portion of sediment column is red-brown and is dragged into sediment column. Very thin dusting of pale-tan fines at SWI. Sea star appendage has been severed by prism and dragged into sediment column.
403	403-01	B	Tan, firm, well sorted medium sand. Bedform, axial view- irregular ripples in PV. Sand crusted proteinaceous tube at SWI, minor light brown detritus at SWI. Trapped clot of tan-brown fines at left in sediment column.
403	403-02	A	Tan, Firm, well sorted medium to coarse sand. Minor fine gravels. Bedform - hummocky surface in PV. Minor light brown recently deposited detritus at SWI.
403	403-03	B	Tan, to light gray, firm, silty fine to medium sand. Poorly sorted, Thin veneer of light brown detritus at SWI and orangish-yellow sponge particles. Bedforms with modification by biogenic mounds. Shell particles appear to be pieces of broken sand dollar skeletons.
403	403-04	A	Tan to light gray slightly silty medium sand. Sand appears to be well sorted with a subsequent deposition of fine grained detritus at the SWI and admixed into the upper sediment column. Detritus appears to biogenically aggregated. Sand dollars and sand dollar shell fragments at SWI. Sand crusted proteinaceous tubes in the far foreground. Low relief bedforms- biogenic mounds visible in PV.
403	403-05	B	Tan, well sorted firm medium to coarse sand with a distinct veneer of light brown detritus at the SWI. Multiple small orange-yellow sponge particles at the SWI. Appears to be either periodically mobile or periodically disturbed.
403	403-06	A	Tan to light gray, firm fine to medium sand with faint bedform trace at SWI. Distinct detrital material st SWI. Sea star arm dragged down at right, stubby sand and protein tube at right foreground. Minor small fragments of orange-yellow sponge at SWI.
403	403-07	A	Orange-tan coarse sand, well sorted, firm, with slightly more orange particles in layer at SWI. Particles are a mix of angular and rounded grains, quartzite, black, and opaque orange mineral. Crushed shell particles in sediment column. Slightly uneven SWI with three sand dollars in view.
403	403-08	A	Orange-tan medium sand, firm and moderately well sorted, sun-angular and rounded grains. Thin orange-brown layer of sand and fines at SWI. Small patches of fines in underlying sediment structure. Small tubes with fines at SWI.
404	404-01	C	Tan, well sorted medium to coarse sand with abundant sand dollars at SWI, more coarse near SWI. Polychaete in center of sediment column. Buried sand dollar skeletal fragments.
404	404-02	C	Tan, well sorted medium to coarse sand with abundant sand dollars at SWI. Bedform - long form ripple in PV. Shrimp at SWI.
404	404-03	A	Tan, moderately sorted medium sand with fine grains admixed deep in visible area. Shell and carapace fragments visible at SWI. Small tubes visible at SWI.
405	405-01	A	Pale gray-tan fine sand with fine black grains. Yellowish layer of sediment at SWI extends about 2cm below sediment surface and terminates in slight color change with few invaginations deeper into sediment (burrow halos?). Small black patches in sediment. Shell fragments in sediment column. Thin drape of fine sediment at SWI. Small tubes and fecal pellets at SWI.
405	405-02	A	Orange-tan coarse sand grading to medium sand near penetration maximum. Sediment structure is well sorted and firm. Few small shell fragments in sediment, especially at SWI. SWI has many sand dollars on it and no discernable detritus layer.
405	405-03	A	Orange -tan coarse sand grading to medium sand near pen maximum. Rounded to sub-rounded medium pebbles of various makeup at SWI. Small tubes are scant at SWI, but few are visible among pebbles.

Line Number	StationID	Replicate	Comments
405	405-04	A	Orange -tan coarse sand grading to medium sand near pen maximum. Rounded to sub-rounded medium pebbles of various makeup at SWI. Sediment is deeper orange near surface and subtly transitions to slightly gray near penetration maximum. Shrimp at SWI.
406	406-01	B	Tan, firm, fine sand with small black particles and ~2cm layer of orange-brown fine sand with depositional fines near SWI. Small shell fragments. Very thin drape of depositional fines at SWI. Small tubes visible at SWI and in far field.
406	406-02	B	Tan, firm sand with small black particles and slightly orange layer with depositional fines near SWI, color transition is very subtle. Small patch of gray fines visible near penetration maximum. Slight dip in SWI near center of image. Small tubes at SWI with two sand dollars.
407	407-01	A	Pale tan, soft, very fine sand and silt/clay with long streaks of oxidization visible (likely from burrowing and hydraulic pumping). Sediment grays toward finer material in deeper section of sediment column. Many small tubes at SWI, single large amphipod fecal strand.
407	407-02	A	Pale tan, soft, very fine sand and silt/clay with long streaks of oxidization visible (likely from burrowing and hydraulic pumping). Sediment grays toward finer material in deeper section of sediment column. Many small tubes at SWI.
407	407-03	B	Pale tan, soft, very fine sand and silt/clay with subtle color change occurring at ~2-3 cm deep (tan turning to gray-tan). Sediment becomes slightly more silty at penetration maximum SWI is irregular at and is studded with small tubes. Long tube(?) in far field.
409	409-01	A	Pale tan silt/clay and black fine sand, soft. SWI is slightly orangish and grades to a finer paler sediment gradually after top ~2cm. Slight burrow hallows visible in sediment. Very thin drape of fines at SWI. Short tubes with detritus at SWI, appear to be slightly deflected from current.
409	409-02	A	Pale tan, soft very fine sand and silt/clay with patches of near black fines. Sediment is moderately sorted, with medium black sand particles present. SWI is slightly darker than underlying sediment Three polychaetes visible in sediment column. Short tubes at SWI.
409	409-03	A	Firm, mostly black very coarse sand, with fewer orange and quartzite grains. Grains appear sub-angular and well sorted. Thin drape of fines at SWI. SWI slopes slightly.
409	409-04	A	Pale tan and gray soft very fine sand with silt/clay with streaks of oxidized sediment extending deep into visible area. aRPD clearly distinguishable. Void present. SWI is sloping and may be slightly disturbed. Tubes and pellets at SWI.
409	409-05	A	Tan silt/clay and black very fine sand, poorly sorted. SWI is slightly more orange-brown than underlying tan material. Silt/clay fines are distributed in patches in sediment column. Small polychaetes and burrow halos visible in sediment. Small tubes in far field, very short tubes in midfield.
409	409-06	A	Tan and black, firm, moderately sorted sand with fraction of silt/clay tan fines. Sediment column is slightly darker in upper ~3cm of sediment column. SWI is slightly rippled, with trough in center of image. Long extensions of oxidized fines pumped into sediment column from SWI. Short tubes at SWI. Small fecal strands.
409	409-07	A	Pale tan and gray, soft, silt/clay with few black sand grains. aRPD is easily distinguishable against underlying reduced material. Long orange-brown burrow haloes visible in sediment. Polychaete in sediment column to far right, tubes and pellets visible at SWI.

Line Number	StationID	Replicate	Date	Time	Image Width (cm)	Image Height (cm)	Field of View	CMECS Substrate Group/Subgroup	Surface Oxidation	Bedforms	Substrate Type	Debris	CMECS Biotic Subclass	Sensitive Taxa Present?
101	101-01	A	7/17/2017	0:56:24	102.77	68.51	0.7	Silty sand	ox	None	IND	Scant shell hash	Soft Sediment	No
101	101-02	A	7/17/2017	1:08:51	100.13	66.75	0.67	Silty sand	ox	None	IND	Shell hash, sand dollar tests, skate egg case	Soft Sediment	No
101	101-03	A	7/17/2017	1:36:22	97.44	64.96	0.63	Silty sand	ox	None	IND	Sand dollar tests	Soft Sediment	No
101	101-04	A	7/17/2017	2:08:42	102.16	68.11	0.7	Sand	ox	Shallow irregular ripples	IND	Scant shell hash, skate egg case	Soft Sediment	No
101	101-05	A	7/17/2017	2:37:50	106.34	70.89	0.75	Sand	ox	None	IND	Scant shell hash	Soft Sediment	No
102	102-01	A	7/15/2017	3:34:16	92.47	61.65	0.57	Sand	ox	None	IND	Shell hash	Soft Sediment	No
102	102-02	A	7/16/2017	23:41:30	104.49	69.66	0.73	Silty sand	ox	None	IND	Shell hash, sand dollar tests	Soft Sediment	No
102	102-03	A	7/16/2017	23:52:00	98.86	65.91	0.65	Silty sand	ox	Shallow irregular ripples	IND	Scant shell hash	Soft Sediment	No
102	102-04	A	7/17/2017	0:09:32	94.78	63.18	0.6	Silty sand	ox	None	IND	Scant shell hash	Soft Sediment	No
102	102-05	A	7/17/2017	3:12:34	97.26	64.84	0.63	Sand	ox	None	IND	Shell hash	Soft Sediment	No
102	102-06	A	7/17/2017	8:45:34	109.94	73.29	0.81	Sand	ox	None	IND	Shell hash	Soft Sediment	No
102	102-07	A	7/17/2017	9:37:08	104.56	69.71	0.73	Sand	ox	Shallow ripples	IND	Shell hash	Soft Sediment	No
103	103-01	A	7/16/2017	22:52:45	99.49	66.33	0.66	Sand	ox	Foraging Mounds & Depressions	IND	Scant shell hash, sand dollar tests	Soft Sediment	No
103	103-02	A	7/17/2017	3:45:58	104.84	69.89	0.73	Sand	ox	None	IND	Scant shell hash	Soft Sediment	No
103	103-03	A	7/17/2017	7:56:43	104.91	69.94	0.73	Sand	ox	None	IND	Scant shell hash	Soft Sediment	No
103	103-04	A	7/17/2017	8:09:01	108.26	72.17	0.78	Sand	ox	None	IND	Shell hash; sand dollar tests	Soft Sediment	No
103	103-05	A	7/17/2017	10:24:39	105.69	70.46	0.74	Sand	ox	None	IND	Scant shell hash; large shell fragment	Soft Sediment	No
103	103-06	A	7/17/2017	12:01:34	105.83	70.56	0.75	Silty sand	ox	Shallow irregular ripples	IND	Sand dollar test	Soft Sediment	No
104	104-01	A	7/16/2017	21:50:34	105.26	70.18	0.74	Sand	ox	Foraging Mound & Depression	IND	Scant shell hash; sand dollar tests; small shell fragments	Soft Sediment	No
104	104-02	A	7/16/2017	22:07:06	95.76	63.84	0.61	Sand	ox	None	IND	Scant shell hash; sand dollar tests; small shell fragments	Soft Sediment	No
104	104-03	A	7/17/2017	4:35:10	99.62	66.41	0.66	Sand	ox	None	IND	Scant shell hash; sand dollar test	Soft Sediment	No
104	104-04	A	7/17/2017	4:53:28	112.07	74.71	0.84	Sand	ox	None	IND	Sand dollar tests, small shell fragments	Soft Sediment	No
104	104-05	B	7/17/2017	5:41:59	101.17	67.44	0.68	Gravelly sand	ox	None	IND	Shell hash, small shell fragments, large shell fragments	Soft Sediment	No
104	104-06	A	7/17/2017	5:57:33	104.84	69.89	0.73	Sand	ox	None	IND	Shell hash	Soft Sediment	No
104	104-07	A	7/17/2017	6:13:31	106.34	70.89	0.75	Sand	ox	None	IND	Scant shell hash; sand dollar tests; small shell fragments	Soft Sediment	No
104	104-08	A	7/17/2017	6:28:29	98.17	65.45	0.64	Sand	ox	None	IND	Shell hash	Soft Sediment	No
104	104-09	A	7/17/2017	6:40:54	107.81	71.87	0.77	Sand	ox	None	IND	Shell hash	Soft Sediment	No
104	104-10	D	7/17/2017	7:14:20	103.45	68.97	0.71	Sand	ox	None	IND	Shell hash	Soft Sediment	No
104	104-11	D	7/17/2017	11:07:13	107.36	71.58	0.77	Sand	ox	Shallow ripples	IND	Shell hash; Small shell fragments	Soft Sediment	No
104	104-12	A	7/17/2017	14:17:58	104.28	69.52	0.72	Sand	ox	None	IND	Scant shell hash; sand dollar tests; small shell fragments	Soft Sediment	No
105	105-01	C	7/16/2017	17:45:39	105.83	70.56	0.75	Silty sand	ox	None	IND	Scant shell hash	Soft Sediment	No

Line Number	StationID	Replicate	Date	Time	Image Width (cm)	Image Height (cm)	Field of View	CMECS Substrate Group/Subgroup	Surface Oxidation	Bedforms	Substrate Type	Debris	CMECS Biotic Subclass	Sensitive Taxa Present?
105	105-02	A	7/16/2017	18:03:16	108.03	72.02	0.78	Sand	ox	None	IND	Shell hash	Soft Sediment	No
105	105-03	A	7/16/2017	18:58:13	105.19	70.13	0.74	Sand	ox	Slight rippling	IND	Shell hash; shell fragments; sand dollar tests	Soft Sediment	No
105	105-04	A	7/16/2017	19:34:13	104.84	69.89	0.73	Sand	ox	None	IND	Shell hash; shell fragments; sand dollar tests	Soft Sediment	No
105	105-05	A	7/16/2017	19:48:19	103.86	69.24	0.72	Sand	ox	Shallow ripples	IND	Shell hash	Soft Sediment	No
105	105-06	A	7/16/2017	20:17:10	100	66.67	0.67	Silty sand	ox	None	IND	Scant shell hash	Soft Sediment	No
105	105-07	A	7/16/2017	20:32:16	108.48	72.32	0.78	Silty sand	ox	Foraging Depression	IND	Scant shell hash	Soft Sediment	No
105	105-08	A	7/16/2017	21:06:52	103.11	68.74	0.71	Sand	ox	None	IND	Shell hash, large shell fragments, sand dollar tests	Soft Sediment	No
105	105-09	A	7/17/2017	14:58:37	103.86	69.24	0.72	Silty sand	ox	None	IND	Shell hash, sand dollar tests	Soft Sediment	No
105	105-10	B	7/17/2017	16:20:19	105.05	70.03	0.74	Sand	ox	Shallow ripples	IND	Shell hash, skate egg case	Soft Sediment	No
105	105-11	A	7/17/2017	16:37:09	106.85	71.23	0.76	Slightly gravelly sand	ox	None	IND	Shell hash, large shell fragments	Soft Sediment	No
105	105-12	A	7/17/2017	17:40:38	113.04	75.36	0.85	Silty sand	ox	None	IND	None	Soft Sediment	No
105	105-13	A	7/17/2017	18:38:37	108.33	72.22	0.78	Sand	ox	None	IND	Sand dollar tests	Soft Sediment	No
106	106-01	A	7/16/2017	14:02:03	103.17	68.78	0.71	Sand	ox	None	IND	Shell hash, large shell fragments	Soft Sediment	No
106	106-02	A	7/16/2017	14:17:01	105.55	70.37	0.74	Sand	ox	Shallow irregular ripples	IND	Shell hash, sand dollar tests, skate egg case	Soft Sediment	No
106	106-03	A	7/16/2017	14:48:08	108.71	72.47	0.79	Silty sand	ox	Foraging Mound & Depression	IND	Shell hash, small shell fragments, sand dollar test	Soft Sediment	No
106	106-04	A	7/16/2017	15:02:38	101.43	67.62	0.69	Silty sand	ox	None	IND	Shell hash, large shell fragments	Soft Sediment	No
106	106-05	B	7/16/2017	15:56:32	102.5	68.33	0.7	Sand	ox	None	IND	Shell hash, sand dollar tests	Soft Sediment	No
106	106-06	A	7/16/2017	16:53:52	107.73	71.82	0.77	Sand	ox	Shallow ripples	IND	Shell hash, small shell fragments, sand dollar test	Soft Sediment	No
106	106-07	A	7/17/2017	19:38:53	99.17	66.12	0.66	Sand	ox	None	IND	Scant shell hash, sand dollar test	Soft Sediment	No
106	106-08	A	7/23/2017	1:49:26	110.56	73.71	0.81	Silty Sand	ox	None	IND	Scant shell hash	Soft Sediment	No
106	106-09	A	7/23/2017	2:04:32	100.52	67.01	0.67	Silty Sand	ox	None	IND	Scant shell hash	Soft Sediment	No
106	106-10	A	7/26/2017	7:47:51	104.84	69.89	0.73	Sand	ox	Slight rippling	IND	Scant shell hash, sand dollar tests	Soft Sediment	No
106	106-11	A	7/26/2017	9:04:01	112.96	75.31	0.85	Slightly gravelly sand	ox	Slight rippling	IND	Shell hash, gray clay clasts	Soft Sediment	No
107	107-01	A	7/16/2017	10:43:37	106.05	70.7	0.75	Sand	ox	Hummocks	IND	Shell hash, small shell fragments	Soft Sediment	No
107	107-02	A	7/16/2017	11:13:43	105.41	70.27	0.74	Sand	ox	Depression	IND	Shell hash, small shell fragments	Soft Sediment	No
107	107-03	A	7/16/2017	11:35:38	106.41	70.94	0.75	Sand	ox	Slight rippling	IND	Shell hash, small shell fragments	Soft Sediment	No
107	107-04	A	7/16/2017	12:34:57	105.76	70.51	0.75	Sand	ox	Slight rippling	IND	Shell hash, small shell fragments, sand dollar tests	Soft Sediment	No
107	107-05	A	7/16/2017	13:14:51	103.79	69.19	0.72	Sand	ox	None	IND	Shell hash, sand dollar tests	Soft Sediment	No
107	107-06	A	7/16/2017	13:29:09	109.47	72.98	0.8	Sand	ox	Shallow irregular ripples	IND	Shell hash, large shell fragments, skate egg case	Soft Sediment	No
107	107-07	A	7/17/2017	20:31:40	101.83	67.89	0.69	Sand	ox	None	IND	Shell hash, small shell fragments, sand dollar tests	Soft Sediment	No
107	107-08	A	7/23/2017	2:43:06	102.16	68.11	0.7	Silty sand	ox	None	IND	Sand dollar tests	Soft Sediment	No

Line Number	StationID	Replicate	Date	Time	Image Width (cm)	Image Height (cm)	Field of View	CMECS Substrate Group/Subgroup	Surface Oxidation	Bedforms	Substrate Type	Debris	CMECS Biotic Subclass	Sensitive Taxa Present?
107	107-09	A	7/26/2017	7:12:02	106.7	71.14	0.76	Sand	ox	Shallow ripples	IND	Shell hash	Soft Sediment	No
107	107-10	A	7/26/2017	10:06:52	111.51	74.34	0.83	Sand	ox	Foraging Depression	IND	Scant shell hash	Soft Sediment	No
108	108-01	A	7/16/2017	9:52:12	114.71	76.47	0.88	Slightly gravelly sand	ox	None	IND	Shell hash	Soft Sediment	No
108	108-02	B	7/17/2017	21:20:47	98.67	65.78	0.65	Sand	ox	None	IND	Shell hash, small shell fragments, sand dollar tests	Soft Sediment	No
108	108-03	A	7/23/2017	3:20:54	99.05	66.03	0.65	Slightly gravelly sand	ox	None	IND	Small shell fragments	Soft Sediment	No
108	108-04	A	7/23/2017	4:32:04	106.56	71.04	0.76	Sand	ox	Possible Foraging Depression	IND	Scant shell hash, sand dollar tests	Soft Sediment	No
108	108-05	A	7/26/2017	6:35:09	116.85	77.9	0.91	Sand	ox	None	IND	Scant shell hash, sand dollar tests	Soft Sediment	No
108	108-06	B	7/26/2017	10:55:17	106.34	70.89	0.75	Sand	ox	None	IND	Shell hash	Soft Sediment	No
109	109-01	A	7/17/2017	21:51:59	106.12	70.75	0.75	Slightly gravelly sand	ox	Foraging Depression	IND	Shell hash, small shell fragments	Soft Sediment	No
109	109-02	A	7/23/2017	5:06:40	107.07	71.38	0.76	Silty sand	ox	None	IND	Scant shell hash, sand dollar tests	Soft Sediment	No
109	109-03	A	7/26/2017	5:58:45	99.24	66.16	0.66	Sand	ox	None	IND	Shell hash, small shell fragments, sand dollar tests	Soft Sediment	No
109	109-04	A	7/26/2017	11:36:49	101.56	67.71	0.69	Sand	ox	None	IND	Scant shell hash, small shell fragments, sand dollar tests	Soft Sediment	No
110	110-01	A	7/17/2017	22:25:49	100.78	67.18	0.68	Sand	ox	Small irregular ripples	IND	Scant shell hash, small shell fragments	Soft Sediment	No
110	110-02	A	7/17/2017	22:40:27	112.8	75.2	0.85	Silty sand	ox	Foraging Mound & Depression	IND	Scant shell hash	Soft Sediment	No
110	110-03	A	7/23/2017	5:47:41	109.94	73.29	0.81	Slightly gravelly sand	ox	None	IND	Scant shell hash, small shell fragments	Soft Sediment	No
110	110-04	A	7/26/2017	5:21:07	103.52	69.01	0.71	Sand	ox	None	IND	Shell hash, large shell fragments, sand dollar test	Soft Sediment	No
110	110-05	A	7/26/2017	12:17:14	101.43	67.62	0.69	Sand	ox	None	IND	Shell hash, sand dollar test, skate egg case	Soft Sediment	No
110	110-06	C	7/26/2017	17:19:12	109.94	73.29	0.81	Sand	ox	None	IND	Shell hash, small shell fragments	Soft Sediment	No
111	111-01	A	7/17/2017	23:21:18	101.04	67.36	0.68	Sand	ox	None	IND	Scant shell hash, small shell fragments, sand dollar test	Soft Sediment	No
111	111-02	A	7/17/2017	23:36:49	106.34	70.89	0.75	Sand	ox	None	IND	Shell hash, small shell fragments, sand dollar test	Soft Sediment	No
111	111-03	A	7/23/2017	6:19:47	104.21	69.47	0.72	Silt	ox	None	IND	None	Soft Sediment	No
111	111-04	A	7/23/2017	7:20:46	103.79	69.19	0.72	Slightly gravelly sand	ox	None	IND	None	Soft Sediment	No
111	111-05	B	7/26/2017	4:25:35	107.59	71.72	0.77	Slightly gravelly sand	ox	Slight irregular rippling	IND	Shell hash	Soft Sediment	No
111	111-06	A	7/26/2017	12:56:31	106.05	70.7	0.75	Sand	ox	Very small rippling	IND	Shell hash	Soft Sediment	No
111	111-07	A	7/26/2017	16:25:00	100.13	66.75	0.67	Gravelly Sand	ox	None	IND	Shell hash, large shell fragments	Soft Sediment	No
111	111-08	A	7/26/2017	18:18:50	113.62	75.75	0.86	Sand	ox	None	IND	Shell hash, sand dollar tests	Soft Sediment	No
112	112-01	A	7/18/2017	0:17:06	93.92	62.61	0.59	Sand	ox	None	IND	Shell hash, small shell fragments, sand dollar tests	Soft Sediment	No

Line Number	StationID	Replicate	Date	Time	Image Width (cm)	Image Height (cm)	Field of View	CMECS Substrate Group/Subgroup	Surface Oxidation	Bedforms	Substrate Type	Debris	CMECS Biotic Subclass	Sensitive Taxa Present?
112	112-02	C	7/18/2017	0:38:06	102.23	68.15	0.7	Sand	ox	Slight irregular rippling	IND	Shell hash	Soft Sediment	No
112	112-03	A	7/18/2017	1:01:41	102.03	68.02	0.69	Sand	ox	Shallow ripples	IND	Scant shell hash	Soft Sediment	No
112	112-04	C	7/26/2017	2:55:48	104.21	69.47	0.72	Gravelly sand	ox	None	IND	Small shell fragments	Soft Sediment	No
112	112-05	B	7/26/2017	3:15:13	100.19	66.8	0.67	Sandy gravel	ox	None	IND	Shell fragments	Soft Sediment	IND
112	112-06	C	7/26/2017	13:49:34	105.05	70.03	0.74	Sand	ox	Shallow ripples	IND	Scant shell hash	Soft Sediment	No
112	112-07	B	7/26/2017	15:48:28	104.21	69.47	0.72	Sand	ox	None	IND	Shell hash, small shell fragments	Soft Sediment	No
112	112-08	A	7/26/2017	19:04:55	106.56	71.04	0.76	Sand	ox	Ripples	IND	Shell hash, large shell fragments	Soft Sediment	No
112	112-09	A	7/26/2017	19:21:07	110.25	73.5	0.81	Slightly gravelly sand	ox	Shallow ripples	IND	Shell hash, small shell fragments, san dollar tests	Soft Sediment	No
113	113-01	A	7/18/2017	3:09:43	104.14	69.43	0.72	Sand	ox	Shallow irregular ripples	IND	Shell hash, small shell fragments	Soft Sediment	No
113	113-02	A	7/18/2017	3:26:14	97.08	64.72	0.63	Sand	ox	None	IND	Shell hash, sand dollar test	Soft Sediment	No
113	113-03	A	7/26/2017	14:31:59	112.07	74.71	0.84	Sand	ox	Shallow irregular ripples	IND	Shell hash, sand dollar test	Soft Sediment	No
113	113-04	B	7/26/2017	15:06:10	108.56	72.37	0.79	Gravelly sand	ox	Shallow irregular ripples	IND	Shell hash, sand dollar tests	Soft Sediment	No
113	113-05	A	7/26/2017	20:20:21	100.39	66.92	0.67	Sand	ox	Very small rippling	IND	Scant shell hash, sand dollar test	Soft Sediment	No
113	113-06	A	7/26/2017	20:39:07	106.12	70.75	0.75	Sand	ox	Ripples	IND	Shell hash, sand dollar tests	Soft Sediment	No
114	114-01	A	7/18/2017	4:55:22	107.73	71.82	0.77	Slightly gravelly sand	ox	Ripples	IND	Shell hash, sand dollar tests	Soft Sediment	No
114	114-02	A	7/26/2017	21:16:30	106.19	70.8	0.75	Slightly gravelly sand	ox	Shallow irregular ripples	IND	Shell hash, small and large shell fragments	Soft Sediment	No
115	115-01	A	7/18/2017	5:38:14	104.77	69.85	0.73	Sand	ox	None	IND	Shell hash, small shell fragments	Soft Sediment	No
115	115-02	A	7/26/2017	22:11:31	110.4	73.6	0.81	Slightly gravelly sand	ox	Slight irregular rippling	IND	Shell hash, sand dollar tests	Soft Sediment	No
116	116-01	A	7/18/2017	6:16:41	108.11	72.07	0.78	Sand	ox	Slight irregular rippling	IND	Scant shell hash, small shell fragments, sand dollar tests	Soft Sediment	No
116	116-02	A	7/18/2017	7:10:19	104.84	69.89	0.73	Gravelly sand	ox	Shallow ripples	IND	Scant shell hash, small shell fragments	Soft Sediment	No
116	116-03	A	7/26/2017	22:51:52	104.14	69.43	0.72	Sand	ox	None	IND	Shell hash, small shell fragments, large bone fragments	Soft Sediment	No
116	116-04	A	7/27/2017	1:23:42	112.07	74.71	0.84	Silty sand	ox	None	IND	Scant shell hash	Soft Sediment	No
117	117-01	A	7/18/2017	7:51:43	107.44	71.63	0.77	Slightly gravelly sand	ox	Slight irregular rippling	IND	Scant shell hash, small shell fragments, sand dollar tests	Soft Sediment	No
117	117-02	A	7/18/2017	8:14:22	105.69	70.46	0.74	Gravelly sand	ox	Slight irregular rippling	IND	Scant shell hash; small shell fragments	Soft Sediment	No
117	117-03	A	7/18/2017	8:29:12	106.78	71.18	0.76	Gravelly sand	ox	Slight irregular rippling	IND	Small shell fragments	Soft Sediment	No
117	117-04	A	7/26/2017	23:29:13	107	71.33	0.76	Sand	ox	Slight irregular rippling	IND	Shell hash, small shell fragments, sand dollar tests	Soft Sediment	No
117	117-05	A	7/27/2017	0:21:17	109.17	72.78	0.79	Gravelly sand	ox	None	IND	Small shell fragments	Soft Sediment	No
118	118-01	A	7/18/2017	9:05:50	100.91	67.27	0.68	Sand	ox	None	IND	Scant shell hash, sand dollar tests	Soft Sediment	No

Line Number	StationID	Replicate	Date	Time	Image Width (cm)	Image Height (cm)	Field of View	CMECS Substrate Group/Subgroup	Surface Oxidation	Bedforms	Substrate Type	Debris	CMECS Biotic Subclass	Sensitive Taxa Present?
118	118-02	B	7/18/2017	9:53:12	102.23	68.15	0.7	Slightly gravelly sand	ox	None	IND	Scant shell hash, small shell fragments	Soft Sediment	No
118	118-03	A	7/18/2017	11:44:49	107.14	71.43	0.77	Sand	ox	None	IND	Shell hash	Soft Sediment	No
118	118-04	A	7/18/2017	11:59:05	103.31	68.87	0.71	Sand	ox	None	IND	Shell hash, small shell fragments	Soft Sediment	No
118	118-05	A	7/18/2017	12:33:47	106.92	71.28	0.76	Gravelly sand	ox	None	IND	Shell hash, small shell fragments	Soft Sediment	No
118	118-06	A	7/18/2017	12:49:28	104.21	69.47	0.72	Gravelly sand	ox	None	IND	Small shell fragments	Soft Sediment	No
119	119-01	A	7/18/2017	10:32:22	105.55	70.37	0.74	Sand	ox	None	IND	Scant shell hash, sand dollar tests	Soft Sediment	No
119	119-02	A	7/18/2017	11:08:23	103.11	68.74	0.71	Gravelly sand	ox	None	IND	Small shell fragments	Soft Sediment	No
203	203-01	A	7/18/2017	20:33:13	99.94	66.62	0.67	Silty sand	ox	Hummocks	IND	Scant shell hash, small shell fragments	Soft Sediment	No
203	203-02	A	7/18/2017	22:44:36	99.24	66.16	0.66	Gravelly sand	ox	None	IND	Shell hash, small shell fragments	Soft Sediment	No
203	203-03	A	7/19/2017	0:20:12	101.17	67.44	0.68	Gravelly sand	ox	Slight irregular rippling	IND	Scant shell hash, small shell fragments	Soft Sediment	No
204	204-01	A	7/27/2017	3:15:23	112.8	75.2	0.85	Sand	ox	None	IND	Scant shell hash	Soft Sediment	No
204	204-02	A	7/27/2017	4:01:59	109.09	72.73	0.79	Sand	ox	None	IND	Shell hash, small shell fragments, sand dollar tests	Soft Sediment	No
205	205-02	A	7/19/2017	7:16:25	108.48	72.32	0.78	Sand	ox	Shallow ripples	IND	Scant shell hash, sand dollar tests	Soft Sediment	No
205	205-03	A	7/19/2017	9:53:16	105.26	70.18	0.74	Sand	ox	None	IND	Shell hash, small shell fragments, sand dollar tests	Soft Sediment	No
205	205-04	B	7/27/2017	4:47:07	112.8	75.2	0.85	Sand	ox	Shallow irregular ripples	IND	Shell hash, large shell fragment, sand dollar test	Soft Sediment	No
206	206-01	A	7/27/2017	5:25:46	114.2	76.13	0.87	Sand	ox	None	IND	Scant shell hash, small shell fragments	Soft Sediment	No
206	206-02	A	8/9/2017	15:39:39	119.82	79.88	0.96	Sand	ox	None	IND	Scant shell hash, small shell fragments, sand dollar tests	Soft Sediment	No
207	207-01	A	7/19/2017	15:32:06	92.75	61.83	0.57	Sand	ox	None	IND	Shell hash	Soft Sediment	No
207	207-02	A	7/19/2017	21:02:08	103.11	68.74	0.71	Slightly gravelly sand	ox	None	IND	Shell hash, shell fragments, crab carapace	Soft Sediment	No
207	207-03	B	7/27/2017	6:02:13	111.19	74.13	0.82	Sand	ox	Shallow irregular ripples	IND	Scant shell hash, sand dollar tests	Soft Sediment	No
207	207-04	A	7/27/2017	6:57:22	111.59	74.39	0.83	Sand	ox	None	IND	Shell hash, small shell fragments	Soft Sediment	No
207	207-05	A	8/9/2017	16:33:38	107.14	71.43	0.77	Sand	ox	None	IND	Scant shell hash, sand dollar tests	Soft Sediment	No
208	208-01	A	7/27/2017	7:44:28	115.47	76.98	0.89	Sand	ox	Slight hummocks	IND	Shell hash, small and large shell fragments	Soft Sediment	No
208	208-02	D	8/9/2017	17:13:33	113.79	75.86	0.86	Slightly gravelly sand	ox	None	IND	Shell hash, small shell fragments, sand dollar tests	Soft Sediment	No
208	208-03	A	8/9/2017	17:59:17	106.05	70.7	0.75	Gravelly sand	ox	None	IND	Shell hash, small shell fragments, sand dollar tests	Soft Sediment	No
209	209-01	A	7/27/2017	8:25:39	105.33	70.22	0.74	Sand	ox	IND	IND	Shell hash, large shell fragments	Soft Sediment	No
209	209-02	B	7/27/2017	9:18:34	105.33	70.22	0.74	Sand	ox	Irregular ripples	IND	Shell hash, sand dollar tests	Soft Sediment	No
209	209-03	A	7/28/2017	18:02:45	104.7	69.8	0.73	Sand	ox	Slight irregular rippling	IND	Shell hash, large shell fragment, sand dollar tests	Soft Sediment	No

Line Number	StationID	Replicate	Date	Time	Image Width (cm)	Image Height (cm)	Field of View	CMECS Substrate Group/Subgroup	Surface Oxidation	Bedforms	Substrate Type	Debris	CMECS Biotic Subclass	Sensitive Taxa Present?
209	209-04	B	7/28/2017	19:01:41	107.88	71.92	0.78	Silty sand	ox	Slight hummocks	IND	Scant shell hash	Soft Sediment	No
209	209-05	A	8/9/2017	18:32:41	111.03	74.02	0.82	Slightly gravelly sand	ox	None	IND	Shell hash, small shell fragments, sand dollar tests	Soft Sediment	IND
210	210-01	A	7/27/2017	9:54:18	112.96	75.31	0.85	Sand	ox	None	IND	Shell hash, small shell fragments	Soft Sediment	No
210	210-02	B	7/27/2017	11:09:06	111.19	74.13	0.82	Sand	ox	None	IND	Shell hash, small shell fragments	Soft Sediment	No
210	210-03	A	7/28/2017	13:12:16	112.55	75.04	0.84	Sand	ox	None	IND	Shell hash, small shell fragments, sand dollar test	Soft Sediment	No
210	210-04	A	7/28/2017	16:53:56	113.21	75.47	0.85	Slightly gravelly sand	ox	Irregular ripples	IND	Scant shell hash, small and large shell fragments, sand dollar test	Soft Sediment	No
210	210-05	A	7/28/2017	17:28:57	110.64	73.76	0.82	Slightly gravelly sand	ox	None	IND	Scant shell hash, sand dollar test, skate egg case	Soft Sediment	No
210	210-06	A	7/28/2017	19:31:31	103.11	68.74	0.71	Sand	ox	Slight hummocks	IND	Scant shell hash, sand dollar test	Soft Sediment	No
210	210-07	A	7/28/2017	19:48:16	102.7	68.47	0.7	Sand	ox	Slight hummocks	IND	Shell hash, skate egg case	Soft Sediment	No
210	210-08	A	7/28/2017	20:40:52	113.95	75.97	0.87	Sand	ox	None	IND	Shell hash, sand dollar test, skate egg case	Soft Sediment	No
210	210-09	B	8/9/2017	19:06:23	108.86	72.58	0.79	Sand	ox	None	IND	Shell hash, small shell fragments, articulated clam shell, sand dollar test	Soft Sediment	No
211	211-01	A	7/27/2017	11:47:04	108.64	72.42	0.79	Sand	ox	None	IND	Shell hash, small shell fragments, sand dollar tests	Soft Sediment	No
211	211-02	A	7/28/2017	9:16:31	104.91	69.94	0.73	Sand	ox	None	IND	Scant shell hash, small shell fragments, sand dollar tests	Soft Sediment	No
211	211-03	A	7/28/2017	11:01:27	107.88	71.92	0.78	Sand	ox	None	IND	Shell hash, small shell fragments, sand dollar tests	Soft Sediment	No
211	211-04	A	7/28/2017	12:16:43	112.72	75.14	0.85	Sand	ox	None	IND	Shell hash, small shell fragments, sand dollar tests	Soft Sediment	No
211	211-05	A	7/28/2017	13:57:57	108.48	72.32	0.78	Sand	ox	None	IND	Shell hash, large shell fragments, sand dollar tests	Soft Sediment	No
211	211-06	A	7/28/2017	14:11:30	117.29	78.2	0.92	Sand	ox	None	IND	Shell hash, sand dollar tests, skate egg case	Soft Sediment	No
211	211-07	A	7/28/2017	16:15:13	109.78	73.19	0.8	Sand	ox	None	IND	Shell hash, sand dollar tests	Soft Sediment	No
211	211-08	B	7/28/2017	21:14:31	105.26	70.18	0.74	Slightly gravelly sand	ox	None	IND	Shell hash, sand dollar tests	Soft Sediment	No
211	211-09	A	7/28/2017	21:54:39	113.62	75.75	0.86	Sand	ox	None	IND	Shell hash, sand dollar tests	Soft Sediment	No
211	211-10	A	8/9/2017	19:41:55	107.22	71.48	0.77	Sand	ox	None	IND	Shell hash, small shell fragments, sand dollar tests	Soft Sediment	No
212	212-01	A	7/5/2017	21:53:28	106.92	71.28	0.76	Sand	ox	None	IND	Shell hash, with irregular chunks, sand dollar tests	Soft Sediment	No
212	212-02	A	7/5/2017	22:07:41	112.23	74.82	0.84	Sand	ox	None	IND	Shell hash, with irregular chunks, sand dollar tests	Soft Sediment	No
212	212-03	B	7/5/2017	22:21:24	110.56	73.71	0.81	Sand	ox	None	IND	Scant shell hash, small shell fragments, sand dollar tests	Soft Sediment	No
212	212-04	A	7/27/2017	12:18:46	112.64	75.09	0.85	Sand	ox	None	IND	Scant shell hash, small shell fragments, sand dollar tests	Soft Sediment	No
212	212-05	A	7/28/2017	8:21:19	113.04	75.36	0.85	Sand	ox	None	IND	Scant shell hash, small shell fragments	Soft Sediment	No

Line Number	StationID	Replicate	Date	Time	Image Width (cm)	Image Height (cm)	Field of View	CMECS Substrate Group/Subgroup	Surface Oxidation	Bedforms	Substrate Type	Debris	CMECS Biotic Subclass	Sensitive Taxa Present?
212	212-06	A	7/28/2017	14:54:30	105.91	70.6	0.75	Slightly gravelly sand	ox	None	IND	Shell hash, razor clam shell fragments	Soft Sediment	No
212	212-07	A	7/28/2017	15:39:26	111.59	74.39	0.83	Sand	ox	None	IND	Shell hash, small shell fragments, sand dollar tests	Soft Sediment	No
212	212-08	A	7/28/2017	22:25:28	115.47	76.98	0.89	Sand	ox	None	IND	Shell hash, small and large shell fragments	Soft Sediment	No
212	212-09	A	7/28/2017	22:37:29	101.76	67.84	0.69	Sand	ox	None	IND	Scant shell hash	Soft Sediment	No
212	212-10	A	8/9/2017	20:45:47	115.56	77.04	0.89	Sand	ox	Slight irregular rippling	IND	Shell hash, large shell fragments	Soft Sediment	No
213	213-01	C	7/27/2017	12:57:46	107.73	71.82	0.77	Sand	ox	Irregular hummocks	IND	Scant shell hash	Soft Sediment	No
213	213-02	A	7/27/2017	13:30:03	106.05	70.7	0.75	Sand	ox	Possible Foraging Depression	IND	Scant shell hash	Soft Sediment	No
213	213-03	A	7/28/2017	7:31:07	112.55	75.04	0.84	Silty sand	ox	None	IND	Small shell fragments, organic debris	Soft Sediment	No
213	213-04	A	8/9/2017	21:32:09	114.37	76.25	0.87	Sand	ox	None	IND	Shell hash, large shell fragments, sand dollar tests	Soft Sediment	No
213	213-05	A	8/9/2017	22:22:50	117.74	78.49	0.92	Sand	ox	None	IND	Shell hash, large shell fragments	Soft Sediment	No
214	214-01	A	7/27/2017	14:09:33	110.64	73.76	0.82	Silt	ox	None	IND	Scant shell hash	Soft Sediment	No
214	214-02	D	7/28/2017	6:54:51	IND	IND	IND	Silt	ox	None	IND	Scant shell hash, large shell fragments	Soft Sediment	No
214	214-03	A	8/9/2017	23:00:04	109.24	72.83	0.8	Sand	ox	None	IND	Shell hash, large shell fragments	Soft Sediment	No
214	214-04	A	8/10/2017	0:02:58	118.18	78.79	0.93	Sand	ox	None	IND	Scant shell hash	Soft Sediment	No
214	214-05	A	8/10/2017	0:16:21	103.17	68.78	0.71	Silty sand	ox	Foraging Depressions	IND	Scant shell hash	Soft Sediment	No
214	214-06	A	8/10/2017	0:33:22	107.07	71.38	0.76	Sand	ox	None	IND	Scant shell hash, sand dollar tests	Soft Sediment	No
215	215-01	A	7/27/2017	15:01:59	113.37	75.58	0.86	Silt	ox	None	IND	Scant shell hash	Soft Sediment	No
215	215-02	A	7/27/2017	15:43:32	113.79	75.86	0.86	Silt	ox	None	IND	Scant shell hash	Soft Sediment	No
215	215-03	C	7/27/2017	16:41:57	108.79	72.52	0.79	Silt	ox	None	IND	Scant shell hash, small shell fragments, skate egg cases	Soft Sediment	No
215	215-04	A	7/28/2017	4:32:29	108.71	72.47	0.79	Sand	ox	None	IND	Scant shell hash, small shell fragments	Soft Sediment	No
215	215-05	A	7/28/2017	5:29:51	112.39	74.93	0.84	Silty sand	ox	None	IND	Scant shell hash, large shell fragments, skate egg case	Soft Sediment	No
215	215-06	B	7/28/2017	6:04:30	113.95	75.97	0.87	Slightly gravelly sand	ox	None	IND	Scant shell hash, small shell fragments, sand dollar tests	Soft Sediment	No
215	215-07	A	8/10/2017	1:13:51	103.59	69.06	0.72	Sand	ox	Irregular ripples	IND	Shell hash, sand dollar test	Soft Sediment	No
215	215-08	C	8/10/2017	2:15:51	111.11	74.07	0.82	Sand	ox	None	IND	Shell hash, small and large shell fragments, sand dollar tests	Soft Sediment	No
215	215-09	A	8/10/2017	2:27:03	103.79	69.19	0.72	Sand	ox	Slight irregular rippling	IND	Shell hash, large shell fragments, sand dollar tests, skate egg case	Soft Sediment	No
216	216-01	A	7/27/2017	17:27:10	112.07	74.71	0.84	Sand	ox	Hummocks	IND	Scant shell hash	Soft Sediment	No
216	216-02	A	7/28/2017	2:56:23	112.39	74.93	0.84	Slightly gravelly sand	ox	Slight irregular rippling	IND	Shell hash, small and large shell fragments	Soft Sediment	No

Line Number	StationID	Replicate	Date	Time	Image Width (cm)	Image Height (cm)	Field of View	CMECS Substrate Group/Subgroup	Surface Oxidation	Bedforms	Substrate Type	Debris	CMECS Biotic Subclass	Sensitive Taxa Present?
216	216-03	A	8/7/2017	12:50:13	114.79	76.53	0.88	Sand	ox	None	IND	Scant shell hash, large scallop shells, sand dollar tests	Soft Sediment	No
216	216-04	A	8/7/2017	13:08:58	116.24	77.5	0.9	Sand	ox	Foraging Depressions	IND	Scant shell hash	Soft Sediment	No
216	216-05	A	8/7/2017	14:20:14	110.8	73.86	0.82	Sand	ox	None	IND	Scant shell hash, sand dollar tests	Soft Sediment	No
216	216-06	C	8/10/2017	3:01:00	111.59	74.39	0.83	Slightly gravelly sand	ox	None	IND	Scant shell hash, small shell fragments, sand dollar tests	Soft Sediment	No
216	216-07	A	8/10/2017	3:11:34	116.07	77.38	0.9	Gravelly sand	ox	None	IND	Shell hash, small shell fragments, sand dollar tests	Soft Sediment	No
217	217-01	A	7/27/2017	18:11:51	114.37	76.25	0.87	Sand	ox	IND	IND	Shell hash, sand dollar tests	Soft Sediment	No
217	217-02	A	7/27/2017	18:26:52	112.15	74.77	0.84	Sand	ox	None	IND	Scant shell hash, large shell fragments, sand dollar tests	Soft Sediment	No
217	217-03	A	7/28/2017	0:25:20	108.79	72.52	0.79	Sand	ox	None	IND	Scant shell hash, large shell fragments	Soft Sediment	No
217	217-04	A	7/28/2017	1:20:12	107.22	71.48	0.77	Slightly gravelly sand	ox	None	IND	Scant shell hash, sand dollar test	Soft Sediment	No
217	217-05	A	7/28/2017	2:07:07	114.54	76.36	0.87	Sand	ox	Ripple	IND	Shell hash, small shell fragments, sand dollar tests	Soft Sediment	No
217	217-06	A	8/7/2017	11:36:27	114.62	76.41	0.88	Sand	ox	None	IND	Shell hash, small shell fragments, sand dollar tests	Soft Sediment	No
217	217-07	A	8/7/2017	12:08:29	116.24	77.5	0.9	Sand	ox	None	IND	Shell hash, small shell fragments	Soft Sediment	No
217	217-08	A	8/7/2017	16:28:22	113.21	75.47	0.85	Sand	ox	Hummocks	IND	Scant shell hash, sand dollars	Soft Sediment	No
217	217-09	A	8/10/2017	3:49:24	112.72	75.14	0.85	Sand	ox	None	IND	Shell hash, small shell fragments, sand dollar tests	Soft Sediment	No
217	217-10	A	8/10/2017	4:02:05	111.51	74.34	0.83	Slightly gravelly sand	ox	Slight irregular rippling	IND	Shell hash, small shell fragments, sand dollar tests	Soft Sediment	No
218	218-01	A	7/27/2017	19:02:46	112.72	75.14	0.85	Sandy gravel	ox	None	IND	Small shell fragments	Soft Sediment	No
218	218-02	A	7/27/2017	19:15:58	111.11	74.07	0.82	Sand	ox	None	IND	Scant shell hash, Small shell fragments	Soft Sediment	No
218	218-03	A	7/27/2017	23:23:46	110.09	73.39	0.81	Gravelly Sand	ox	None	IND	Scant shell hash, small shell fragments, sand dollar tests	Soft Sediment	No
218	218-04	A	7/27/2017	23:46:33	111.43	74.29	0.83	Sand	ox	None	IND	Shell hash, small shell fragments	Soft Sediment	No
218	218-05	C	8/7/2017	7:56:08	113.13	75.42	0.85	Sand	ox	None	IND	Shell hash, small and large shell fragments, sand dollar tests	Soft Sediment	No
218	218-06	A	8/7/2017	8:40:35	120.37	80.25	0.97	Sand	ox	Irregular ripples	IND	Scant shell hash, large shell fragment	Soft Sediment	No
218	218-07	A	8/7/2017	10:31:32	112.07	74.71	0.84	Sand	ox	None	IND	Shell hash, small shell fragments, sand dollar tests	Soft Sediment	No
218	218-08	A	8/7/2017	11:00:32	115.38	76.92	0.89	Sand	ox	None	IND	Shell hash, small shell fragments, sand dollar tests	Soft Sediment	No
218	218-09	A	8/7/2017	17:03:04	112.47	74.98	0.84	Silty sand	ox	None	IND	Scant shell hash, small shell fragments, large scallop shell	Soft Sediment	IND
218	218-10	A	8/7/2017	17:17:57	115.3	76.87	0.89	Silty sand	ox	None	IND	None	Soft Sediment	No
219	219-01	A	7/27/2017	20:00:00	112.15	74.77	0.84	Sand	ox	None	IND	Shell hash, small shell fragments, sand dollar tests	Soft Sediment	No

Line Number	StationID	Replicate	Date	Time	Image Width (cm)	Image Height (cm)	Field of View	CMECS Substrate Group/Subgroup	Surface Oxidation	Bedforms	Substrate Type	Debris	CMECS Biotic Subclass	Sensitive Taxa Present?
219	219-02	A	7/27/2017	21:01:01	113.62	75.75	0.86	Sand	ox	None	IND	Scant shell hash, large scallop shells, sand dollar tests	Soft Sediment	No
219	219-03	A	7/27/2017	22:43:40	109.47	72.98	0.8	Sand	ox	None	IND	Shell hash, small shell fragments	Soft Sediment	No
219	219-04	A	8/7/2017	7:03:59	117.65	78.43	0.92	Slightly gravelly sand	ox	None	IND	Scant shell hash, large shell fragments	Soft Sediment	No
219	219-05	A	8/7/2017	18:04:30	109.94	73.29	0.81	Silt	ox	None	IND	None	Soft Sediment	No
219	219-06	A	8/10/2017	5:07:13	112.96	75.31	0.85	Sand	ox	Slight irregular rippling	IND	Shell hash	Soft Sediment	No
219	219-07	A	8/10/2017	5:22:35	108.26	72.17	0.78	Sand	ox	None	IND	Scant shell hash, sand dollar tests	Soft Sediment	No
301	301-01	A	8/7/2017	4:53:19	113.37	75.58	0.86	Sand	ox	None	IND	Scant shell hash, sand dollar tests	Soft Sediment	No
301	301-02	A	8/7/2017	5:35:10	115.47	76.98	0.89	Slightly gravelly sand	ox	None	IND	Scant shell hash, large shell fragments	Soft Sediment	No
301	301-03	A	8/7/2017	6:19:19	113.95	75.97	0.87	Sand	ox	None	IND	Scant shell hash	Soft Sediment	No
301	301-04	A	8/7/2017	18:46:50	108.56	72.37	0.79	Silt	ox	None	IND	Scant shell hash	Soft Sediment	No
301	301-05	A	8/10/2017	6:25:05	111.03	74.02	0.82	Sand	ox	Foraging Depression	IND	Shell hash, large shell fragments, sand dollar tests	Soft Sediment	No
301	301-06	B	8/10/2017	6:42:51	107.44	71.63	0.77	Sand	ox	None	IND	Shell hash, large shell fragments, sand dollar tests	Soft Sediment	No
302	302-01	A	6/28/2017	2:12:28	93.53	62.35	0.58	Sand	ox	Slight rippling	IND	Shell hash	Soft Sediment	No
302	302-02	A	6/28/2017	2:27:04	96.59	64.4	0.62	Sand	ox	Slight rippling	IND	Shell hash, sand dollar tests	Soft Sediment	No
302	302-03	A	6/28/2017	3:16:34	111.03	74.02	0.82	Silty sand	ox	Foraging Mounds & Depressions	IND	Shell hash, sand dollar tests	Soft Sediment	No
302	302-04	A	6/28/2017	3:31:57	109.94	73.29	0.81	Sand	ox	None	IND	Shell hash, small shell fragments, sand dollar tests	Soft Sediment	No
302	302-05	A	6/28/2017	4:06:55	106.12	70.75	0.75	Slightly gravelly sand	ox	None	IND	Shell hash, large shell fragments, sand dollar tests	Soft Sediment	No
302	302-06	A	8/7/2017	4:15:09	108.33	72.22	0.78	Sand	ox	None	IND	Shell hash, large shell fragments	Soft Sediment	No
302	302-07	A	8/7/2017	19:25:33	108.71	72.47	0.79	Silty sand	ox	None	IND	Small shell fragments	Soft Sediment	No
303	303-01	A	6/28/2017	5:17:49	106.41	70.94	0.75	Sand	ox	None	IND	Scant shell hash, sand dollar tests	Soft Sediment	No
303	303-02	A	6/28/2017	6:17:56	111.91	74.61	0.83	Sand	ox	None	IND	Scant shell hash, sand dollar tests	Soft Sediment	No
303	303-03	A	6/28/2017	6:38:27	110.64	73.76	0.82	Sand	ox	None	IND	Scant shell hash, sand dollar tests	Soft Sediment	No
303	303-04	A	8/7/2017	3:27:08	113.21	75.47	0.85	Silty sand	ox	None	IND	Scant shell hash, few large shells	Soft Sediment	No
303	303-05	B	8/7/2017	20:32:58	112.39	74.93	0.84	Sand	ox	None	IND	Small shell fragments, sand dollar tests	Soft Sediment	No
303	303-06	A	8/10/2017	9:43:57	110.64	73.76	0.82	Sand	ox	None	IND	Shell hash, sand dollar tests	Soft Sediment	No
303	303-07	B	8/10/2017	10:04:21	115.3	76.87	0.89	Sand	ox	None	IND	Shell hash, small shell fragments, sand dollar tests	Soft Sediment	No
304	304-01	A	6/28/2017	7:39:00	108.18	72.12	0.78	Silty sand	ox	None	IND	Scant shell hash	Soft Sediment	No

Line Number	StationID	Replicate	Date	Time	Image Width (cm)	Image Height (cm)	Field of View	CMECS Substrate Group/Subgroup	Surface Oxidation	Bedforms	Substrate Type	Debris	CMECS Biotic Subclass	Sensitive Taxa Present?
304	304-02	C	6/28/2017	9:05:52	111.35	74.23	0.83	Sand	ox	None	IND	Shell hash, small shell fragments, sand dollar tests	Soft Sediment	No
304	304-03	A	6/28/2017	9:45:14	110.25	73.5	0.81	Sand	ox	Foraging Depression	IND	Shell hash, small shell fragments, sand dollar tests	Soft Sediment	No
304	304-04	A	6/28/2017	10:06:34	95.82	63.88	0.61	Slightly gravelly sand	ox	None	IND	Shell hash, large shell fragments, sand dollar tests	Soft Sediment	No
304	304-05	A	8/7/2017	0:03:02	112.39	74.93	0.84	Silt	ox	None	IND	Scant shell hash	Soft Sediment	No
304	304-06	A	8/7/2017	1:16:24	105.48	70.32	0.74	Silt	ox	None	IND	None	Soft Sediment	No
304	304-07	A	8/7/2017	2:49:22	113.37	75.58	0.86	Sand	ox	None	IND	Shell hash; large shell fragments	Soft Sediment	No
304	304-08	A	8/7/2017	21:03:23	114.29	76.19	0.87	Silty sand	ox	None	IND	Shell hash; large shell fragments	Soft Sediment	No
304	304-09	A	8/7/2017	21:41:56	111.35	74.23	0.83	Sand	ox	Ripples	IND	Scant shell hash	Soft Sediment	No
401	401-01	A	6/28/2017	11:03:23	109.24	72.83	0.8	Sand	ox	None	IND	Scant shell hash, sand dollar tests	Soft Sediment	No
401	401-02	A	6/28/2017	11:27:56	112.8	75.2	0.85	Sand	ox	None	IND	Shell hash, small shell fragments, sand dollar tests	Soft Sediment	No
401	401-03	A	6/28/2017	12:12:12	109.55	73.03	0.8	Silty sand	ox	Foraging Depression	IND	Shell hash	Soft Sediment	No
401	401-04	A	6/28/2017	12:51:23	108.64	72.42	0.79	Slightly gravelly sand	ox	None	IND	Shell hash, large shell fragments	Soft Sediment	No
401	401-05	A	6/28/2017	13:28:23	112.07	74.71	0.84	Silt	ox	None	IND	None	Soft Sediment	No
401	401-06	B	8/6/2017	23:04:30	109.17	72.78	0.79	Silty sand	ox	Shallow ripples	IND	Scant shell hash	Soft Sediment	No
401	401-07	B	8/10/2017	13:59:32	107.73	71.82	0.77	Silty sand	ox	Shallow ripples	IND	None	Soft Sediment	No
401	401-08	A	8/10/2017	14:20:21	110.01	73.34	0.81	Silty sand	ox	Shallow irregular ripples	IND	Scant shell hash	Soft Sediment	No
402	402-01	A	6/28/2017	14:15:21	108.26	72.17	0.78	Silt	ox	None	IND	None	Soft Sediment	No
402	402-02	A	6/28/2017	14:26:22	108.71	72.47	0.79	Silt	ox	None	IND	None	Soft Sediment	No
402	402-03	A	8/6/2017	20:54:30	113.21	75.47	0.85	Silty sand	ox	None	IND	Scant shell hash, large shell halves, sand dollar tests, crab carapace	Soft Sediment	No
402	402-04	A	8/6/2017	21:29:05	111.11	74.07	0.82	Sand	ox	None	IND	Scant shell hash, sand dollar tests	Soft Sediment	No
402	402-05	A	8/6/2017	22:13:04	114.45	76.3	0.87	Silty sand	ox	None	IND	Scant shell hash	Soft Sediment	No
403	403-01	B	6/28/2017	15:12:44	113.29	75.53	0.86	Silty sand	ox	None	IND	Scant shell hash	Soft Sediment	No
403	403-02	A	6/28/2017	15:26:49	114.37	76.25	0.87	Silty sand	ox	None	IND	Scant shell hash	Soft Sediment	No
403	403-03	B	6/28/2017	16:06:43	109.01	72.68	0.79	Silty sand	ox	None	IND	Shell hash, large shell fragments	Soft Sediment	No
403	403-04	A	6/28/2017	16:51:30	109.24	72.83	0.8	Silty sand	ox	None	IND	Scant shell hash	Soft Sediment	No
403	403-05	B	6/28/2017	17:18:54	109.01	72.68	0.79	Silt	ox	None	IND	Scant shell hash	Soft Sediment	No
403	403-06	A	6/28/2017	17:37:27	112.64	75.09	0.85	Silt	ox	None	IND	None	Soft Sediment	No
403	403-07	A	8/6/2017	19:30:06	99.94	66.62	0.67	Sand	ox	Slight irregular rippling	IND	Scant shell hash	Soft Sediment	No
403	403-08	A	8/6/2017	20:17:57	105.98	70.65	0.75	Sand	ox	None	IND	Scant shell hash, small shell fragments	Soft Sediment	No
404	404-01	C	6/28/2017	18:41:55	107.36	71.58	0.77	Sand	ox	Slight irregular rippling	IND	Shell hash, sand dollar tests	Soft Sediment	No

Line Number	StationID	Replicate	Date	Time	Image Width (cm)	Image Height (cm)	Field of View	CMECS Substrate Group/Subgroup	Surface Oxidation	Bedforms	Substrate Type	Debris	CMECS Biotic Subclass	Sensitive Taxa Present?
404	404-02	C	6/28/2017	19:01:40	104.98	69.99	0.73	Sand	ox	Slight irregular rippling	IND	Scant shell hash	Soft Sediment	No
404	404-03	A	8/6/2017	18:55:34	110.01	73.34	0.81	Sand	ox	None	IND	Shell hash, small and large shell fragments	Soft Sediment	No
405	405-01	A	8/6/2017	16:48:17	107.51	71.67	0.77	Silty sand	ox	None	IND	Scant shell hash	Soft Sediment	No
405	405-02	A	8/6/2017	18:07:56	102.77	68.51	0.7	Sand	ox	Long shallow ripple	IND	Shell hash, scallop shell, sand dollar tests	Soft Sediment	No
405	405-03	A	8/10/2017	16:35:50	110.87	73.92	0.82	Gravelly sand	ox	None	IND	Small shell fragments	Soft Sediment	No
405	405-04	A	8/10/2017	16:50:38	111.67	74.45	0.83	Gravelly sand	ox	None	IND	Small shell fragments	Soft Sediment	No
406	406-01	B	8/10/2017	17:35:43	113.45	75.64	0.86	Sand	ox	Slight hummocks	IND	Scant shell hash, large shell fragments (including scallop shells)	Soft Sediment	No
406	406-02	B	8/10/2017	17:50:20	111.03	74.02	0.82	Sand	ox	Foraging Depression	IND	Scant shell hash, sand dollar tests	Soft Sediment	No
407	407-01	A	8/10/2017	18:28:53	106.41	70.94	0.75	Slightly gravelly silty sand	ox	None	IND	Small and large shell fragments	Soft Sediment	No
407	407-02	A	8/10/2017	18:40:19	109.7	73.14	0.8	Silt	ox	None	IND	Scant small shell fragments	Soft Sediment	No
407	407-03	B	8/10/2017	18:53:58	106.7	71.14	0.76	Silt	ox	None	IND	None	Soft Sediment	No
409	409-01	A	8/10/2017	19:45:14	109.55	73.03	0.8	Silt	ox	None	IND	Scant small shell fragments	Soft Sediment	No
409	409-02	A	8/10/2017	19:54:07	114.45	76.3	0.87	Silty sand	ox	None	IND	Scant small shell fragments	Soft Sediment	No
409	409-03	A	8/10/2017	20:02:16	108.48	72.32	0.78	Sand	ox	None	IND	Scant small shell fragments	Soft Sediment	No
409	409-04	A	8/10/2017	20:10:51	112.72	75.14	0.85	Silt	ox	None	IND	Scant small shell fragments	Soft Sediment	No
409	409-05	A	8/10/2017	20:25:53	111.27	74.18	0.83	Silty sand	ox	None	IND	Scant small shell fragments	Soft Sediment	No
409	409-06	A	8/10/2017	20:38:44	114.71	76.47	0.88	Silty sand	ox	None	IND	Scant shell hash	Soft Sediment	No
409	409-07	A	8/10/2017	20:47:18	111.67	74.45	0.83	Slightly gravelly silty sand	ox	Foraging Depression	IND	Scant shell hash	Soft Sediment	No

Line Number	StationID	Replicate	Tubes Present?	Burrows Present?	Tracks Present?	Infauna	Epifauna	Sand Dollars Percent Cover	Live Scallop(s) Present?	Flora
101	101-01	A	No	Yes	No	None	Sand dollars (large and small size classes), hermit crab	Moderate (30 to < 70%)	No	None
101	101-02	A	No	Yes	Yes	None	Sand dollars (large and small size classes), small shrimp	Sparse (1 to <30%)	No	None
101	101-03	A	Yes	Yes	Yes	None	Sand dollars, nudibranchs, flatfish, hydroids	Trace (<1%)	No	None
101	101-04	A	Yes	Yes	Yes	None	Sand dollars (small and large size classes)	Moderate (30 to < 70%)	No	None
101	101-05	A	No	No	No	None	Sand dollars (small and large size classes), gastropod	Moderate (30 to < 70%)	No	None
102	102-01	A	No	No	No	None	Sand dollars (small and large size classes)	Sparse (1 to <30%)	No	None
102	102-02	A	No	No	Yes	None	Sand dollars (small and large size classes)	Moderate (30 to < 70%)	No	None
102	102-03	A	Yes	No	Yes	None	Sand dollars (small and large size classes) , small gastropods	Sparse (1 to <30%)	No	None
102	102-04	A	Yes	Yes	Yes	None	Sand dollars (small and large size classes)	Moderate (30 to < 70%)	No	None
102	102-05	A	Yes	No	Yes	None	Sand dollars, crab	Moderate (30 to < 70%)	No	None
102	102-06	A	Yes	No	Yes	None	Sand dollars (small and large size class), nudibranchs	Sparse (1 to <30%)	No	None
102	102-07	A	Yes	No	No	None	Sand dollars (small and large size class), hermit crab	Moderate (30 to < 70%)	No	None
103	103-01	A	Yes	Yes	Yes	Cerianthids	Sand dollars, gastropods, nudibranch	Moderate (30 to < 70%)	No	None
103	103-02	A	No	No	Yes	None	Sand dollars (small and large size class), hermit crab	Moderate (30 to < 70%)	No	None
103	103-03	A	Yes	Yes	No	None	Sand dollars (small and large size class), nudibranch	Sparse (1 to <30%)	No	None
103	103-04	A	Yes	No	Yes	None	Sand dollars	Sparse (1 to <30%)	No	None
103	103-05	A	Yes	No	No	None	Sand dollars	Sparse (1 to <30%)	No	None
103	103-06	A	No	No	Yes	None	Sand dollars (small and large size class)	Moderate (30 to < 70%)	No	None
104	104-01	A	No	Yes	Yes	None	Sand dollars (small and large size class), hermit crab	Dense (70 to < 90%)	No	None
104	104-02	A	Yes	Yes	No	None	Sand dollars (small and large size class), hermit crab	Moderate (30 to < 70%)	No	None
104	104-03	A	Yes	No	Yes	None	Sand dollars (small and large size class)	Sparse (1 to <30%)	No	None
104	104-04	A	Yes	Yes	Yes	None	Sand dollars (small and large size class), nudibranch	Moderate (30 to < 70%)	No	None
104	104-05	B	No	No	No	None	Sand dollars, hermit crab, crab	Trace (<1%)	No	None
104	104-06	A	Yes	Yes	No	Bivalve, Cerianthid	Sand dollars	Trace (<1%)	No	None
104	104-07	A	Yes	Yes	Yes	None	Sand dollars, corymorpha, nudibranchs	Sparse (1 to <30%)	No	None
104	104-08	A	No	Yes	Yes	None	None	None	No	None
104	104-09	A	No	Yes	No	None	Sand dollars, hermit crab	Trace (<1%)	No	None
104	104-10	D	No	Yes	Yes	None	Sand dollars (small and large size class),	Trace (<1%)	No	None
104	104-11	D	No	Yes	No	None	Sand dollars	Trace (<1%)	No	None
104	104-12	A	Yes	Yes	Yes	Cerianthid	Sand dollars (large and small size class), gastropods	Sparse (1 to <30%)	No	None
105	105-01	C	No	Yes	No	None	Sand dollars (small and large size class)	Dense (70 to < 90%)	No	None
105	105-02	A	No	Yes	No	Cerianthid	Sand dollars (small and large size class), hermit crab	Trace (<1%)	No	None
105	105-03	A	Yes	No	Yes	None	Sand dollars	Moderate (30 to < 70%)	No	None
105	105-04	A	Yes	Yes	Yes	None	Sand dollars, small gastropod	Trace (<1%)	No	None
105	105-05	A	Yes	Yes	No	None	Sand dollars; small fish	Sparse (1 to <30%)	No	None
105	105-06	A	Yes	Yes	No	None	Sand dollars	Moderate (30 to < 70%)	No	None
105	105-07	A	Yes	Yes	Yes	None	Sand dollars (small and large size class)	Moderate (30 to < 70%)	No	None
105	105-08	A	No	No	Yes	None	Sand dollars (small and large size class), hermit crab, gastropod	Moderate (30 to < 70%)	No	None
105	105-09	A	Yes	Yes	No	None	Sand dollar, gastropods	Trace (<1%)	No	None
105	105-10	B	Yes	No	No	None	Sand dollars, gastropods	Trace (<1%)	No	None

Line Number	StationID	Replicate	Tubes Present?	Burrows Present?	Tracks Present?	Infauna	Epifauna	Sand Dollars Percent Cover	Live Scallop(s) Present?	Flora
105	105-11	A	Yes	No	No	None	Sand dollars, gastropods	Trace (<1%)	No	None
105	105-12	A	Yes	Yes	Yes	None	Sand dollars, sponge, gastropods	Sparse (1 to <30%)	No	None
105	105-13	A	Yes	Yes	Yes	None	Sand dollars, gastropods	Moderate (30 to < 70%)	No	None
106	106-01	A	Yes	Yes	No	None	Barnacles	None	No	None
106	106-02	A	No	Yes	Yes	None	Sand dollars (small and large size class), gastropods	Sparse (1 to <30%)	No	None
106	106-03	A	Yes	Yes	Yes	None	Sand dollars (small and large size class)	Moderate (30 to < 70%)	No	None
106	106-04	A	No	Yes	Yes	None	Sand dollars (small and large size class), hermit crabs	Moderate (30 to < 70%)	No	None
106	106-05	B	Yes	Yes	Yes	None	Sand dollars (small and large size class)	Moderate (30 to < 70%)	No	None
106	106-06	A	Yes	No	Yes	None	Sand dollars (small and large size class), hermit crabs	Trace (<1%)	No	None
106	106-07	A	No	No	Yes	None	Sand dollars (large and small size class), gastropods, very large moon snail (foot is 26 cm across)	Sparse (1 to <30%)	No	None
106	106-08	A	Yes	Yes	No	None	None	None	No	None
106	106-09	A	Yes	Yes	Yes	None	Hermit crab	None	No	None
106	106-10	A	Yes	No	No	None	Sand dollars, hermit crab	Sparse (1 to <30%)	No	None
106	106-11	A	Yes	No	Yes	None	Sand dollars	Trace (<1%)	No	None
107	107-01	A	Yes	Yes	Yes	None	Sand dollars (small and large size class)	Sparse (1 to <30%)	No	None
107	107-02	A	Yes	Yes	Yes	None	Sand dollars (small and large size class), Moon snail egg case	Sparse (1 to <30%)	No	None
107	107-03	A	No	Yes	No	None	Sand dollars (small and large size class)	Sparse (1 to <30%)	No	None
107	107-04	A	Yes	Yes	No	None	Sand dollars (small and large size class)	Sparse (1 to <30%)	No	None
107	107-05	A	Yes	Yes	Yes	None	Sand dollars (small and large size class)	Moderate (30 to < 70%)	No	None
107	107-06	A	No	No	No	None	Sand dollars (small and large size class)	Moderate (30 to < 70%)	No	None
107	107-07	A	Yes	No	Yes	None	Sand dollars (small and large size class), gastropods, hermit crab	Moderate (30 to < 70%)	No	None
107	107-08	A	Yes	Yes	Yes	None	Sand dollars, gastropods	Sparse (1 to <30%)	No	None
107	107-09	A	No	No	Yes	None	Sand dollars, gastropods	Sparse (1 to <30%)	No	None
107	107-10	A	No	Yes	Yes	None	Sand dollars (small and large size class), gastropods	Sparse (1 to <30%)	No	None
108	108-01	A	Yes	Yes	Yes	None	Sand dollars, gastropods, corymorpha, hermit crab	Trace (<1%)	No	None
108	108-02	B	Yes	No	No	None	Sand dollars, sea stars, gastropod	Sparse (1 to <30%)	No	None
108	108-03	A	Yes	No	Yes	None	Scallop, sand dollar, hydroids	Trace (<1%)	Yes	None
108	108-04	A	Yes	Yes	Yes	None	Sand dollars, gastropod	Trace (<1%)	No	None
108	108-05	A	Yes	Yes	Yes	None	Sand dollars, gastropod	Sparse (1 to <30%)	No	None
108	108-06	B	No	No	Yes	None	Sand dollars	Sparse (1 to <30%)	No	None
109	109-01	A	Yes	No	Yes	Cerianthid	Sand dollars (small and large size class), corymorpha, scallop	Sparse (1 to <30%)	Yes	None
109	109-02	A	Yes	Yes	Yes	None	Sand dollars, nudibranch	Trace (<1%)	No	None
109	109-03	A	Yes	Yes	Yes	None	Sand dollars	Sparse (1 to <30%)	No	None
109	109-04	A	No	No	Yes	None	Sand dollars (small and large size class)	Moderate (30 to < 70%)	No	None
110	110-01	A	Yes	Yes	Yes	None	Sand dollars (small and large size class)	Dense (70 to < 90%)	No	None
110	110-02	A	Yes	Yes	Yes	None	Sand dollars	Sparse (1 to <30%)	No	None
110	110-03	A	Yes	No	Yes	None	None	None	No	None
110	110-04	A	No	Yes	Yes	None	Sand dollars (small and large size class), corymorpha	Sparse (1 to <30%)	No	None
110	110-05	A	Yes	Yes	Yes	None	Sand dollars, gastropod	Sparse (1 to <30%)	No	None

Line Number	StationID	Replicate	Tubes Present?	Burrows Present?	Tracks Present?	Infauna	Epifauna	Sand Dollars Percent Cover	Live Scallop(s) Present?	Flora
110	110-06	C	No	Yes	No	None	Sand dollars (small and large size class)	Sparse (1 to <30%)	No	None
111	111-01	A	Yes	Yes	Yes	None	Sand dollars (small and large size class)	Moderate (30 to < 70%)	No	None
111	111-02	A	Yes	Yes	Yes	None	Sand dollars (small and large size class)	Sparse (1 to <30%)	No	None
111	111-03	A	Yes	Yes	No	None	Sea stars; demersal fish	None	No	None
111	111-04	A	No	No	No	None	Hydroids	None	No	None
111	111-05	B	No	No	Yes	None	Sand dollars	Sparse (1 to <30%)	No	None
111	111-06	A	No	No	Yes	None	Sand dollars (small and large size class)	Sparse (1 to <30%)	No	None
111	111-07	A	No	No	No	None	Sand dollars	Trace (<1%)	No	None
111	111-08	A	No	Yes	No	None	Sand dollars, scallop	Moderate (30 to < 70%)	Yes	None
112	112-01	A	Yes	No	No	None	Sand dollars (small and large size class)	Sparse (1 to <30%)	No	None
112	112-02	C	Yes	No	No	None	Sand dollars, gastropods, corymorpha	Sparse (1 to <30%)	No	None
112	112-03	A	Yes	Yes	No	Bivalve	Sand dollars	Sparse (1 to <30%)	No	None
112	112-04	C	Yes	Yes	Yes	None	Scallop, demersal fish	None	Yes	None
112	112-05	B	No	No	Yes	Cerianthids	Attached hydroids; possible egg case, unknown origin	None	No	None
112	112-06	C	Yes	No	Yes	None	Sand dollars, gastropod, unidentified flatworm(?)	Trace (<1%)	No	None
112	112-07	B	No	No	Yes	None	Sand dollars, crab, hermit crab	Dense (70 to < 90%)	No	None
112	112-08	A	No	No	No	None	Sand dollars	Sparse (1 to <30%)	No	None
112	112-09	A	No	No	No	None	Sand dollars, hermit crab.	Sparse (1 to <30%)	No	None
113	113-01	A	No	No	No	None	Sand dollars	Sparse (1 to <30%)	No	None
113	113-02	A	No	No	No	None	Sand dollars	Sparse (1 to <30%)	No	None
113	113-03	A	Yes	No	Yes	None	Sand dollars	Sparse (1 to <30%)	No	None
113	113-04	B	Yes	Yes	Yes	None	Sand dollars, gastropod, hermit crab	Sparse (1 to <30%)	No	None
113	113-05	A	Yes	No	No	None	Sand dollars, gastropod, small fish	Trace (<1%)	No	None
113	113-06	A	Yes	No	Yes	None	Sand dollars, sponge	Moderate (30 to < 70%)	No	None
114	114-01	A	Yes	No	Yes	Cerianthid	Sand dollars (small and large size class), crab	Moderate (30 to < 70%)	No	None
114	114-02	A	No	No	Yes	None	Sand dollars (small and large size class), hermit crab, hydroids	Moderate (30 to < 70%)	No	None
115	115-01	A	No	No	Yes	None	Sand dollars	Sparse (1 to <30%)	No	None
115	115-02	A	Yes	No	No	None	Sand dollars (small and large size class)	Sparse (1 to <30%)	No	None
116	116-01	A	Yes	No	Yes	None	Sand dollars (small and large size class)	Sparse (1 to <30%)	No	None
116	116-02	A	No	No	Yes	None	Sand dollars	Trace (<1%)	No	None
116	116-03	A	Yes	Yes	Yes	None	Sand dollars (small and large size class)	Moderate (30 to < 70%)	No	None
116	116-04	A	Yes	Yes	Yes	Cerianthid	Sand dollar, scallop	Trace (<1%)	Yes	None
117	117-01	A	Yes	No	No	None	Sand dollars	Trace (<1%)	No	None
117	117-02	A	Yes	No	No	Cerianthids	Sand dollars, scallop	Sparse (1 to <30%)	Yes	None
117	117-03	A	Yes	Yes	Yes	Cerianthids	Sand dollars	Trace (<1%)	No	None
117	117-04	A	Yes	Yes	No	Cerianthid	Sand dollars (small and large size class), gastropods	Sparse (1 to <30%)	No	None
117	117-05	A	No	Yes	No	Cerianthid	Sand dollars, corymorpha	Trace (<1%)	No	None
118	118-01	A	Yes	Yes	Yes	None	Sand dollars (small and large size class)	Sparse (1 to <30%)	No	None
118	118-02	B	Yes	Yes	Yes	Cerianthid	Sand dollars (small and large size class), hermit crab	Trace (<1%)	No	None
118	118-03	A	Yes	Yes	Yes	Cerianthids	Sand dollars (small and large size class), hermit crab	Trace (<1%)	No	None

Line Number	StationID	Replicate	Tubes Present?	Burrows Present?	Tracks Present?	Infauna	Epifauna	Sand Dollars Percent Cover	Live Scallop(s) Present?	Flora
118	118-04	A	Yes	No	Yes	None	Sand dollars (small and large size class)	Sparse (1 to <30%)	No	None
118	118-05	A	No	Yes	No	None	Burrowing fish	None	No	None
118	118-06	A	Yes	No	No	None	Sand dollars, scallops	Trace (<1%)	Yes	None
119	119-01	A	Yes	Yes	Yes	Cerianthids	Sand dollars (small and large size class)	Sparse (1 to <30%)	No	None
119	119-02	A	Yes	No	Yes	Cerianthids	Sand dollar, scallop, moon snail	Trace (<1%)	Yes	None
203	203-01	A	Yes	Yes	No	None	Hermit crab	None	No	None
203	203-02	A	Yes	Yes	No	None	Hydroids	None	No	None
203	203-03	A	Yes	No	No	None	Hermit crabs	None	No	None
204	204-01	A	Yes	No	Yes	None	None	None	No	None
204	204-02	A	Yes	No	Yes	None	Sand dollars, scallop, fish	Trace (<1%)	Yes	None
205	205-02	A	Yes	No	Yes	None	Sand dollars (small and large size class), crabs, metridium anemone, corymorpha, shrimp	Sparse (1 to <30%)	No	None
205	205-03	A	Yes	No	No	None	None	None	No	None
205	205-04	B	Yes	No	Yes	None	Sand dollars	Trace (<1%)	No	None
206	206-01	A	Yes	Yes	Yes	None	Sand dollars (small and large size class), moon snail, shrimp	Sparse (1 to <30%)	No	None
206	206-02	A	Yes	Yes	Yes	None	Sand dollars, shrimp	Trace (<1%)	No	None
207	207-01	A	Yes	No	No	None	Sand dollars	Trace (<1%)	No	None
207	207-02	A	Yes	No	No	None	Shrimp	None	No	None
207	207-03	B	No	Yes	Yes	IND	Sand dollars, scallop, gastropod, hydroids	Sparse (1 to <30%)	Yes	None
207	207-04	A	Yes	Yes	Yes	None	Sand dollars (Small and large size class), fish	Sparse (1 to <30%)	No	None
207	207-05	A	Yes	Yes	Yes	None	Sand dollars (Small and large size class), gastropods	Sparse (1 to <30%)	No	None
208	208-01	A	Yes	Yes	Yes	None	Moon snail	None	No	None
208	208-02	D	Yes	Yes	No	None	Sand dollars, gastropod	Sparse (1 to <30%)	No	None
208	208-03	A	No	No	No	None	Sand dollars, hermit crab, moon snail egg case	Trace (<1%)	No	None
209	209-01	A	Yes	Yes	Yes	None	Sand dollars (Small and large size class), shrimp	Trace (<1%)	No	None
209	209-02	B	Yes	No	Yes	Cerianthids	Sand dollars (small and large size class), nudibranch (dorid)	Sparse (1 to <30%)	No	None
209	209-03	A	Yes	No	Yes	None	Sand dollars (small and large size class)	Moderate (30 to < 70%)	No	None
209	209-04	B	Yes	Yes	Yes	None	Shrimp, sea stars, corymorpha	None	No	None
209	209-05	A	No	Yes	Yes	None	Sand dollars	Trace (<1%)	No	None
210	210-01	A	Yes	Yes	Yes	None	Sand dollars (small and large size class), shrimp	Trace (<1%)	No	None
210	210-02	B	Yes	Yes	Yes	None	Sand dollars (small and large size class), hermit crab	Sparse (1 to <30%)	No	None
210	210-03	A	Yes	Yes	Yes	None	Sand dollar, small scallop	Trace (<1%)	Yes	None
210	210-04	A	Yes	Yes	Yes	None	Sand dollars (small and large size class), crab, shrimp, gastropods, nudibranch	Sparse (1 to <30%)	No	None
210	210-05	A	Yes	Yes	Yes	None	Sand dollars (small and large size classes), gastropod	Sparse (1 to <30%)	No	None
210	210-06	A	Yes	Yes	Yes	None	Sand dollars (mostly small size class), gastropods, flatfish	Sparse (1 to <30%)	No	None
210	210-07	A	Yes	Yes	Yes	None	Sand dollars (small size class), nudibranch, gastropod, very small flatfish	Sparse (1 to <30%)	No	None
210	210-08	A	Yes	Yes	Yes	None	Sand dollars (small and large size class), gastropod, shrimp	Sparse (1 to <30%)	No	None
210	210-09	B	Yes	Yes	Yes	None	Sand dollars, gastropod	Sparse (1 to <30%)	No	None
211	211-01	A	Yes	No	Yes	Cerianthid	Sand dollars (small and large size class), shrimp, demersal fish	Moderate (30 to < 70%)	No	None

Line Number	StationID	Replicate	Tubes Present?	Burrows Present?	Tracks Present?	Infauna	Epifauna	Sand Dollars Percent Cover	Live Scallop(s) Present?	Flora
211	211-02	A	Yes	Yes	Yes	None	Sand dollars (small size class), shrimp	Trace (<1%)	No	None
211	211-03	A	Yes	Yes	Yes	None	Sand dollars	Sparse (1 to <30%)	No	None
211	211-04	A	Yes	No	Yes	None	Sand dollars	Sparse (1 to <30%)	No	None
211	211-05	A	Yes	No	Yes	None	Sand dollars (small and large size class)	Sparse (1 to <30%)	No	None
211	211-06	A	Yes	Yes	Yes	Cerianthid	Sand dollars (small and large size class), shrimp	Sparse (1 to <30%)	No	None
211	211-07	A	Yes	Yes	Yes	None	Sand dollars (mostly small size class), flatfish, gastropod	Dense (70 to < 90%)	No	None
211	211-08	B	No	No	Yes	None	Sand dollars (mostly small size class)	Moderate (30 to < 70%)	No	None
211	211-09	A	Yes	Yes	Yes	None	Sand dollars (mostly small size class), gastropods	Moderate (30 to < 70%)	No	None
211	211-10	A	Yes	No	Yes	None	Sand dollars, shrimp	Trace (<1%)	No	None
212	212-01	A	No	Yes	No	Cerianthid	Cancer crab (possible, lower right near edge), Sand dollars (small and 1 large)	Trace (<1%)	No	None
212	212-02	A	No	Yes	Yes	None	Sand dollars (small and 1 large)	Trace (<1%)	No	None
212	212-03	B	Yes	Yes	Yes	None	Sand dollars, shrimp	Trace (<1%)	No	None
212	212-04	A	Yes	Yes	Yes	None	Sand dollars, shrimp	Trace (<1%)	No	None
212	212-05	A	Yes	Yes	Yes	None	Sand dollars, shrimp	Trace (<1%)	No	None
212	212-06	A	Yes	Yes	Yes	None	Sand dollars (mostly small size class), hermit crab	Sparse (1 to <30%)	No	None
212	212-07	A	Yes	Yes	Yes	None	Sand dollars (mostly small size class), hermit crab, shrimp, possible orange sponge or nudibranch at lower middle edge	Dense (70 to < 90%)	No	None
212	212-08	A	Yes	Yes	Yes	None	Sand dollars (small and large size class)	Sparse (1 to <30%)	No	None
212	212-09	A	Yes	Yes	Yes	None	Sand dollars (mostly small size class), gastropods	Dense (70 to < 90%)	No	None
212	212-10	A	Yes	Yes	Yes	None	Sand dollars, shrimp	Trace (<1%)	No	None
213	213-01	C	Yes	Yes	Yes	None	Sand dollars (small and large size class), shrimp	Sparse (1 to <30%)	No	None
213	213-02	A	Yes	Yes	Yes	None	Sand dollars (small and large size class), shrimp	Sparse (1 to <30%)	No	None
213	213-03	A	Yes	Yes	Yes	None	Sea stars	None	No	None
213	213-04	A	Yes	Yes	Yes	None	Sand dollars (small and large size class)	Sparse (1 to <30%)	No	None
213	213-05	A	Yes	Yes	Yes	None	Sand dollars (small and large size class)	Moderate (30 to < 70%)	No	None
214	214-01	A	Yes	Yes	Yes	Cerianthid	Sea stars, shrimp, gastropod, moon snail egg case	None	No	None
214	214-02	D	Yes	Yes	Yes	None	Sea stars	None	No	None
214	214-03	A	Yes	Yes	Yes	None	Sand dollars (small and large size class), moon snail egg case	Moderate (30 to < 70%)	No	None
214	214-04	A	Yes	Yes	Yes	None	Sand dollars (small size class only), hermit crabs, shrimp, nudibranch	Trace (<1%)	No	None
214	214-05	A	Yes	Yes	Yes	None	Sand dollars (small and large size class), Jonah crab	Sparse (1 to <30%)	No	None
214	214-06	A	Yes	Yes	Yes	None	Sand dollars (small size class only), flatfish	Trace (<1%)	No	None
215	215-01	A	Yes	Yes	Yes	None	Sea stars, shrimp, flatfish	None	No	None
215	215-02	A	Yes	Yes	Yes	None	Sand dollars, sea stars, shrimp	Trace (<1%)	No	None
215	215-03	C	Yes	Yes	Yes	None	Sand dollars, sea stars, shrimp, demersal fish	Trace (<1%)	No	None
215	215-04	A	Yes	No	Yes	None	Sand dollars, shrimp	Trace (<1%)	No	None
215	215-05	A	Yes	No	Yes	None	Sand dollars, clam	Trace (<1%)	No	None
215	215-06	B	Yes	Yes	No	None	Sand dollars, sea stars, crab	Trace (<1%)	No	None
215	215-07	A	No	No	Yes	None	Sand dollars (mainly small size class)	Moderate (30 to < 70%)	No	None
215	215-08	C	No	No	Yes	None	Sand dollars (mainly small size class)	Moderate (30 to < 70%)	No	None

Line Number	StationID	Replicate	Tubes Present?	Burrows Present?	Tracks Present?	Infauna	Epifauna	Sand Dollars Percent Cover	Live Scallop(s) Present?	Flora
215	215-09	A	No	No	Yes	None	Sand dollars (small and large size class)	Moderate (30 to < 70%)	No	None
216	216-01	A	Yes	Yes	Yes	None	Sand dollars (mainly small size class), hermit crabs	Moderate (30 to < 70%)	No	None
216	216-02	A	Yes	Yes	Yes	None	Sand dollars; hermit crabs; moon snail egg case	Sparse (1 to <30%)	No	None
216	216-03	A	Yes	Yes	Yes	None	Sand dollars, moon snail egg case	Sparse (1 to <30%)	No	None
216	216-04	A	Yes	Yes	Yes	None	Sand dollars, scallop, shrimp	Sparse (1 to <30%)	Yes	None
216	216-05	A	Yes	Yes	Yes	None	Sand dollars (small and large size class), scallop	Moderate (30 to < 70%)	Yes	None
216	216-06	C	No	No	No	None	Sand dollars (mostly small size class)	Sparse (1 to <30%)	No	None
216	216-07	A	No	No	No	None	Sand dollars (small and large size class), shrimp, gastropod	Sparse (1 to <30%)	No	None
217	217-01	A	No	Yes	No	None	Sand dollars (small and large size classes)	Moderate (30 to < 70%)	No	None
217	217-02	A	Yes	Yes	Yes	None	Sand dollars	Sparse (1 to <30%)	No	None
217	217-03	A	Yes	Yes	Yes	None	Sand dollars, flatfish	Sparse (1 to <30%)	No	None
217	217-04	A	Yes	Yes	Yes	None	Sand dollars (mostly small size class)	Sparse (1 to <30%)	No	None
217	217-05	A	Yes	Yes	Yes	None	Sand dollars (mostly small size class)	Moderate (30 to < 70%)	No	None
217	217-06	A	Yes	Yes	Yes	None	Sand dollars (small size class)	Sparse (1 to <30%)	No	None
217	217-07	A	Yes	Yes	Yes	None	Sand dollars (small size class), scallop, hermit crab, shrimp	Trace (<1%)	Yes	None
217	217-08	A	Yes	Yes	Yes	None	Sand dollars, shrimp	Trace (<1%)	No	None
217	217-09	A	Yes	Yes	Yes	None	Sand dollars (mostly small size class), hermit crab, shrimp	Moderate (30 to < 70%)	No	None
217	217-10	A	Yes	Yes	Yes	None	Sand dollars (small and large size class), scallop	Sparse (1 to <30%)	Yes	None
218	218-01	A	No	Yes	No	None	Hermit crab, shrimp	None	No	None
218	218-02	A	No	Yes	Yes	None	Sand dollars (small and large size class)	Dense (70 to < 90%)	No	None
218	218-03	A	No	No	No	None	Sand dollars (small and large size class)	Moderate (30 to < 70%)	No	None
218	218-04	A	Yes	No	Yes	None	Sand dollars (small size class), scallop, fish	Sparse (1 to <30%)	Yes	None
218	218-05	C	Yes	Yes	Yes	Cerianthid	Sand dollars, scallop	Sparse (1 to <30%)	Yes	None
218	218-06	A	Yes	Yes	Yes	None	Sand dollars, scallop	Moderate (30 to < 70%)	Yes	None
218	218-07	A	No	No	Yes	None	Sand dollars (mostly small, few large size class)	Dense (70 to < 90%)	No	None
218	218-08	A	Yes	Yes	Yes	None	Sand dollars, shrimp	Trace (<1%)	No	None
218	218-09	A	Yes	Yes	Yes	None	Small fish	None	No	None
218	218-10	A	Yes	Yes	Yes	None	Shrimp, sea stars	None	No	None
219	219-01	A	Yes	No	Yes	None	Sand dollars (mostly small size class, few large individuals) crab, hermit crab	Dense (70 to < 90%)	No	None
219	219-02	A	Yes	No	Yes	None	Sand dollars (mostly small size class, few large individuals) sea stars	Moderate (30 to < 70%)	No	None
219	219-03	A	Yes	No	Yes	None	Sand dollars	Sparse (1 to <30%)	No	None
219	219-04	A	Yes	Yes	Yes	None	Sand dollars, shrimp	Trace (<1%)	No	None
219	219-05	A	Yes	Yes	Yes	None	Sea stars, shrimp	None	No	None
219	219-06	A	Yes	Yes	Yes	None	Sand dollars, scallop	Sparse (1 to <30%)	Yes	None
219	219-07	A	Yes	Yes	Yes	None	Sand dollars (mostly small size class), gastropod	Sparse (1 to <30%)	No	None
301	301-01	A	Yes	Yes	No	None	Sand dollars (mostly small size class)	Moderate (30 to < 70%)	No	None
301	301-02	A	Yes	No	Yes	None	Sand dollars (small size class)	Trace (<1%)	No	None
301	301-03	A	Yes	Yes	Yes	Cerianthid	Sand dollars, shrimp	Trace (<1%)	No	None

Line Number	StationID	Replicate	Tubes Present?	Burrows Present?	Tracks Present?	Infauna	Epifauna	Sand Dollars Percent Cover	Live Scallop(s) Present?	Flora
301	301-04	A	Yes	Yes	Yes	Cerianthids	Sea stars, shrimp, unidentified organism	None	No	None
301	301-05	A	No	Yes	Yes	None	Sand dollars (small and large size class), shrimp, scallop	Moderate (30 to < 70%)	Yes	None
301	301-06	B	No	No	Yes	None	Sand dollars (mostly small, few large size class), shrimp	Moderate (30 to < 70%)	No	None
302	302-01	A	No	No	IND	None	Sand dollars (all smaller size class), hermit crab, gastropod, shrimp	Sparse (1 to <30%)	No	None
302	302-02	A	No	Yes	No	Bivalve, Cerianthid	Sand dollars (mostly small size class), hermit crab, gastropod, shrimp	Moderate (30 to < 70%)	No	None
302	302-03	A	No	Yes	Yes	None	Sand dollars (mostly small size class), flatfish	Sparse (1 to <30%)	No	None
302	302-04	A	No	Yes	No	None	Sand dollars (mostly small size class), sea star, shrimp	Moderate (30 to < 70%)	No	None
302	302-05	A	No	Yes	No	None	Sand dollars (all smaller size class)	Moderate (30 to < 70%)	No	None
302	302-06	A	Yes	Yes	Yes	None	Sand dollars (larger size class), sea stars, corymorpha	Trace (<1%)	No	None
302	302-07	A	Yes	Yes	Yes	None	Small shrimp, sea stars	None	No	None
303	303-01	A	No	No	No	None	Small sand dollars	Sparse (1 to <30%)	No	None
303	303-02	A	No	Yes	Yes	None	Sand dollars (small and large size classes), Cancer crab, Hermit crab, Sea stars, Shrimp	Moderate (30 to < 70%)	No	None
303	303-03	A	No	Yes	Yes	None	Sand dollars (small and large size classes), Sea stars	Moderate (30 to < 70%)	No	None
303	303-04	A	Yes	Yes	Yes	None	Sea stars, small shrimp	None	No	None
303	303-05	B	Yes	No	Yes	None	Sand dollars (large size class), small shrimp	Dense (70 to < 90%)	No	None
303	303-06	A	Yes	Yes	Yes	None	Sand dollars (small and large size classes); small shrimp	Moderate (30 to < 70%)	No	None
303	303-07	B	Yes	No	Yes	None	Sand dollars (small and large size classes); small shrimp	Moderate (30 to < 70%)	No	None
304	304-01	A	No	Yes	Yes	None	Sand dollars (all larger size class), Shrimp	Sparse (1 to <30%)	No	None
304	304-02	C	No	Yes	No	None	Sand dollars (small and large size classes), hermit crab	Moderate (30 to < 70%)	No	None
304	304-03	A	No	Yes	Yes	None	Sand dollars (small and large size classes),Gastropod?, Scallop	Moderate (30 to < 70%)	Yes	None
304	304-04	A	No	Yes	Yes	None	Sand dollars (small and large size classes)	Sparse (1 to <30%)	No	None
304	304-05	A	No	Yes	Yes	Cerianthids	Small shrimp, sea stars (exposed and buried)	None	No	None
304	304-06	A	Yes	Yes	Yes	Cerianthids	Hydroids?, Sea stars, small fish	None	No	None
304	304-07	A	Yes	No	Yes	None	Sand dollars (small and large size class), demersal fish	Moderate (30 to < 70%)	No	None
304	304-08	A	No	Yes	Yes	None	Small shrimp, hydroids	None	No	None
304	304-09	A	Yes	Yes	Yes	None	Sea stars, small shrimp, corymorpha	None	No	None
401	401-01	A	No	Yes	Yes	None	Sand dollars (small only), Shrimp, Gastropod (whelk),	Sparse (1 to <30%)	No	None
401	401-02	A	No	Yes	Yes	None	Sand dollars (small and large size classes), Cancer crab, Corymorpha (5), Shrimp	Moderate (30 to < 70%)	No	None
401	401-03	A	IND	Yes	Yes	Cerianthid	Sand dollars (small and large), Sea Star, Shrimp	Trace (<1%)	No	None
401	401-04	A	IND	Yes	Yes	None	Holothurian, Shrimp	None	No	None
401	401-05	A	Yes	Yes	Yes	Cerianthids	Sand dollar (1), Sea stars, Shrimp, flatfish	Trace (<1%)	No	None
401	401-06	B	Yes	Yes	Yes	Cerianthids	Sand dollar (1), small shrimp, moon snail egg case	Trace (<1%)	No	None
401	401-07	B	No	No	Yes	None	Sand dollars (large size class only), scallops (2), small shrimp	Moderate (30 to < 70%)	Yes	None
401	401-08	A	Yes	No	Yes	None	Sand dollars (large and small size classes), small shrimp, fish	Sparse (1 to <30%)	No	None
402	402-01	A	Yes	Yes	Yes	Cerianthids	Sea stars, Shrimp, flatfish	None	No	None
402	402-02	A	Yes	Yes	No	Cerianthids	Sand dollar (1), Sea stars, Shrimp	Trace (<1%)	No	None
402	402-03	A	Yes	Yes	Yes	None	Sand dollars (large), small shrimp, flatfish	Sparse (1 to <30%)	No	None

Line Number	StationID	Replicate	Tubes Present?	Burrows Present?	Tracks Present?	Infauna	Epifauna	Sand Dollars Percent Cover	Live Scallop(s) Present?	Flora
402	402-04	A	Yes	Yes	Yes	None	Sand dollars (large), sea star (buried), small shrimp, hydroids	Sparse (1 to <30%)	No	None
402	402-05	A	Yes	No	Yes	None	Sand dollars (large), small shrimp, exposed and buried sea stars	Trace (<1%)	No	None
403	403-01	B	Yes	Yes	Yes	None	Sand dollars (all large size class), Corymorpha hydroid (3), Sea stars, Shrimp; small sponges	Trace (<1%)	No	None
403	403-02	A	Yes	Yes	Yes	None	Corymorpha hydroids (3), Sea stars, Shrimp, fish, small sponges	None	No	None
403	403-03	B	IND	Yes	No	None	Corymorpha hydroids (4), Sea stars, Shrimp, small sponges	None	No	None
403	403-04	A	Yes	Yes	Yes	Cerianthid	Corymorpha hydroids (3), Sea stars, Shrimp, small sponges	None	No	None
403	403-05	B	IND	Yes	Yes	Cerianthids	Corymorpha hydroids (2), Sea stars, Shrimp, small sponges	None	No	None
403	403-06	A	Yes	Yes	No	Cerianthids	Sea star?, Shrimp, small sponges	None	No	None
403	403-07	A	Yes	No	Yes	None	Sand dollars (small and large), Shrimp	Moderate (30 to < 70%)	No	None
403	403-08	A	Yes	Yes	Yes	None	Sand dollars (small and large)	Sparse (1 to <30%)	No	None
404	404-01	C	Yes	No	Yes	None	Sand dollars (small and large), Shrimp	Sparse (1 to <30%)	No	None
404	404-02	C	No	No	No	None	Sand dollars (small size class only), Sea star	Moderate (30 to < 70%)	No	None
404	404-03	A	Yes	Yes	Yes	None	Sand dollars (small size class only), Scallop	Trace (<1%)	Yes	None
405	405-01	A	Yes	Yes	Yes	None	Small fish; Sea star	Trace (<1%)	No	None
405	405-02	A	No	No	No	None	Sand dollars (small size class only)	Moderate (30 to < 70%)	No	None
405	405-03	A	No	No	No	None	Sand dollars (small size class only)	Trace (<1%)	No	None
405	405-04	A	No	No	No	None	Sand dollars (small size class only)	Sparse (1 to <30%)	No	None
406	406-01	B	No	No	Yes	None	Sand dollars (small and large), scallop, gulf stream flounder; very small shrimp	Sparse (1 to <30%)	Yes	None
406	406-02	B	Yes	Yes	Yes	None	Sand dollars (small and large), Scallop, Small shrimp	Sparse (1 to <30%)	Yes	None
407	407-01	A	Yes	Yes	No	None	Many hydroids, small shrimp	None	No	None
407	407-02	A	Yes	Yes	Yes	None	Sea stars, small shrimp, hydroids	None	No	None
407	407-03	B	Yes	Yes	Yes	None	Sea stars, small shrimp, hydroids	None	No	None
409	409-01	A	Yes	Yes	No	None	Small shrimp, flounder	None	No	None
409	409-02	A	Yes	Yes	No	None	Small shrimp, flounder	None	No	None
409	409-03	A	Yes	Yes	No	None	Small shrimp, Sea stars, hermit crabs	None	No	None
409	409-04	A	Yes	Yes	Yes	None	Small shrimp, flounder, hydroids	None	No	None
409	409-05	A	Yes	Yes	No	None	Small shrimp, flounder, hydroids	None	No	None
409	409-06	A	Yes	No	Yes	None	Fish (2)	None	No	None
409	409-07	A	Yes	Yes	No	None	Sea stars, small shrimp, hydroids	None	No	None

Line Number	StationID	Replicate	Comments
101	101-01	A	Pale tan sand with strands of piled fecal pellets; Scant shell hash; small and large sand dollars in loose distribution; Small hermit crab; reduced burrow mounds visible.
101	101-02	A	Pale sand covered with abundant shell hash and sand dollar tests; Burrow depression and excavated mound in upper left corner of image; Large and small sand dollars.
101	101-03	A	Pale tan silty sand with few sand dollar tests; carpet of small tubes (likely Ampelisca amphipod) covers entire image; several small nudibranchs; ctenophores in water column; hydroid near center of image.
101	101-04	A	Pale tan sand with shell hash; Shallow ripple through center of image. Sand dollar test; single skate egg case.
101	101-05	A	Pale tan sand with scant shell hash; small and large sand dollars; small gastropod; ctenophores in water column
102	102-01	A	Pale tan sand with shell hash throughout image; small and large sand dollars.
102	102-02	A	Pale tan sand with shell hash throughout image; brown/rust colored sand/fecal pellets in pockets on seafloor; shell fragments; sand dollars in even distribution; long thin tracks; small ctenophores in water column.
102	102-03	A	Pale tan sand with small shallow ripples; scant shell hash on sediment; darker sand in troughs of ripples; small thin tracks in sediment; sand dollars evenly distributed throughout image.
102	102-04	A	Pale tan sand with scant shell hash; sand dollars evenly distributed throughout image.
102	102-05	A	Pale tan sand with scant shell hash; Small crab in lower edge of image; ctenophores in water column; sand dollars evenly distributed throughout image.
102	102-06	A	Pale tan and brown sand with shell hash; many tubes emerging from sediment; small nudibranch; small and large sand dollars.
102	102-07	A	Light brown sand in shallow ripples; shell hash in troughs of ripples; short tubes ; sand dollars across ripples.
103	103-01	A	Light brown sand with large foraging depressions and adjacent mounds of reduced excavated sediment; Cerianthids emerging from sediment; many large sand dollars; small nudibranch; small gastropod.
103	103-02	A	Light brown sand with rust colored patches; many sand dollars evenly distributed across image
103	103-03	A	Brown sand with shell hash scattered evenly throughout image; Sand appears coarser than in adjacent replicates; small nudibranch.
103	103-04	A	Light brown coarse sand with shell hash; Several sand dollars leaving tracks in sediment; sand dollar tests visible; ctenophores in water column.
103	103-05	A	Light brown sand with rust colored patches; abundant small tubes; 12 sand dollars; large shell half partially buried in sediment
103	103-06	A	Pale tan sand with strands of rust colored sediment; shallow ripples in sediment; many sand dollars of various sizes throughout image.
104	104-01	A	Pale tan sand with large burrow depression and excavated sediment mound; Small sand dollar tests, shell fragments; Abundant sand dollars throughout image
104	104-02	A	Light brown sand with very shallow burrow depression; Small sand dollar tests, shell fragments; Abundant sand dollars throughout image
104	104-03	A	Light brown sand covered with small tracks; Shell hash scattered throughout image; few sand dollars present; small tubes present.
104	104-04	A	Light brown and rust colored sand with small shell fragments and sand dollar tests; small reduced burrow mounds visible; very small tubes; many sand dollars in view; small nudibranch.
104	104-05	B	Light tan gravelly sand with abundant shell fragments; small crab, small nudibranch, few sand dollars.
104	104-06	A	Light brown sand with small pebbles and shell hash scattered throughout image; Cerianthid and bivalve in sediment; few sand dollars; ctenophore in water column.
104	104-07	A	Light brown sand with scant shell hash; and two large sand dollar tests; long, thin, tracks in sediment; sand dollars in frame; small translucent corymorpha below laser.
104	104-08	A	Light brown sand with small pieces of shell hash scattered over sediment; large shell fragment near center of image; long thin tracks in upper right; trigger weight visible
104	104-09	A	Light tan and gray sand with dense shell hash and few large shell fragments; small cobble/large gravel to right of lasers; small burrow mounds with gray reduced sand; 4 sand dollars; large hermit crab.
104	104-10	D	Light brown sand with coarse particles and shell hash arranged in bands (indicating shallow ripples?), few sand dollars; ctenophores in water column.
104	104-11	D	Light brown coarse sand with small shell fragments; Sand crest visible at right side of image; few sand dollars; Image is slightly clouded.
104	104-12	A	Light brown sand with shell hash scattered throughout image; Patches of darker sediment; small and large sand dollars present; small gastropods
105	105-01	C	Pale tan silty sand with scant shell hash; dense covering of sand dollars throughout image
105	105-02	A	Pale tan silty sand with uniform covering of shell hash, moderately dense. Seafloor appears fairly flat; few sand dollars, small and large; ctenophores in water column.
105	105-03	A	Light brown silty sand with slight rippling; Shell hash between sand ridges; Rough sediment at edges of image; Many sand dollars present.
105	105-04	A	Pale tan silty sand with rough texture to sediment (likely tracks); evenly distributed, moderately dense, shell hash; few sand dollars; small gastropod.
105	105-05	A	Pale tan silty sand; shallow ripples in sediment with crest running diagonally through image center; shell hash in ripple troughs; small fish in water column; sand dollars at ripple crest
105	105-06	A	Light brown silty sand with small rough patches and low density shell hash; small foraging/burrow depressions and excavated mounds visible; many sand dollars at seafloor.
105	105-07	A	Light brown silty sand with few small burrow mounds and excavations revealing reduced silty sand; Scant shell hash throughout visible area. Small and large sand dollars.
105	105-08	A	Light brown sand with shell hash throughout image; Few large shell halves; Small gastropod; Small and large sand dollars.
105	105-09	A	Light brown and pale tan silty sand with scant shell hash; small foraging depression in upper left corner of image; single sand dollar; two small gastropods.
105	105-10	B	Light brown sand with fairly dense small shell hash around edges of image (indicating ripple?); two sand dollars; several small gastropods; abundant ctenophores in water column; skate egg case in upper right corner.

Line Number	StationID	Replicate	Comments
105	105-11	A	Light brown gravelly sand with light covering of shell hash; single large shell half; several small sand dollars; ctenophores in water column.
105	105-12	A	Pale tan sand, fairly flat surface, with patchy cover of rusty brown sediment; Sand dollars over sediment leaving tracks; small gastropods; sponge in upper right quadrant of image.
105	105-13	A	Light brown sand with patches of slightly darker sediment; scant shell particles mixed with sediment; many sand dollars present.
106	106-01	A	Light brown sand with shell hash and coarse sand particles; large shell fragments visible; slightly raised area in lower portion of image; barnacles on large bivalve shell
106	106-02	A	Light brown sand with low ripple ridge crossing center of image; Shell hash scattered across sediment away from ridge; Sand dollars occupying area of ridge; skate egg case at left of image
106	106-03	A	Light brown sand with scant shell hash; burrow depression with mound of excavated sediment nearby; many small and large sand dollars
106	106-04	A	Gray-tan silty sand with dispersed shell hash scattered over sediment; few large shell fragments (shell halves and articulated shells); many tracks in sediment; small and large sand dollars.
106	106-05	B	Light brown sand with shell hash scattered over sediment; thin tracks in sediment; many small and large sand dollars; ctenophores in water column.
106	106-06	A	Light brown sand in shallow ripples extending diagonally across image area; shell hash in ripple troughs; several (13) sand dollars present.
106	106-07	A	Light brown sand with patches of rusty brown and scant shell hash; Low density sand dollars throughout visible area; small gastropods; very large moon snail.
106	106-08	A	Pale brown silty sand with scant shell hash; Many small tubes and fecal strands (amphipods); sea star imprint in sediment in right lower quadrant of image.
106	106-09	A	Pale tan silty sand with scant shell hash; small burrow mounds visible; many small tubes; hermit crab in top left of image.
106	106-10	A	Rusty brown sand with pale brown patches in troughs of small ripples; scant shell hash scattered over sediment; Hermit crab; sand dollars in low density.
106	106-11	A	Light brown gravelly sand with high density shell hash in troughs of ripples; few tracks visible; two small sand dollars.
107	107-01	A	Light brown sand with lots of shell hash in even distribution throughout image area; rough textures in upper right corner of image, foraging or burrows(?); small burrow mounds visible; small and large sand dollars.
107	107-02	A	Light brown sand with dense shell hash and razor clam shell halves; moon snail egg case to left of lasers; large and small sand dollars.
107	107-03	A	Light brown sand with small ripples barely visible; moderately dense shell hash mixed with sands; small burrow mounds; small and large sand dollars; ctenophores in water column.
107	107-04	A	Light brown sand with small ripples barely visible; moderately dense shell hash mixed with sands; small burrow mound; small and large sand dollars; ctenophores in water column.
107	107-05	A	Light brown sand with low density shell hash; tracks visible, especially in upper left; many sand dollars.
107	107-06	A	Pale tan sand with abundant shell hash and shallow ripples; ripple crest very evident in upper left corner of image; few large shell fragments (including razor clam); skate egg case many small and large sand dollars.
107	107-07	A	Light brown sand with low density shell hash and small burrow depressions; few small shell fragments (including razor clam); many small and large sand dollars; hermit crab; small gastropods.
107	107-08	A	Light brown sand, very flat; small areas of roughness (possibly burrow depressions) in upper right corner; small thin tracks; few sand dollars.
107	107-09	A	Light brown, slightly rippled, sediment with shell hash between ripple crests; SPI image pair shows crest of shallow ripple; Small sand dollars.
107	107-10	A	Light tan sand with scant shell hash and shallow depressions; tracks cross sediment; small and large sand dollars.
108	108-01	A	Gravelly pale tan sand with shell hash and small shell fragments; Small burrow mounds in lower left corner of image; hermit crab and few small sand dollars.
108	108-02	B	Light brown flat sand with shell hash and small shell fragments (including razor clam); sand dollars mostly in lower right quadrant of image; two sea stars on top of each other to far left
108	108-03	A	Light brown gravelly sand with low ridge running through center of image and ripples evident in SPI pair; small shell fragments visible on sand; very small scallop, single sand dollar, hydroid colony
108	108-04	A	Pale brown sand with small depressions throughout image; SPI pair indicates some rippling exists that is not evident in PV; Scant shell hash visible; Few sand dollars present; Small gastropod.
108	108-05	A	Light brown sand with shell hash between hummocks; Small and large sand dollars distributed throughout image
108	108-06	B	Pale brown sand with dense shell hash throughout; sand dollars evenly distributed throughout image; small tracks visible where shell hash is not covering underlying sediment; ctenophore in water column.
109	109-01	A	Light brown gravelly sand with even distribution of low density shell hash; Scallop burrowing into sediment in upper left corner of image; small and large sand dollars; two corymorpha visible; Cerianthid in lower right.
109	109-02	A	Light brown sand with scant shell hash; Small tubes and burrows; several sand dollars; large nudibranch.
109	109-03	A	Light brown sand with moderately dense shell hash; Small depressions and tracks in sediment; sand dollars present
109	109-04	A	Light brown sand with scant shell hash and few small shell fragments; dense covering of sand dollars.
110	110-01	A	Light brown sand with small ripples and scant shell hash; dense covering of small and large sand dollars.
110	110-02	A	Pale tan sand with rough rust brown patches and scant shell hash; small burrows and track marks throughout sediment; Sea star burrow imprint visible
110	110-03	A	Pale tan gravelly sand with scant shell hash; top of images appears slightly lower than bottom; Small shell fragments.
110	110-04	A	Light brown sand with shell hash between ripple crests; shallow rippling evident by textural changes and placement of sand dollars; corymorpha to far left; sand dollars on ridges
110	110-05	A	Light brown sand with moderately dense cover of shell hash and small shell fragments; few sand dollars; skate egg.

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110	110-06	C	Light brown sand with coarse particles and fairly dense shell hash; groove from foraging/burrowing/track near center of lasers; evenly distributed large and small sand dollars.
111	111-01	A	Light brown sand with scant shell hash and pockets of rusty-brown material; many small and large sand dollars leaving tracks in sediment.
111	111-02	A	Light brown sand with shell hash, small shell fragments, and pockets of rusty-brown material; small reduced burrow in center of image; many small and large sand dollars.
111	111-03	A	Pale tan silty mud bottom; Carpet of tubes covers image area; several large sea stars; large demersal fish.
111	111-04	A	Light brown gravelly coarse sand; small depressions in center of image; small hydroid colony above and right of lasers.
111	111-05	B	Light brown coarse gravelly sand with shell hash; Shallow ripples ; Sand dollars clustered in lower right.
111	111-06	A	Light tan coarse sand with very small ripples (most visible in upper right); Shell hash; Small and large sand dollars.
111	111-07	A	Light brown sand with small pebbles. Shell hash and large razor clam fragments; Possible bedform (center of image may be a ridge crest); two sand dollars.
111	111-08	A	Light brown coarse sand with dense shell hash; Dense sand dollars cover most of visible area; small ctenophore in water column. Scallop to right of lasers.
112	112-01	A	Light brown sand with shell hash and small shell fragments; shallow depression to far left of lasers; Many small and large sand dollars present.
112	112-02	C	Pale tan slightly rippled sand with some shell hash; Strands of orange-brown organics visible. Few sand dollars; Corymorpha visible; Ctenophore in water column.
112	112-03	A	Light brown sand with scant shell hash and brown organics; Sediment features shallow rippling; bivalve siphon visible to left of lasers; Sand dollars present; small ctenophores in water column.
112	112-04	C	Pale tan gravelly sand; Small shell fragments; articulated clam shell above lasers; many small tubes present; large scallop; fish tail visible in upper right corner of image.
112	112-05	B	Orange and white pebbles over sand; two small cobbles with attached fauna-hydroids; eggs of unknown origin in upper left of image; Cerianthids visible; Unidentified organism in water column.
112	112-06	C	Light tan sand with shallow ripples; scant shell hash evenly distributed over visible area; few sand dollars present; small gastropod; unidentified fauna (flatworm?).
112	112-07	B	Light brown sand with few larger pebbles; Scant shell hash and larger shell fragments throughout visible area; two hermit crabs; dense sand dollars.
112	112-08	A	Light brown sand with large ridge running through center of image; shell hash in ripple troughs; large scallop shell at top of image; sand dollars present.
112	112-09	A	Light brown gravelly sand; Shell hash accumulated in ripple troughs with sand encroaching; many sand dollars; hermit crab; ctenophore in water column.
113	113-01	A	Light brown sand with evenly distributed shell hash and small shell fragments; Two parallel shadows across image suggests shallow rippling; Sand dollars, mostly in bottom half of image.
113	113-02	A	Light tan sand with evenly distributed shell hash in low density; orange/brown organics visible on sediment; many sand dollars
113	113-03	A	Light brown sand with rippling; few gravels in sand; low density shell hash in troughs of ripples; Few sand dollars to far right.
113	113-04	B	Light tan sand with scant shell hash and thin lines of brown/orange organic fines; Sand dollars, hermit crab, and small gastropod present.
113	113-05	A	Light brown sand with shallow ripples; Gravels and shell hash accumulated in ripple troughs; large scallop shells to left.
113	113-06	A	Light brown sand forming clear ripples; few pebbles present; shell hash and darker sediment in troughs; Many sand dollars clustered on center ridge of ripple; small sponge; ctenophore in water column.
114	114-01	A	Light brown sand with clear rippling; Shell hash and coarser sands and pebbles in ripple troughs; sand dollars on ripple crests; large Jonah crab to far right; Cerianthid on center ripple crest, below lasers
114	114-02	A	Light brown sand with shallow ripples clearly visible; shell hash accumulating in ripple troughs; small pebbles in ripple troughs; many sand dollars present; hermit crabs.
115	115-01	A	Light brown sand with shell hash; slight rippling evident in textural changes and slight shadowing; few sand dollars.
115	115-02	A	Light brown sand with small pebbles and shell hash; sediment is slightly rippled; small and large sand dollars are present.
116	116-01	A	Light brown sand with very slight rippling visible; scant shell hash distributed evenly over visible area; organic fines accumulated in ripple troughs; few small and large sand dollars.
116	116-02	A	Light brown gravelly sand with shallow ripples visible; scant shell hash and more pebbles between ripples; few sand dollars; ctenophore in water column
116	116-03	A	Light brown sand with shell hash in low density throughout image; large bone on seafloor; small hydroid colony; many small and large sand dollars.
116	116-04	A	Pale tan sand with scant shell hash and tracks; large scallop in shallow burrow near lasers, possible hydroid near scallop; moon snail egg case in lower left corner; single sand dollar.
117	117-01	A	Light brown gravelly sand with very slight rippling visible; scant shell hash throughout visible area; few sand dollars.
117	117-02	A	Light brown gravelly sand with very slight rippling visible; scant shell hash throughout visible area; large scallop in lower right of image; few sand dollars.
117	117-03	A	Light brown, slightly rippled, gravelly sand with small shell fragments throughout image; pebbles are arranged along ripple troughs; four large Cerianthids; moon snail egg cases visible; three sand dollars.
117	117-04	A	Light brown sand with shell hash and few pebbles; sediment appears slightly hummocky due to rippling and small burrow mounds; Cerianthid visible; sand dollars near lower edge of image.
117	117-05	A	Light tan gravelly sand with many small shell fragments; no visible bedforms; few sand dollars; single corymorpha.
118	118-01	A	Light brown sand with scant shell hash and few small shell fragments; no visible bedforms; small and large sand dollars; small tubes present.
118	118-02	B	Light brown gravelly sand with few small washed cobbles present and scant shell hash; few sand dollars; small hermit crab.
118	118-03	A	Light brown sand is mounded near center of image; shell hash and gravels at mound border (ripple?); Two small washed cobbles near lower edge of image; Cerianthids visible; few sand dollars and hermit crabs.
118	118-04	A	Light brown sand with even distribution of moderately dense shell hash giving sediment a rough texture; long thin tracks in sediment; small and large sand dollars to far right of image.

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118	118-05	A	Light brown gravelly sand with abundant small shell fragments (mostly half clam shells); Burrowing fish in upper left corner of image (oyster toadfish?).
118	118-06	A	Light brown gravelly sand with many small shell fragments (mostly half clam shells); Medium sized tubes visible, especially in upper left; few sand dollars; two small scallop above lasers on top of shell fragments.
119	119-01	A	Light brown sand with scant shell hash is slightly uneven but not rippled; long thin tracks visible in sediment; small tubes present; several very small Cerianthids; small and large sand dollars; ctenophore in water column.
119	119-02	A	Pale brown gravelly sand with many small shell fragments and pebbles; moderately large tubes throughout image; single sand dollar at right edge of image; scallop above lasers; small moon snail above left laser; possible eggs of a type below left laser
203	203-01	A	Hummocky light brown sand with scant shell hash and few razor clam shell fragments; fairly dense carpet of tubes; single hermit crab
203	203-02	A	Light brown gravelly sand with high density of shell hash and shell fragments; small burrow mounds visible throughout image; small hydroid colony to left of lasers.
203	203-03	A	Light brown, slightly rippled, gravelly sand with scant shell hash; Few large washed pebbles/small cobbles; hermit crabs and small tubes.
204	204-01	A	Light brown sand with shell hash to far left of image; no fauna visible; long thin tracks in upper right of image.
204	204-02	A	Light brown sand with dense shell hash to far left; Ridge crest to far right corner; scallop in shallow depression to lower right; fish barely visible in lower left corner; few sand dollars.
205	205-02	A	Light brown sand with shallow ripples and scant shell hash; small and large sand dollars; two crabs; stalked anemone; few Corymorpha; small shrimp.
205	205-03	A	Light brown sand with abundant shell hash throughout image (is slightly less dense near top of image); moderately large tubes throughout image
205	205-04	B	Light brown sand with shallow ripples and shell hash and troughs; Few larger shell fragments present; small sand dollars; Astarte type clam shell at right lower edge of image
206	206-01	A	Light brown sand with scant shell hash; shallow burrow at top of image; small and large sand dollars; small moon snail; small shrimp.
206	206-02	A	Light brown sand with irregular hummocks topped with darker sediment; Scant shell hash and small shell/carapace fragments; few sand dollars; two small shrimp.
207	207-01	A	Light brown sand with shell hash and small rise near center of image; two sand dollars; moon snail egg case present.
207	207-02	A	Pale tan gravelly sand with dense covering of shell hash; crab carapace above lasers; tubes visible; open bivalve shell at far right vertical on sediment surface
207	207-03	B	Light brown sand is rippled with scant shell hash accumulating in ripple trough; Small burrow mounds on ripple crests; many sand dollars present; small gastropod leaving long trail in sediment; large scallop burrowing into sediment at lower left; worm(?) emerging from sediment at upper right corner of image.
207	207-04	A	Light brown sand with shell hash and small shell fragments; small pebbles are scant; small and large sand dollars; demersal fish near left laser.
207	207-05	A	Light brown sand with scant shell hash and small mounds visible; small and large sand dollars; several small gastropods.
208	208-01	A	Pale brown sand with shell hash and small mounds; mounds appear to be a result of burrowing; small moon snail present near lasers.
208	208-02	D	Light brown sand with dense shell hash and shell fragments; small pebbles present; small burrow mounds near top edge of image; Sand dollars at upper left.
208	208-03	A	Light brown gravelly sand with shell hash and fragments evenly distributed throughout image area; few sand dollars; moon snail egg case at lower left
209	209-01	A	Light brown sand with small trenches and mounds; shell hash evenly distributed over image area; two large shell halves, one with reduced sediment surrounding it; small and large sand dollars; single small shrimp.
209	209-02	B	Light brown sand with shell hash including larger bivalve fragments in trough of long ripple; several Cerianthids and many sand dollars at ripple crest
209	209-03	A	Light brown sand with slight rippling identifiable by continuous strands of shell hash in troughs; many small and large sand dollars present; long seagrass fragment at center of image.
209	209-04	B	Pale tan silty sand with small hummocks (likely burrows); scant shell hash present; small orange clam shell at lower edge of image; sea star to far right; corymorpha near left laser.
209	209-05	A	Light brown gravelly sand with dense shell hash throughout image; few large shell fragments; white tube attached to shell fragment (squid egg?); Few sand dollars to far right.
210	210-01	A	Light brown sand with shell hash evenly distributed over image area; few razor clam shell fragments; tracks and small burrow; Large and small sand dollars.
210	210-02	B	Light tan sand with scant shell hash; many small mounds at image center and top right; small and large sand dollars.
210	210-03	A	Light brown sand with shell hash evenly distributed over visible area; Many large and small tracks present; decaying sand dollar with reduced ring and bacteria surrounding it; very small scallop to right of decaying sand dollar; living sand dollar mostly buried to far left
210	210-04	A	Light brown sand with ripples; shell hash in troughs of ripples, darker sediment at ridges; Few large shell fragments; Small and large sand dollars at ridge crest to lower right; small nudibranch below left laser; crab to far right
210	210-05	A	Light brown gravelly sand with scant shell hash and slight rippling; skate egg case to far left; small gastropods; small and large sand dollars
210	210-06	A	Light brown sand with light cover of shell hash in low areas; slightly raised areas in irregular pattern; small burrow depressions and mounds; gastropod and flatfish in lower right corner of image; small sand dollars.
210	210-07	A	Light brown sand with evenly distributed shell hash; small raised areas in sediment arranged in irregular distribution; decaying skate egg case; Small sand dollars; moderately large tubes. Nudibranch and very small flatfish to far left.
210	210-08	A	Light brown sand with shell hash evenly distributed throughout image area; small mounds at surface with darker sediment capping them; decaying skate egg pouch to lower left; few small shrimp above lasers; small and large sand dollars.
210	210-09	B	Light brown sand with slightly irregular surface; scant shell hash; articulated shell halves at bottom of image; sand dollars present.

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211	211-01	A	Light brown sand with evenly distributed shell hash; many sand dollars to right half of image; fish swimming at left side of image.
211	211-02	A	Light brown sand with scant shell hash; mounds to far left of image; few sand dollars; very small shrimp.
211	211-03	A	Light brown sand with even cover of low density shell hash, few larger shell fragments; tracks and burrows with reduced sediment visible; sand dollars mostly at upper right corner of image.
211	211-04	A	Light brown sand with shell pieces and shell hash; small tracks in sediment; few sand dollars.
211	211-05	A	Light brown sand with shell hash in low density pockets; large shell halves at lower half of image; clusters of high density sand dollars; tracks in sediment.
211	211-06	A	Light brown sand with shell hash in upper half of image; sand dollar tests visible; skate egg case decaying to right of lasers; small and large sand dollars.
211	211-07	A	Light brown sand with pockets of shell hash; dense sand dollars cover most of visible area, mostly small individuals; small gastropod below right laser; flatfish to upper left of left laser.
211	211-08	B	Light brown coarse sand with pebbles and shell hash accumulating in troughs between large ripples; Dense sand dollars clustered on ridge of ripple
211	211-09	A	Light brown sand with low density shell hash evenly distributed throughout visible area; dense cover of sand dollars, mostly small but with few large individuals.
211	211-10	A	Light brown sand with dense shell hash cover throughout visible area; small and large sand dollars present
212	212-01	A	Light brown sand with few small patches of dark-orange/rusty sand; lots of shell hash, with some small dead sand dollars, larger chunks, one may be scallop, some irregular shaped chunks; small burrows; Cerianthid left-middle, near larger sand dollar; small and 1 large sand dollars
212	212-02	A	Light brown sand with couple very small patches of dark-orange/rusty sand in lower right; lots of shell hash, with some irregular shaped chunks, couple bivalve shells; few small burrows; tracks in upper right and center; small and 1 large sand dollars
212	212-03	B	Light brown sand with shell hash in low density at edges of image; burrow mounds rising above surrounding sediment; decaying sand dollar test at center of image; few sand dollars present.
212	212-04	A	Light brown sand with shell hash in low density at edges of image; burrow mounds rising above surrounding sediment; few sand dollars present.
212	212-05	A	Light brown sand with shell hash in low density throughout visible area; burrow mounds rising above surrounding sediment; few sand dollars present.
212	212-06	A	Light brown gravelly sand made irregular by tracks; shell hash and razor clam shell fragments scattered in low density throughout visible area; Few burrow mounds present; small sand dollars.
212	212-07	A	Light brown sand with slight rippling and banded lines of shell hash; small mounds to far right; dense cover of small sand dollars;
212	212-08	A	Light brown sand forming shallow ripples with dense shell hash and fragments in ripple troughs; Small and large sand dollars present, largely on ripple crests with brown-orangish sediment
212	212-09	A	Light brown sand with slightly hummocky surface; shell hash in low density throughout visible area; dense sand dollars, mostly small individuals.
212	212-10	A	Light brown sand with low density shell hash and slight rippling visible (troughs of ripples are slightly darker than surrounding sediment); few sand dollars; single small shrimp.
213	213-01	C	Light brown sand with depressions and raised areas forming irregular hummocks; shell hash in low density at lowest areas of sediment; sand dollars forming wide tracks; small shrimp.
213	213-02	A	Light brown sand with scant shell hash; large burrow depression at center of image; burrow mounds visible; ctenophore in water column; small and large sand dollars.
213	213-03	A	Gray-brown gravelly sand with rough, irregular, surface covered with small shell fragments and organic detritus; Two sea stars visible in frame.
213	213-04	A	Light brown sand with small pockets of shell hash; sediment pocked with shallow burrow depressions and long thin tracks; few larger shell fragments (razor clam); sand dollars.
213	213-05	A	Light brown sand with dense pockets of shell hash and irregular surface formed by tracks; small areas of darker rust brown sediment; many small sand dollars.
214	214-01	A	Gray-brown silt, very flat; tracks in sediment; moon snail egg case; Cerianthids present; many sea stars.
214	214-02	D	Shot taken on upswing from SPI, sediment in water column and disrupted sediment surface; Gray brown silty sediment; sea stars visible
214	214-03	A	Light brown sand with lighter patch near right laser; long thin tracks in sediment; razor clam shell fragments and small shell hash; large and small sand dollars; moon snail egg case.
214	214-04	A	Light brown sand with flat, heavily tracked surface; scant shell hash over sediment; small sand dollars; shrimp.
214	214-05	A	Pale brown silt with slightly irregular, mounded surface; many tracks; scant shell hash; skate egg pouch to far right; small and large sand dollars; large Jonah crab.
214	214-06	A	Light brown sand with tracks and small burrow mounds; deep tracks in pairs of 3 in upper portion of image; small flatfish to far right; few sand dollars.
215	215-01	A	Pale brown silt with many small burrow mounds; sea stars present; reduced burrow mounds; flatfish at right
215	215-02	A	Pale brown silty sediment with scant shell hash; seafloor is rough with small burrow openings and reduced sediment mounds; sea stars and sand dollars present; small shrimp visible; small tubes visible.
215	215-03	C	Light brown silt with scant shell hash; possible very small patches of bacteria at upper left; ctenophore in water column; fish tail visible to right edge of image; sand dollars, sea stars; small tubes visible
215	215-04	A	Light brown sand with slightly rough texture; low density shell hash over visible area; few small shell fragments; small shrimp and sand dollars present.
215	215-05	A	Light brown sand with scant shell hash and partially buried large shell fragments; small sand dollars in view; single small clam to lower left.
215	215-06	B	Light brown sand with shell hash in low density (slightly higher density to lower left); seafloor appears flat; small shell fragments over entire visible area; crab in center of image; two sea stars; two sand dollars.
215	215-07	A	Light brown sand with large ripples in diagonal orientation; dense shell hash in ripple troughs; dense sand dollars at ripple crests.
215	215-08	C	Light brown sand with irregular crests and troughs (hummocks or ripples); scants shell hash with large half-scallop shells; patches of densely clustered small sand dollars.

Line Number	StationID	Replicate	Comments
215	215-09	A	Light brown sand with slight rippling recognizable through buildup of shell hash in low troughs; skate egg cases and sand dollar tests; abundant sand dollars at higher areas of sediment
216	216-01	A	Light tan sand with gray sandy subsurface material visible in burrow/foraging mounds; Large burrow/foraging mounds and excavated pits; many small sand dollars; hermit crab above lasers.
216	216-02	A	Light brown sand with slight rippling visible by dense shell hash in troughs; Sand dollars and hermit crabs visible.
216	216-03	A	Light brown sand with scant shell hash and few large scallop shells; moon snail egg case at upper edge of image; dense clusters of sand dollars present.
216	216-04	A	Light brown sand with ripples visible and large foraging depressions; scant shell hash; dense sand dollars around lower edge of image; scallop in upper left
216	216-05	A	Light brown sand with scant shell hash and slightly darker bands of sediment (rippling?); Small and large sand dollars present, scallop in foraging depression
216	216-06	C	Light brown sand with orange pebbles and scant shell hash; mostly small sand dollars in low density throughout visible area.
216	216-07	A	Pale tan silt with small depression near image center; shell hash in dense pockets; Small sand dollars over most of visible area; few large sand dollars.
217	217-01	A	Light brown sand; shell hash throughout; many small and a few large sand dollars present.
217	217-02	A	Light brown sand with many small burrows and mounds; shell has with bivalve and razor clam shells; scallop shell at upper right few sand dollars present.
217	217-03	A	Light brown sand with small thin tracks and scant shell hash; scallop shell near lasers; very small flatfish at lower edge of image; few sand dollars present.
217	217-04	A	Light brown sand; small mounds and burrows, fecal casts in lower left; tracks across surface; sand dollars
217	217-05	A	Light brown sand with very distinct ripple edge, visible by dense line of shell hash; moon snail egg case; tracks in sediment from sand dollars; dense sand dollars outside of ripple trough area.
217	217-06	A	Light brown sand with many small shell fragments and shell hash; seafloor appears flat; Small sand dollars present.
217	217-07	A	Light brown sand with bands of shell hash and small shell fragments; Tracks in sediment at upper right; Few small sand dollars; single small scallop.
217	217-08	A	Light brown sand with scant shell hash; seafloor is hummocky, with raised area in lower half of image; small sand dollars leaving wide tracks visible;
217	217-09	A	Light brown sand with patches of pale brown sediment as well as low density of shell hash; Few small shell fragments and sand dollar tests; small burrow openings and tubes visible; many sand dollars in dense clusters, mostly small size class. small shrimp visible.
217	217-10	A	Light brown gravelly sand with distinct line of dense shell hash running diagonally across center of image, second line of shell hash to lower right; Dense sand dollars at upper left corner; single scallop.
218	218-01	A	Dense matrix of pebbles with underlying sand visible between coarse materials; small shell fragments visible; small shrimp; small hermit crab at center of image.
218	218-02	A	Light brown sand with scant shell hash; seafloor gives appearance of shallow ripples; bands of dense sand dollars over most of image, few large individuals.
218	218-03	A	Light brown sand with pebbles; seafloor is slightly uneven but does not give the appearance of ripples; shell hash and few shell fragments among pebbles; small and large sand dollars in discrete clusters.
218	218-04	A	Light brown sand with shell hash and small shell fragments; seafloor is slightly uneven but not suggestive of rippling; low density sand dollars; large scallop at left.
218	218-05	C	Light brown sand with shell hash and small shell fragments; large scallops shell, many tracks to far right corner; sparse small sand dollars; large scallop at upper center of image
218	218-06	A	Light brown sand with shell hash in lowest areas of sediment; sediment appears rippled, with many sand dollars clustered at ripple peaks; large scallop in view.
218	218-07	A	Light brown sand with pockets of dense shell hash and shell fragments; dense sand dollars over most of visible area, cannot see if bedforms are present beneath sand dollars.
218	218-08	A	Light brown sand with small raised mounds; pockets of high density shell hash; few sand dollars.
218	218-09	A	Light brown sand with small mounds creating texture; burrows and tubes visible; large scallop shell with tubes and eggs attached to it and a small fish peeking out from underneath.
218	218-10	A	Light brown sand, very flat; small burrow openings with reduced burrow mounds visible; small tubes visible; few sea stars are partially buried in sediment
219	219-01	A	Light brown sand with pockets of dense shell hash; seafloor is covered with a dense carpet of small sand dollars; large crab near lasers; small hermit crab present.
219	219-02	A	Light brown sand, fairly flat surface, with scant shell hash; large scallop shell half; partially buried sea stars; many small sand dollars.
219	219-03	A	Light brown sand with low density scattered shell hash and small shell fragments; small tubes visible but no burrows; dense clusters of small sand dollars.
219	219-04	A	Light brown gravelly sand with scant shell hash and large shell half near lasers; small tubes on shell half; few small sand dollars.
219	219-05	A	Pale brown silt with tracks; many small tubes across surface, more dense in upper left; burrow openings visible with associated reduced mounds; exposed and partially buried sea stars
219	219-06	A	Light brown sand with slight rippling evidenced by strands of dense shell hash (indicating ripple troughs); small burrow mounds visible; few small sand dollars; small scallop in upper left
219	219-07	A	Light brown sand with scant shell hash and ripple crest extending through center of image; many sand dollars clustered in image; small gastropod; few burrows visible.
301	301-01	A	Light brown sand with scant shell hash; large ripple extending left to right across image; dense sand dollars at ripple crest;
301	301-02	A	Light brown gravelly sand with scant shell hash; few medium to large shell fragments; several small sand dollars
301	301-03	A	Light brown sand with scant shell hash; low depressions (foraging depressions?) in seafloor; few wide tracks behind sand dollars visible; small shrimp; small Cerianthid above lasers, near top edge of image.
301	301-04	A	Pale tan silt with many small reduced burrow mounds; seafloor is very flat; many small tubes visible; large Cerianthids; buried and partially buried sea stars; small shrimp; long orange tendril visible below left laser.
301	301-05	A	Light brown sand with flat surface and slow density assemblages of shell hash; few razor clam shell fragments; large and small sand dollars; large scallop excavating sediment to lower right.

Line Number	StationID	Replicate	Comments
301	301-06	B	Light brown sand with moderate shell hash and razor clam fragments; patches of slightly darker sediment visible; dense clusters of sand dollars cover most of image, most are small with few larger individuals.
302	302-01	A	Light brown sand with patches of dark-orange/rusty sand, slight rippling; shell hash, somewhat gathered between ripples; small sand dollars dispersed across surface, and dimple marks from sand dollar movement in upper left
302	302-02	A	Light brown sand with patches of dark-orange/rusty sand, slight rippling; shell hash, somewhat gathered between ripples; small and large sand dollars across surface concentrated in middle of image; large bivalve partially on surface; Cerianthid at lower edge of image just to left of center
302	302-03	A	Light tan silty sand with patches of dark-orange/rusty sand, hummocky appearance with burrows and mounds visible, small patches of gray sediment around a few burrows/mounds; small and large sand dollars, patches distributed across surface; sand dab in upper right
302	302-04	A	Light brown sand; shell hash, with single bivalve and razor clam shells and many small sand dollar tests, across surface; small and 1 large sand dollars across surface, mostly clustered in upper corners and left lower corner; partially buried sea star in lower left
302	302-05	A	Light brown sand, with small patches of pebbles mixed with shell hash, couple large shells, hole in one bivalve shell, razor clam shell?; small sand dollars across much of surface
302	302-06	A	Light brown sand with shell hash scattered throughout image; Few larger shell fragments; Low ridge peak visible running through center of image; two large sea stars; small burrow mound in upper portion of image, Corymorpha on large shell fragment near bottom of image (also captured in SPI replicate)
302	302-07	A	Light tan silt; small shell fragments visible; many tubes ; small gray burrow mounds visible in image; small shrimp; part of fish at base of image
303	303-01	A	No flash in image, photograph was lightened in camera raw; Indeterminate color silty sand; shell hash scattered throughout image; Few burrows.
303	303-02	A	Light tan silty sand; some shell hash, mostly dead small sand dollars; small and large sand dollars distributed across surface; few sea stars partially buried; tracks in upper right
303	303-03	A	Light brown sand with a few patches of light tan silty sand; few burrows and small mounds; small and large sand dollars distributed across surface; ctenophore? In water column at left
303	303-04	A	Light brown silty sand with shell hash strewn throughout image; Few large disarticulated shells; Small burrow mounds and depressions; outlines of buried sea stars; small shrimp.
303	303-05	B	Light brown sand; Dense large sand dollars covers nearly entire image; White sand dollar tests; small shrimp.
303	303-06	A	Light brown/rust colored sand with pockets of dense shell hash; many small and large sand dollars; large sand fecal cast above right laser
303	303-07	B	Light brown/rust colored sand with pockets of dense shell hash; many small and large sand dollars arranged in dense clusters.
304	304-01	A	Light tan and brown silty sand; scant shell hash; few small to medium burrows; large sand dollars distributed across surface
304	304-02	C	Light brown and dark-orange/rusty sand; shell hash across surface; small and large sand dollars across surface with larger patch at left edge
304	304-03	A	Light brown sand with few patches of dark-orange/rusty sand; shell hash across surface; scallop in slight depression; small and large sand dollars across much of surface
304	304-04	A	Light brown sand with few patches of dark-orange/rusty sand, patches of pebbles mixed with shell hash in patches, few larger shells; small and large sand dollars mostly in patch in lower right
304	304-05	A	Light tan silt with scant shell hash; short tracks covering center of image; large Cerianthids; buried and exposed sea stars.
304	304-06	A	Light tan silt; many small sea stars, both exposed and partially buried; several Cerianthids visible; possible hydroids
304	304-07	A	Light brown sand with rusty orange-brown areas; shell hash scattered throughout image; few large shell halves; Many sand dollars arranged in dense clusters; demersal fish at lower edge of image.
304	304-08	A	Light tan silty sand with shallow undefined tracks; scant shell hash and a couple large shells; hydroid in upper left of image; small shrimp
304	304-09	A	Light brown sand with low rise in center of image (mound or shallow ripple); few sea stars partially buried in sediment; small corymorpha to right side of image
401	401-01	A	Light brown and dark-orange/rusty sand; scant shell hash across surface; small sand dollars distributed across surface; whelk in lower right corner.
401	401-02	A	Dark-orange/rusty and light brown sand; lots of shell hash; small and large sand dollars across surface; Corymorpha in lower left
401	401-03	A	Light tan silty sand with few small patches of dark-orange/rusty sand; small shell hash across surface; few small and 1 large sand dollars; tubes or clasts on surface; possible bivalve siphon openings; Cerianthid near left laser
401	401-04	A	Light tan sand with few patches of dark-orange/rusty sand, some pebbles along with shell hash in patches on surface, concentrated in lower left; holothurian near right laser
401	401-05	A	Light tan silt; lots of small and medium burrows; several clusters of tubes; one sand dollar partially in view at lower right; several Cerianthids and sea stars; 4 sand dabs
401	401-06	B	Light tan silt; shallow ridge of sediment extends through center of image; moon snail egg case at top of image; one sand dollar in view; small burrows and tubes.
401	401-07	B	Light brown silty sand with ridge in center of image; large sand dollars clustered on ridgetop; two large scallops; small shrimp in ridge troughs.
401	401-08	A	Light brown silty sand with visible coarse grains; Few sand dollars clustered at corners of image. Small demersal fish in view.
402	402-01	A	Light tan silt; many small burrows; tracks in upper right; Cerianthid in lower left; several sea stars; sand dab
402	402-02	A	Light tan silt; many small burrows, few with small mounds; couple Cerianthids; several sea stars
402	402-03	A	Light brown and tan mottled silty sand with scant shell hash; evenly distributed large sand dollars; Small flatfish; few tubes; crab carapace.
402	402-04	A	Light brown sand with scant shell hash; sand dollar tests; Sand dollars grouped in large clusters; small shrimp.

Line Number	StationID	Replicate	Comments
402	402-05	A	Light brown, slightly mottled, silty sand; small depressions from sea star burrowing; few large sand dollars; small shrimp.
403	403-01	B	Light tan silty sand with few patches of dark-orange/rusty sand; small burrows; couple large sand dollars, couple sea stars; few Corymorpha hydroids; few patches of orange-yellow sponges
403	403-02	A	Light brown silty sand with few small patches of dark-orange/rusty sand; scant shell hash across surface; several sea stars; few Corymorpha hydroids; few patches of orange-yellow sponges; sand dab
403	403-03	B	Light brown silty sand; small mounds of light tan/gray sediment; small shell hash distributed across surface, one large bivalve shell; several Corymorpha hydroids; couple sea stars; few small patches of orange-yellow sponges
403	403-04	A	Light brown silty sand; small scant shell hash; Cerianthid at middle right; few Corymorpha hydroids; several sea stars; small patches of orange-yellow sponges
403	403-05	B	Light tan silty sand; scant shell hash, articulated dark bivalve shell in upper right; Slight ridge indicating rippling extending through center of image; couple Corymorpha hydroids; Cerianthid in lower right; many small patches of orange-yellow sponges
403	403-06	A	Light tan silty sand; many small burrows, few with mounds of gray silt; couple Corymorpha hydroids; several Cerianthids; small patches of orange-yellow sponges
403	403-07	A	Light brown sand; scant shell hash; shallow ripple extends through center of image; small and large sand dollars clustered at ripple ridge.
403	403-08	A	Light brown sand; scant shell hash; small tubes; small and large sand dollars in two small clusters at either edge of image.
404	404-01	C	Light brown sand; shell hash mostly in left, somewhat gathered between slight ripples; small and large sand dollars, mostly in patches on right
404	404-02	C	Light brown sand; shell hash somewhat gathered between slight ripples; small sand dollars in large patches across surface
404	404-03	A	Light brown sand; scant shell hash; small sand dollar scattered around visible area; large scallop.
405	405-01	A	Light brown sand; scant shell hash; Small tubes; large orange sea star in upper portion of image; long thin tracks in sediment.
405	405-02	A	Light brown sand; shell hash dense between ridges; sand dollars clustered between ridges; Large scallop shell half.
405	405-03	A	Light brown gravelly sand with small shell fragments; few small sand dollars; Small fish in water column.
405	405-04	A	Light brown gravelly sand with small shell fragments; gravels are sub-rounded; dispersed small sand dollars; Small fish in water column.
406	406-01	B	Light brown sand; slight hummocks in sand; trace shell hash with few large shell fragments; Small and large sand dollars; large scallop; two small flounder (gulf stream flounder).
406	406-02	B	Light brown sand; slight hummocks in sand; trace shell hash; Small and large sand dollars in large clusters; scallop; few small shrimp.
407	407-01	A	Light brown gravelly silty sand; small shell fragments scattered throughout image; abundant hydroids deflected by current; small shrimp; burrows.
407	407-02	A	Light tan silty sand; scant small shell fragments; very small tubes; buried and exposed sea stars; medium sized burrows.
407	407-03	B	Light tan silty sand; scant small shell fragments; Partially camera drop footprint in view; very small tubes; buried and exposed sea stars; small shrimp; medium sized burrows.
409	409-01	A	Light tan silty sand; scant small shell fragments; very small tubes; medium burrows; small shrimp; flounder.
409	409-02	A	Light tan silty sand; scant small shell fragments; very small tubes; small shrimp; flounder at upper edge of image center.
409	409-03	A	Coarse light brown and dark gray sand; articulated shell fragments; hermit crabs, sea stars, and small shrimp; few large tubes.
409	409-04	A	Light tan silty sand; small tubes and hydroids; small burrow openings; small flounder visible.
409	409-05	A	Light tan silty sand; small tubes and hydroids; small burrow openings; small flounder visible.
409	409-06	A	Light gray silty sand; two large demersal fish; small long tracks in sediment.
409	409-07	A	Light tan silty sand with pebbles and scant shell hash; Large foraging depression revealing light gray silty sand in buried layer; hydroids, shrimp, and buried sea stars.

Appendix D. Field Oversight Summary

Ecology and Environment, Inc. (E&E) provided oversight while INSPIRE Environmental (INSPIRE) collected multibeam echo sounder (MBES) data and sediment profile image (SPI) and plan view (PV) photographic data on the benthic environment of the Atlantic Ocean using a vessel and crew supplied by Alpine Ocean Seismic Survey, Inc. (Alpine). The overall objectives of the oversight effort were to

- Provide management support and project coordination for the collection of MBES and SPI/PV data.
- Provide comprehensive quality control for survey-data deliverables.
- Ensure the field data were recorded accurately and were relevant to the Master Planning efforts.
- Verify that the data collected during the survey would provide the State with a planning-level characterization of the geological, geotechnical, and benthic characteristics of all potential offshore wind energy areas within previously identified water depth zones off the coast of New York.

A marine scientist from E&E provided direct, on-board technical oversight throughout a majority (June 21–July 23, 2017) of the survey period (June 21–August 10, 2017). Additionally, the marine scientist maintained daily log sheets, provided daily written and photo-documentation of completed station numbers and the locations of collected samples, and provided supplemental information on issues of concern. This approach ensured consistency in documentation of samples, allowed for enhanced communication between on-board scientists and the project team, and maintained coordination and quality of deliverables for use in the Master Plan.

Minimal variations in daily field efforts were identified between INSPIRE's, Alpine's, and E&E's daily log sheets. Minor discrepancies in log details were generally associated with weather-related events and slight miscommunications between representatives during daily shift changes. Despite these minor discrepancies, E&E's staff concluded that the data collected during the survey provided the State with a planning-level characterization of the geological, geotechnical, and benthic characteristics of potential offshore wind energy areas in support the goals of the Master Plan. Daily log sheets are available upon request.

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