Sunrise Wind Farm Project

Appendix M1
Benthic Resources Characterization Report – Federal Waters

Prepared for:

Sunrise Wind | Powered by Ørsted & Eversource

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Benthic Resources Characterization Report – Federal Waters

Sunrise Wind Farm Project

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LIST OF ACRONYMS

aRPD	apparent redox potential discontinuity
BOEM	Bureau of Ocean Energy Management
cm	centimeter
CMECS	Coastal and Marine Ecological Classification Standard
COP	Construction and Operations Plan
DC	direct current
DSLR	digital single-lens reflex
EFH	Essential Fish Habitat
Eversource	Eversource Investment LLC
FGDC	Federal Geographic Data Committee
ft	feet
G&G	geological and geophysical
HDD	horizontal directional drill
IAC	Inter-Array Cables
ICW	Intracoastal Waterway
INSPIRE	INSPIRE Environmental, LLC
km	kilometer
Lease Area	BOEM-designated Renewable Energy Lease Area OCS-A 0487
LIPA	Long Island Power Authority
MACZM	Massachusetts Office of Coastal Zone Management
MADMF	Massachusetts Division of Marine Fisheries
m	meter
mi	statute mile
NEF	Nikon Electronic Format
nm	nautical mile
NOAA	National Oceanic and Atmospheric Association
NYSDEC	New York State Department of Environmental Conservation
NYSDOS	New York Department of State
NYSERDA	New York State Energy Research and Development Authority
OCS	Outer Continental Shelf
OCS–DC	Offshore Converter Station
OnCS–DC	Onshore Converter Station
PSD	Photoshop Document
PV	Plan View
RICRMC	Rhode Island Coastal Resources Management Council
RIDEM	Rhode Island Department of Environmental Management
SD	Standard Deviation

SOD	Sediment oxygen demand
SPI	Sediment Profile Imaging
SRWEC–ICW	Sunrise Wind Export Cable HDD Route – Intracoastal Waterway
SRWEC–NYS	Sunrise Wind Export Cable – New York State Waters
SRWEC–OCS	Sunrise Wind Export Cable – Outer Continental Shelf
SRWF	Sunrise Wind Farm
Sunrise Wind	Sunrise Wind LLC
TJB	transition joint bay
WEA	Wind Energy Area
WTG	wind turbine generator

EXECUTIVE SUMMARY

The objective of this benthic assessment survey was to provide data characterizing the physical and biological components of the benthic environment associated with the Sunrise Wind Farm (SRWF), the proposed export cable route in federal waters (SRWEC–OCS), and four reference areas. The benthic environment associated with the proposed export cable route in New York State waters (SRWEC–NYS) is characterized in a separate report (INSPIRE 2020). The survey design, the specific parameters measured, and the data reported were framed around the Bureau of Ocean Energy Management (BOEM) regulations and guidelines (BOEM 2020a) and NOAA Habitat recommendations (NOAA 2020) in order for Sunrise Wind LLC (Sunrise Wind) to efficiently and accurately communicate a comprehensive depiction of the baseline conditions across the surveyed area to the necessary state and federal regulatory agencies. Specifically, the physical sediment composition and the biological benthic components were assessed through Sediment Profile and Plan View Imaging (SPI/PV) analysis using the Coastal and Marine Ecological Classification Standard (CMECS) classifications in addition to other variables that aid in describing baseline conditions. A total of 379 stations were surveyed, which included 252 stations at the SRWF, 107 stations along the outer continental shelf section of the export cable (SRWEC–OCS), and 20 stations across four reference areas.

At the SRWF, spatial trends in sediment composition were observed: the northwest region consisted of a higher frequency of stations with gravels; the southeast and west-central regions were characterized by finer substrata and limited small-scale sediment mobility; the northeast region was generally composed of Fine to Coarse Sand with sand ripples common. Boulders were infrequently observed at the SRWF but did occur at 12 of the stations, all of which were in the northwest region, with the exception of Station 085, which was located along the southern border at approximate longitude of 71.1°W. The biological attributes of the SRWF followed similar spatial trends to the physical features. Stations in the southeast region of the SRWF, which were predominantly Very Fine Sand (CMECS Substrate Subgroup) and *sand and mud* (macrohabitat type), had high occurrences of burrowing anemones (cerianthids) and sabellid worms. Stations in the northeast region of the SRWF, which were predominantly Medium Sand or Fine Sand (CMECS Substrate Subgroup) and *sand with ripples* (macrohabitat type), had high occurrences of sand dollars. The northwest region of the SRWF, which was more heterogenous in seabed composition but included higher frequency of Gravelly Sand and Sandy Gravel (CMECS Substrate Subgroups) compared to the rest of the SRWF, and was generally more complex in macrohabitat types (e.g., *sand with pebbles/granules*, *patchy cobbles and/or boulders on sand*), was inhabited by attached epifauna (e.g., hydroids [*Tubularia* spp.], sea stars, and bryozoa).

There were two distinct regions of the SRWEC–OCS that differed based on sediment composition and benthic community: (1) the western stations extending from the three-mile New York State waters boundary to where the planned cable corridor redirects northeastward, and (2) the eastern stations that include the remaining stations along the SRWEC–OCS extending to the SRWF. There were spatial trends associated with the physical features along the SRWEC–OCS, notably a transition from Medium Sand and Fine Sand (CMECS Substrate Subgroups) with ripples in the western extent to Very Fine Sand with limited small-scale bedforms along the eastern portion of the SRWEC–OCS. This spatial distribution of seabed composition was also reflected in the biological component of the benthic environment along the SRWEC–OCS. Generally, the western portion of the SRWEC–OCS was characterized by high densities of sand dollars while the eastern portion of the SRWEC–OCS was inhabited by burrowing anemones (cerianthids) and sea stars. Gravel did not make up a substantial proportion of the sediments along the SRWEC–OCS and was not greater than 5% cover at any station, with the exception of two stations both of which were composed of Gravelly Sand (CMECS Substrate Subgroup; i.e., 5-30% cover of gravel), with pebble/granule being the largest gravel at these two stations. No boulders were observed at any of the stations along the SRWEC–OCS.

The northern star coral, *Astrangia poculata*, a non reef-building hard coral, was the only sensitive taxa observed across the surveyed area, occurring at five stations, all of which were located within the SRWF (Stations 003, 085, 227, 702, and 721). The sea scallop, *Placopecten magellanicus*, a species of concern in the region, was found at 21 stations across the surveyed area interspersed at the SRWF and along the eastern portion of the SRWEC–OCS. An ocean quahog (*Arctica islandica*), another species of concern in the region, was observed at one station (Station 130), while several stations had dead clam shell valves on the sediment surface. Additionally, the Jonah Crab, a notable species given its increasing importance as a targeted species by the fishing industry, was observed at two stations within the SRWF (Stations 091 and 121), both of which were characterized by the *sand and mud* macrohabitat type.

In general, the physical and biological features characterizing the four reference areas were similar to the nearby stations at the SRWF and SRWEC–OCS. This indicates that these potential reference areas are likely suitable for comparison after cable installation.

This benthic assessment resulted in sufficient information on the physical and biological properties of the benthic habitats at SRWF, along SRWEC–OCS, and at the reference areas to fully characterize the baseline conditions of the benthic environment. Further, this baseline characterization survey meets the requirements outlined in the BOEM guidelines and NOAA Habitat's recommendations associated with the development of offshore wind. These data will be coupled with high resolution geophysical data and underwater video data to inform habitat mapping of the benthic environment associated with the SRWF, SRWEC–OCS, and SRWEC–NYS, which will be provided in a supplemental filing.

1.0 INTRODUCTION

1.1 DESCRIPTION OF PROPOSED ACTION

Sunrise Wind LLC (Sunrise Wind), a 50/50 joint venture between Orsted North America Inc. (Orsted NA) and Eversource Investment LLC (Eversource), proposes to construct, own, and operate the Sunrise Wind Farm Project (the Project). The wind farm portion of the Project (i.e., the Sunrise Wind Farm [SRWF]) will be located on the Outer Continental Shelf (OCS) in the designated Bureau of Ocean Energy Management (BOEM) Renewable Energy Lease Area OCS-A 0487[1] (Lease Area). The Lease Area is approximately 18.9 statute miles (mi) (16.4 nautical miles [nm], 30.4 kilometers [km]) south of Martha's Vineyard, Massachusetts, and approximately 30.5 mi (26.5 nm, 48.1 km) east of Montauk, New York (NY) (Figure 1.1-1). The Lease Area contains portions of areas that were originally awarded through the BOEM competitive renewable energy lease auctions of the Wind Energy Areas (WEA) off the shores of Rhode Island and Massachusetts. Other components of the Project will be located on the OCS, in state waters of New York, and onshore in the Town of Brookhaven, Long Island, New York. The proposed interconnection location for the Project is the Holbrook Substation, which is owned and operated by Long Island Power Authority (LIPA).

The Project's components are generally defined into two categories, which are described in further detail in Section 3.0 of the Project's Construction and Operations Plan (COP):

- Onshore:
    - Onshore Transmission Cable, Transition Joint Bays (TJBs) and concrete and/or direct buried joint bays and associated components;
    - Onshore Interconnection Cable;
    - Fiber optic cable co-located with the Onshore Transmission and Onshore Interconnection Cables; and
    - One Onshore Converter Station (OnCS–DC).

- Offshore:
    - Up to 94 wind turbine generators (WTGs) at 102 potential positions;
    - One Offshore Converter Station (OCS–DC);
    - Up to 95 foundations (for WTGs and OCS–DC);
    - Up to 180 mi (290 km) of Inter-Array Cables (IACs); and
    - One direct current (DC) submarine export cable bundle (Sunrise Wind Export Cable [SRWEC]) comprised of two cables located within an up to 104.6-mi (168.4-km)-long corridor.

This technical report provides a detailed assessment of benthic resources that may be affected by implementation of the offshore components of the Project. The analyses presented in this *Benthic Resources Characterization Report* are summarized in Section 4.4.2 of the Project's COP. This report will serve as Appendix M1 to the COP.

1.2 BENTHIC ASSESSMENT BACKGROUND

The southern New England OCS is an ideal area for offshore wind development. A slowly sloping shelf in concert with relatively high average wind conditions and large urban population centers along the coast provide a prime location for offshore wind energy production. A benthic assessment is required by BOEM to be

[1] [1] A portion of Lease Area OCS-A 0500 (Bay State Wind LLC) and the entirety of Lease Area OCS-A 0487 (formerly Deepwater Wind New England LLC) were assigned to Sunrise Wind LLC on September 3, 2020, and the two areas were merged, and a revised Lease OCS-A 0487 was issued on March 15, 2021. Thus, in this report, the term "Lease Area" is used to refer to the new merged Lease Area OCS-A 0487.

included in the COP submission for any proposed offshore wind farm (BOEM 2019). INSPIRE Environmental (INSPIRE) was subcontracted by Stantec to conduct a Sediment Profile and Plan View Imaging (SPI/PV) survey to characterize the benthic environment associated with the proposed Project.

During initial Project planning, a Benthic Survey Protocol document was prepared and submitted to federal and state agencies for review in November 2019. Two meetings were held in December 2019 with representatives from BOEM, the National Oceanic and Atmospheric Association (NOAA), National Parks Service, New York State Department of Environmental Conservation (NYSDEC), New York State Energy Research and Development Authority (NYSERDA), New York Department of State (NYSDOS), Massachusetts Division of Marine Fisheries (MADMF), Massachusetts Office of Coastal Zone Management (MACZM), Rhode Island Department of Environmental Management (RIDEM), and Rhode Island Coastal Resources Management Council (RICRMC) to discuss survey logistics, field techniques and equipment, data acquisition systems, parameters to be measured, data processing, analysis and interpretation, and report format. Comments and discussion points generated from that meeting were incorporated into a revised version of the Benthic Survey Protocol and provided to agencies in January 2020. Additional written comments received in January and February 2020 from NYSDEC, NOAA, MADMF, and NYSDOS were incorporated into the Benthic Survey Protocol and an additional revised version was provided to agencies in April 2020.

During April and May 2020, INSPIRE collected SPI and PV images offshore within the SRWF, along the portion of the SRWEC located on the OCS (SRWEC–OCS), as well as at reference areas. These data are presented in this report, which will serve as Appendix M1 of the Project's COP. Preliminary results were shared with federal and state agencies during a webinar in July 2020. During the webinar, the proposed plans for continued survey in the SRWF (video), NY state waters (SPI/PV, sediment grabs), and the intracoastal waterway (ICW) (PV, sediment grabs, video) were discussed. Additional benthic data was collected to support the New York State Article VII application and benthic resource characterization (these data are not presented in this report). In August 2020, the SRWF video survey was conducted to further delineate complex bottom observed during geophysical surveys and the SPI/PV survey (INSPIRE 2020); data from this SRWF video survey will be used to inform future habitat mapping efforts. In August 2020, INSPIRE collected SPI and PV images and sediment grab samples at stations along the export cable located within the state waters in New York (SRWEC–NYS). In September 2020, INSPIRE collected PV images, sediment grab samples, and underwater video footage within the ICW HDD survey area. Analysis of the SPI and PV images, sediment grabs, and video data provided information about surface sediments and benthic habitats in the proposed construction areas to support the benthic habitat assessment and for ground-truthing of geophysical and geotechnical (G&G) data.

BOEM has produced regulations and guidelines for preparing a COP for the proposed development of all offshore wind projects in US federal waters. The SPI/PV survey was conducted to provide Sunrise Wind with data addressing:

- BOEM's *Information Guidelines for a Renewable Energy Construction and Operation Plan (COP)* (BOEM 2020a),
- *Guidelines for Providing Geophysical, Geotechnical, and Geohazard Information Pursuant to 30 CFR Part 585* (BOEM 2020b),
- *Guidelines for Providing Archaeological and Historic Property Information Pursuant to 30 CFR Part 585* (BOEM 2020c),
- *Guidelines for Providing Benthic Habitat Survey Information for Renewable Energy Development on the Atlantic Outer Continental Shelf Pursuant to 30 CFR Part 585* (BOEM 2019), and

- *Recommendations for Mapping Fish Habitat* (NOAA's National Marine Fisheries Greater Atlantic Regional Fisheries Office Habitat Conservation and Ecosystem Services Division [NOAA Habitat] 2020).

SPI/PV imagery is a proven technique to document baseline benthic conditions (physical and biological) as well as any pre-existing pollution or other environmental damage (Germano et al. 2011). This approach can accurately detect and document potential changes in shallow (21 cm) sediment profiles resulting from exploration, construction, and operation activities. The imagery is well-suited to inform constituents and stakeholders of baseline and post-construction/operation conditions given its visual photographic format. These capabilities allow the SPI/PV survey to provide fine-scale ground-truthing of G&G survey data. The value in using SPI/PV imaging to assess the benthic habitat within the context of offshore wind development was exemplified by the acceptance of this technique, with no need for benthic community analysis using traditional grab methods, by BOEM and NOAA Habitat.

1.3 OBJECTIVES

The purpose of the benthic surveys was to provide data to assess benthic habitats and communities, and to characterize surficial sediments that can be used to ground-truth interpreted G&G data collected independently from this survey. Results from the SPI/PV surveys satisfy multiple BOEM guidelines and NOAA recommendations for offshore wind development planning and permitting. Pursuant to several BOEM guidelines, the Coastal and Marine Ecological Classification Standard (CMECS) (Federal Geographic Data Committee [FGDC] 2012) was used to classify dominant biotic categories and to classify surficial sediments and associated fauna (BOEM 2019, 2020b). CMECS is a useful standardized classification system to characterize environments and allows seamless comparisons across studies (FGDC 2012). In addition to CMECS variables, CMECS modifiers are variables that provide additional descriptive information characterizing the physical and biological components of an environment. For example, for these SPI/PV surveys, descriptive information such as successional stage and the epifauna types present are considered CMECS modifiers.

SPI/PV parameters collected as part of this survey correspond to BOEM Benthic Habitat guidelines (BOEM 2019) and NOAA Habitat recommendations (2020) (Table 1.3-1). As such, these data contributed to the completion of the COP in satisfaction of the regulatory guidelines and recommendations. The specific objectives of the SPI/PV survey were to:

- Characterize and delineate benthic habitats
    - Characterization of benthic habitat attributes (SPI/PV)
    - Identification of dominant benthic macrofaunal and macrofloral communities classified using the CMECS Biotic Component to the lowest taxonomic unit practicable (PV)
    - Characterization of benthic community composition visible in SPI and PV images
    - Characterization of the benthic community composition of the sediment grab samples
    - Characterization of physical hydrodynamics (SPI/PV)
    - Identification of sensitive taxa (SPI/PV)
    - Identification of non-native taxa (SPI/PV)

- Identify surficial seafloor conditions
    - Identification/confirmation of rock outcrops and boulders (PV)
    - Identification of bedforms (PV)
    - Identification of distinct horizons in subsurface sediments (SPI)
    - Identification of notable features such as corals, gas seepage, silt/clay, sand, gravel, cobbles, rock, and hardground with very dense or consolidated sediments (SPI/PV)

  - Classification of surface sediment composition to the CMECS Substrate Group and Subgroup levels (PV and SPI)
  - Classification of grain size major mode, expressed in phi units of the Udden-Wentworth classification system (SPI)

- Identify potentially sensitive seafloor habitats, such as corals, submerged aquatic vegetation beds, and ecologically valuable cobble and boulder habitat (BOEM 2019). Cobble and boulder habitat can serve as nursery ground for juvenile lobster and as preferred habitat for squid to deposit their eggs. Both lobster and squid are specific in their habitat requirements and are also economically important species in New England. For these reasons, federal and state agencies consider evidence of these taxa to indicate potentially sensitive habitats.

- Establish a pre-construction baseline that may be used to assess whether detectable changes occur in post-construction benthic habitats associated with proposed operations.

Table 1.3-1. SPI/PV Survey Parameters with Corresponding BOEM Guidelines for Providing Benthic Habitat Survey Information (30 CFR Part 585, BOEM 2019) and NOAA Recommendations for Mapping Fish Habitat (NOAA Habitat 2020)

Table 1.3-1		
BOEM COP Guidelines and *NOAA*† *Recommendations*	**Parameters Derived from PV Images**	**Parameters Derived from SPI Images**
Classification of CMECS sediment type Grain size analysis	CMECS Substrate Group CMECS Substrate Subgroup Gravel measurements	Sediment type (based on grain size major mode)
Identification of distinct horizons in subsurface sediment	None	Sediment type (based on grain size major mode) Apparent Redox Potential Discontinuity (aRPD)*
Delineate hard bottom substrates	CMECS Substrate Group CMECS Substrate Subgroup Gravel measurements	Sediment type (based on grain size major mode)
Identification of bedforms Characterization of physical hydrodynamic properties	Bedform type Sediment Descriptor (e.g., mobile or non-mobile)*	Boundary roughness
Identification of rock outcrops and boulders Characterization and delineation of any hard bottom gradients of low to high relief such as coral (heads/reefs), rock or clay outcroppings, or other shelter-forming features	CMECS Substrate Group CMECS Substrate Subgroup Gravel measurements	None
Characterization of benthic habitat attributes	Gravel measurements Sediment Descriptor* Habitat type	aRPD* Prism penetration depth Sediment oxygen demand and proxies (methane, *Beggiatoa*)
Classification to CMECS Biotic Component to lowest taxonomic unit practicable	CMECS Dominant Biotic Subclass CMECS Co-occurring Biotic Subclass	None

Table 1.3-1		
BOEM COP Guidelines and *NOAA*† *Recommendations*	**Parameters Derived from PV Images**	**Parameters Derived from SPI Images**
Characterization of benthic community composition (identify and confirm benthic species [flora and fauna] that inhabit the area) Identification of communities of sessile and slow-moving marine invertebrates (clams, quahogs, mussels, polychaetes, anemones, sponges, echinoderms) *Identification of potentially sensitive seafloor habitat* *Identification of important biogenic habitats:* • *Hard bottom substrates with epifauna* • *Hard bottom substrates with macroalgae* • *Submerged aquatic vegetation (seagrass)* • *Long-lived and habitat forming taxa (e.g., emergent fauna)*	CMECS Dominant Biotic Subclass CMECS Co-occurring Biotic Subclass Epifauna* Sensitive taxa Attached Flora/Fauna Percent Cover* Burrows/Tubes/Tracks Habitat type	Epifauna* Sensitive taxa Tubes/Voids Successional Stage*

† NOAA Recommendations are indicated by use of italicized characters and support BOEM Guidelines with further detail.
* Indicates variable that is a CMECS modifier. CMECS modifiers provide additional detail to further characterize habitat components using a consistent set of definitions.

2.0 SITE SPECIFIC SURVEY METHODOLOGY

2.1 SEDIMENT PROFILE AND PLAN VIEW IMAGE COLLECTION

Sediment profile and plan view (SPI/PV) imaging is a monitoring technique used to provide data describing the physical characteristics of the seafloor and the benthic biological community (Germano et al. 2011). SPI/PV imaging is a powerful reconnaissance tool that can efficiently map gradients in sediment type, biological communities, and disturbances from physical forces. As an observational approach, SPI/PV data are a snapshot in time and space of the benthic environment, and through interpretation and analysis can provide information on the dynamic processes that shape the physical and biological characteristics of the seafloor; these interpretations should be considered hypotheses available for further testing/confirmation.

All stations within the SRWF, the four reference areas, and the SRWEC–OCS were sampled April 17-May 5, 2020 during 24-hour operations aboard the *Northstar Challenger* out of New Bedford, Massachusetts (Figures 2.1-1, 2.1-2, 2.1-3). Results from the nearshore stations sampled along the SRWEC–NYS and within the ICW near the planned HDD cable route are presented in a separate report (INSPIRE 2020).

SPI/PV station locations are provided in Attachment A. The methodology for data acquisition and analysis for these images was consistent with the sampling methods described in detail in INSPIRE's standard operating procedures (INSPIRE 2019) and summarized below.

2.1.1 Sediment Profile Imaging

The SPI technique involves deploying an underwater camera system to photograph a cross-section of the sediment–water interface. High-resolution SPI were acquired using a Nikon® D7200 digital single-lens reflex (DSLR) camera mounted inside an Ocean Imaging® Model 3731 pressure housing. The pressure housing sat atop a wedge-shaped steel prism with a plexiglass front faceplate and a back mirror, that was mounted at a 45° 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 the camera always had an optically clear path. The descent of the prism into the sediment was controlled by a hydraulic piston. As the prism penetrated the seafloor, a trigger activated a time-delayed circuit that fired the internal strobe to obtain a cross-sectional image of the upper sediment column (Figure 2.1-4). The camera remained on the seafloor for approximately 20 seconds to ensure that successful images were obtained.

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 white balance. Test images were also captured to confirm proper camera settings for site conditions. For this survey, the SPI camera ISO-equivalent was set at 640, shutter speed was 1/250s, and the f-stop was f11. Images were stored in compressed raw Nikon Electronic Format (NEF) files (approximately 30 MB each). Images were checked periodically throughout the survey to confirm that the initial camera settings were still resulting in the highest quality images possible. All camera settings and any setting changes were recorded in the field logs (Attachment B). Details of the camera settings for each digital image are also available in the associated parameters file embedded in each electronic image file.

When the camera was brought back on board after each station, the frame counter was checked to ensure that the requisite number of replicates had been obtained. In addition, a prism penetration depth indicator on the camera frame was checked to verify that the optical prism had penetrated the bottom to a sufficient depth. If images were missed or the penetration depth was insufficient, the camera frame stop collars were adjusted and/or weights were added or removed, and additional replicate images were taken. Frame counts, time of image acquisition, water depth, frame stop-collar position, and the number of weights used were recorded in the field logs for each replicate image (Attachment B). Visual checks and hand tightening checks of all nuts and bolts on the SPI/PV camera frame were conducted periodically to make sure nothing vibrated loose during the survey.

Prior to field operations, the internal clock in the digital SPI system was synchronized with the vessel's navigation. Each image was assigned a unique time stamp in the digital file attributes by the camera's data logger and 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 and other relevant features present at a given station. Digital image files were renamed with the appropriate station names immediately after downloading as a further quality assurance step.

2.1.2 Plan View Imaging

An Ocean Imaging® Model DSC24000 plan view underwater camera system with two Ocean Imaging® Model 400-37 Deep Sea Scaling lasers was attached to the sediment profile camera frame and used to collect plan view images of the seafloor surface. Both SPI and PV images were collected during each "drop" of the system. The PV system consisted of a Nikon® D7200 DSLR camera encased in a pressure housing, a 24 VDC autonomous power pack, a 500 W 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 2.1-4).

During set-up and testing of the PV camera, the positions of lasers on the PV camera were checked and calibrated to ensure separation of 26 cm. Test images were also captured to confirm proper camera settings for site conditions. For this survey, the PV camera ISO-equivalent was set at 640, shutter speed was 1/15s and the f-stop was f18. Images were stored in compressed raw NEF files (approximately 30 MB each). Images were checked periodically throughout the survey to confirm that the initial camera settings were still resulting in the highest quality images possible. All camera settings and any setting changes were recorded in the field logs (Attachment B). Details of the camera settings for each digital image also are available in the associated parameters file embedded in each electronic image file.

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

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 a 0.8 m (2.6 ft) trigger wire, resulting in a mean image width of 0.7 m and a mean field of view of 0.30 m^2. During the survey, 373 of the 379 stations sampled had PV images that were suitable for analysis (i.e., clear enough to discern measured parameters) and six stations had high turbidity that prevented acquisition of any acceptable PV images.

2.1.3 SPI and PV Data Collection

Navigation software was used for positional data acquisition and navigating the vessel to sampling stations. When the vessel was within a 7.5-meter radius of the target location, the SPI and PV camera system was lowered to the seafloor. The navigator electronically recorded the vessel's position and water depth when the SPI camera contacted the seafloor and the winch wire went slack. At least four replicate SPI/PV samples were taken at each station. Each replicate camera position was recorded, time stamped, and linked to the SPI log by station number and replicate. During sampling, the vessel position was electronically recorded by the navigator. At the time of sample acquisition, the time, station name and replicate were recorded in the field log (Attachment B). A total of 1,678 SPI/PV replicates were collected across the 379-station survey. The three replicate images with the best quality (adequate prism penetration, no or minimal sampling artifacts) at each station were selected for analysis. Based on quality, 49 stations had two replicate PV images analyzed, 25 stations had only one replicate PV image analyzed, and three stations had two replicate SPI analyzed (Attachments C and D, which includes the data from all analyzed parameters).

2.1.4 Image Conversion and Calibration

Following completion of field operations, quality control checks were conducted of filenames, date/time stamps, and the field log. After these procedures, the NEF raw image files were color calibrated in Adobe Camera Raw® by synchronizing the raw color profiles to the Color Calibration Target that was photographed prior to field operations with the SPI camera. The raw SPI and PV images were then converted to high-resolution Photoshop Document (PSD) format files, using a lossless conversion file process and maintaining an Adobe RGB (1998) color profile. The PSD images were then calibrated and analyzed in Adobe Photoshop®. Length and area measurements were recorded as number of pixels and converted to scientific units using the calibration information.

2.2 SPI AND PV DATA ANALYSIS

SPI/PV images were analyzed using a set of standard computer-aided measurements to allow for comparisons among different areas of interest.

Measured parameters for SPI and PV images were recorded in Microsoft Excel© spreadsheets. These data were subsequently checked by INSPIRE'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 ESRI ArcGIS 10.7. Map backgrounds use a world-wide data layer called ESRI Oceans (Esri, Garmin, GEBCO, NOAA NGDC, and other contributors) to provide geospatial context.

2.2.1 Sediment Profile Image Analysis Parameters

The parameters discussed below were assessed and/or measured and recorded for each replicate SPI selected for analysis (Attachment C). Descriptive comments were also recorded for each. A depiction of standard variables derived from example SPI from soft bottom settings are provided in Figure 2.2-1.

2.2.1.1 Sediment Type

The sediment grain size major mode and range were visually estimated from the color images by overlaying a grain size comparator utilizing Udden-Wentworth sediment standards that was at the same scale and photographed through the SPI optical system. This comparison allows for grain sizes to be transformed into a sediment type for data presentation. This transformation was prepared by photographing a series of Udden-Wentworth size classes (equal to or less than coarse silt up to granule and larger sizes) with the SPI camera: silt/clay (>4 phi), very fine sand (4 to 3 phi), fine sand (3 to 2 phi), medium sand (2 to 1 phi), coarse sand (1 to 0 phi), very coarse sand (0 to -1 phi), and granule and larger (<-1 phi). The lower limit of optical resolution of the photographic system is about 62 microns, allowing recognition of grain sizes equal to, or greater than, coarse silt (≥4 phi). The accuracy of this method has been documented by comparing SPI estimates with grain size statistics determined from laboratory sieve analyses (Marine Surveys 1984). The comparison of the SPI with Udden-Wentworth sediment standards photographed through the SPI optical system was also used to map near-surface stratigraphy such as sand-over-mud or mud-over-sand, where observed. When mapped on a local scale, this stratigraphy can provide information on relative transport magnitude and frequency.

2.2.1.2 Prism Penetration Depth

The SPI prism penetration depth was measured from the bottom of the image to the sediment–water interface. The area of the entire cross-sectional sedimentary portion of the image was digitized; the number of pixels within this area was divided by the calibrated linear width of the image to determine the mean penetration depth. Linear maximum and minimum depths of penetration were also measured. All three measurements (maximum, minimum, and mean penetration depths) were recorded in the data file.

Since the stop collar settings and the number of weights used in the camera frame were held constant for all stations, the depth to which the SPI prism penetrated the seafloor provided an indication of the sediment bearing capacity and shear strength. The penetration depth can range from a minimum of 0 cm (no penetration on hard substrata) to a maximum of 20 cm (full penetration of very soft substrata). Comparative penetration values from sites of similar grain size give an indication of the relative water content of the sediment. Highly bioturbated sediments and rapidly accumulating sediments tend to have higher water content and greater prism penetration depths.

2.2.1.3 Small-Scale Surface Boundary Roughness

Surface boundary roughness was determined by measuring the vertical distance between the highest and lowest points of the sediment–water interface. The camera must be level to record accurate boundary roughness measurements. The surface boundary roughness (sediment surface relief) measured over the width of sediment profile images typically ranges from 0 to 4 cm and may be related to either physical structures (ripples) or biogenic features (burrow openings, fecal mounds, foraging depressions). Biogenic roughness typically changes seasonally and is related to the interaction of bottom turbulence and bioturbation. In sandy sediments, boundary roughness can be a measure of sand wave height. On silt/clay bottoms, boundary roughness values often reflect biogenic features such as fecal mounds or surface burrows. The size and scale of boundary roughness values can have dramatic effects on both sediment erodibility and localized oxygen penetration into subsurface sediments (Huettel et al. 1996).

2.2.1.4 Apparent Redox Potential Discontinuity Depth

Oxic near-surface marine sediments typically have higher reflectance relative to underlying hypoxic or anoxic sediments. Surface sands washed free of mud also have higher optical reflectance than underlying muddy sands. Oxidized surface sediments contain particles coated with ferric hydroxide (an olive or tan color when associated with particles) while reduced and muddy sediments below this oxygenated layer are darker, generally gray to black (Fenchel 1969; Lyle 1983; Sturdivant and Shimizu 2017). These differences in optical reflectance are visible in SPI. The boundary between colored ferric hydroxide surface sediments and underlying gray to black sediments is called the apparent redox potential discontinuity (aRPD) (Figure 2.2-1). The aRPD is described as “apparent” because of the potential discrepancy between where the sediment color shifts and the complete depletion of dissolved oxygen concentration occurs due to the lag time between when the redox potential (Eh) reaches 0 millivolts (mV) and the precipitation of darker sulfidic sediments (Jorgensen and Fenchel 1974). However, the mean aRPD depth measured in SPI is a suitable proxy for the redox potential discontinuity depth 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). Factors that influence the depth of the aRPD include biological processes (e.g., respiration, bioturbation) and physical processes (e.g., advection, diffusion, local erosion). Scouring can wash away fines and shell or gravel deposits and can result in a very thin surface oxidized layer. During storm periods, erosion may completely remove any evidence of the aRPD (Fredette et al. 1988).

In sandy sediments that have very low sediment oxygen demand (SOD), the sediment may lack a visibly reduced layer even if an RPD is present. Because the determination of the aRPD requires discrimination of optical contrast between oxidized and reduced particles, it is difficult, if not impossible, to determine the depth of the aRPD in well-sorted sands of any size that have little to no silt or organic matter in them. When using SPI technology on sand bottoms, estimates of the mean aRPD depths are often indeterminate with conventional white light photography.

2.2.1.5 Sediment Oxygen Demand Proxies

Sediment oxygen demand (SOD) represents the overall rate of oxygen consumption, biologically and chemically, in the sediments. The relative amount of organic enrichment is indicated by sediment color; darker coloration indicates more reduced sediments with greater organic loading and higher SOD (Fenchel 1969; Rhoads 1974; Lyle 1983; Bull and Williamson 2001; Sturdivant and Shimizu 2017). SOD levels (i.e., none, low, medium, and high) were assessed for all images. Under high organic matter loading and subsequently high SOD, microbial sulfate reduction proceeds and may completely deplete porewater sulfate concentrations. Under these conditions, methanogenesis can occur, leading to methane bubbles in the sediment column. In SPI, methane appears as irregular shaped gas-filled voids with a glassy texture (due to the reflection of the strobe off the gas bubble). Any presence of methane was noted. Similarly, under highly reduced anoxic conditions, *Beggiatoa* bacteria may be present. These bacterial colonies have diagnostic morphology that has been documented in numerous other sediment profile imaging surveys (Nilsson and Rosenberg 1997; Rosenberg et al. 2001; Karakassis et al. 2002; Germano et al. 2011). Although unlikely to be important in OCS sediments, if encountered, *Beggiatoa* or *Beggiatoa*-like colonies were noted. SOD is a CMECS modifier, adding detail and informing CMECS classifications.

2.2.2 Plan View Image Analysis Parameters

Plan view images record conditions at the seafloor surface in a downward-looking orientation. They provide a larger field-of-view than SPI along with valuable information about the landscape ecology and sediment topography in the area where the pinpoint “optical core” of the sediment profile was taken (Figure 2.2-2). The parameters discussed below were assessed and/or measured and recorded for each replicate PV image selected for analysis (Attachment D). Descriptive comments were also recorded for each replicate PV image.

2.2.2.1 Field-of-View

The field-of-view area was measured using the scale information provided by the underwater lasers (i.e., the measurement between two laser points with a known distance). Scaling allows accurate measurements of sediment grain sizes, density counts of attached epifaunal colonies, sediment burrow openings, and/or larger macrofauna or fish. The laser points may not be visible in images with high turbidity.

2.2.2.2 Boulders

The CMECS size definition of boulders was utilized for this survey: gravel larger than 256 mm. Sensitive taxa and attached fauna (e.g., sponges, hydroids, barnacles) are often associated with boulders. Further, the presence of boulders in mixed bottom types has been noted as an important feature for understanding the distribution of soft and hard non reef-building corals in the region of the SRWF. The presence/absence of boulders in each replicate was noted.

2.2.2.3 Bedforms

Seafloor bedforms are indicative of seafloor hydrodynamics and are physical features visible on the surface of the seafloor. These features can give an indication of the physical energy of the system (ripples) or of biotic activity (feeding pits). Sediment bedforms such as sand waves, sand bars, and ripples develop as a response of the seafloor to hydrodynamic conditions. For example, short wavelength sediment ripples indicate mobile sands and active bedload transport. In contrast, soft silt/clay sediments often lack surficial bedforms and indicate quiescent depositional environments. The view of the seafloor provided in the PV images was <1 m^2, the scope of this view limits the ability to distinguish bedforms that exist over larger scales (e.g., sand waves or dunes). Bedforms, where present, were noted in each replicate PV image.

2.2.3 Parameters Obtained Using Both SPI and PV Image Analysis

The parameters discussed below were assessed and/or measured and recorded for each replicate SPI and PV pair selected for analysis (Attachments C and D).

2.2.3.1 Infaunal Successional Stage

The classification of infaunal successional stages is readily accomplished with SPI/PV technology. Infaunal successional stage is a measure of the biological community inhabiting the seafloor. 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 is 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 recolonizing 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 2.2-3).

Various combinations of these basic successional stages are possible. For example, secondary succession can occur (Horn 1974) in response to additional labile carbon input to surface sediments, with surface-dwelling Stage 1 or 2 organisms coexisting at the same time and place with Stage 3, resulting in the assignment of a “Stage 1 on 3” or “Stage 2 on 3” designation. If both Stage 1 and Stage 2 organisms exist in an image with Stage 3 fauna, the Stage 1 on 3 designation is used because it is more important to denote the presence of recruiting organisms than intermediate Stage 2 fauna. In addition, intermediate stages (1->2 and 2->3) exist when limited evidence of a more advanced stage is documented alongside an earlier stage. For example, a Stage 2->3 designation might be assigned to an image where Stage 2 tubes are documented overlaying a very deep aRPD, which suggests that deep-dwelling, head-down deposit feeders are likely to exist in that area and were not captured in that particular SPI replicate.

While the successional dynamics of invertebrate communities in fine-grained sediments have been well documented, the successional dynamics of invertebrate communities in sand and coarser sediments are not well known. Consequently, the insights gained from SPI/PV technology regarding biological community structure and dynamics in sandy and coarse-grained bottoms are limited. Successional stage was assigned by assessing the types of infauna and related activities (e.g., feeding voids) apparent in both the SPI and PV images. Successional stage is a CMECS modifier, adding detail and informing CMECS classifications.

2.2.3.2 Fauna and Flora Presence

Where visible in the SPI and/or PV images, flora and fauna were identified to the lowest possible taxonomic grouping. The inferred presence of fauna was identified through observations of burrows, tubes, tracks, foraging pits, and fecal casts. The presence of surficial tubes and deep voids were also noted. Fauna were grouped into several categories: fish, soft sediment infauna, sessile epifauna, mobile epifauna, sensitive taxa, and non-native taxa. Epifauna taxa is a CMECS modifier (Associated Taxa), adding detail to the CMECS classifications. Where attached flora and fauna were present in PV images, the percent coverage of the image was estimated using the CMECS Percent Cover Modifier (FGDC 2012).

2.2.3.3 CMECS Substrate Group and Subgroup

CMECS Substrate Groups, Substrate Subgroups, and Biotic Subclasses observed during these analyses within the context of broader level CMECS classifications (e.g., CMECS Origin, CMECS Subclass) is summarized below (Table 2.2-1). Substrate[2] is defined in CMECS as the non-living materials that form an aquatic bottom or seafloor or that provide a surface (e.g., floating objects, buoys) for growth by attached biota. Substrate may be composed of any substance, natural or manmade. Describing the composition of the substrate is a fundamental part of any ecological classification scheme. Substrate provides context and setting for many aquatic processes and it provides living space for benthic and attached biota. The Substrate Component is a characterization of the composition and particle size of the surface layers of the substrate; this component is designed to be compatible with a range of sampling tools (FGDC 2012).

Detailed definitions of all possible substrate classifications can be found in the CMECS document (FGDC 2012); only the substrate classifications observed in this survey are presented here. Where gravels were present, the dominant grain size was measured; the diameter in millimeters was calculated and translated to a gravel type according to the Wentworth scale (Wentworth 1922). PV images were assigned one of four Substrate Groups: Gravel, Gravel Mixes, Gravelly, and Sand or Finer. Subsequently, each PV image was assigned one of the following Substrate Subgroups, nested hierarchically within the Groups (Figure 2.2-4).

- Gravel:
    - Boulder - Geologic Substrate contains >80% Gravel, with predominant Gravel size range of 256 mm to <4,096 mm.
    - Cobble - Geologic Substrate contains >80% Gravel, with predominant Gravel size range of 64 mm to <256 mm.
    - Pebble - Geologic Substrate contains >80% Gravel, with predominant Gravel size range of 4 mm to <64 mm.
    - Granule - Geologic Substrate contains >80% Gravel, with predominant Gravel size range of 2 mm to <4 mm.
- Gravel Mixes:
    - Sandy Gravel - Geologic Substrate is 30% to <80% Gravel, with Sand composing 90% or more of the remaining Sand-Mud mix.
    - Mixed Sediment – Geologic Substrate is 5% to <80% Gravel, and the remaining Sand-Mud mix is <90% Sand
- Gravelly
    - Gravelly Sand - Geologic Substrate is 5% to <30% Gravel, and the remaining Sand-Mud mix is 90% or more Sand.
- Sand or Finer – geologic substrate is <5% Gravel, grain size major mode obtained from SPI of surficial sediments (see Section 2.2.1.1 for size classification descriptions) was used to decipher the following Subgroups within this Group
    - Very Coarse Sand
    - Coarse Sand
    - Medium Sand
    - Fine Sand
    - Very Fine Sand
    - Silt/Clay

[2] 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.

2.2.3.4 CMECS Biotic Subclass

The Biotic Component of CMECS is a classification of the living organisms of the seabed and water column together with their physical associations at a variety of spatial scales. The Biotic Component is organized into a branched hierarchy of five nested levels: Biotic Setting, Biotic Class, Biotic Subclass, Biotic Group, and Biotic Community. Biotic Component classifications are defined by the dominance of life forms, taxa, or other classifiers in the observation. In the case of PV images dominance is assigned to the taxa with the greatest percent cover in the observational footprint (FGDC 2012).

The Biotic Subclass is a key CMECS classifier that presents valuable information about the surveyed area in terms of physical habitat and the potential presence of sensitive taxa; therefore, it was identified as a parameter for PV image analysis. Biotic Subclasses describe dominant biota at a coarse level, and, to provide additional information, a Co-occurring Biotic Subclass was designated as any secondarily dominant (by percent cover) Biotic Subclass. The Biotic Component Setting most applicable to all data reported here is the Benthic/Attached Biota. Within the Benthic/Attached Biota setting, there are eight classes, of which the Faunal Bed class is of most relevance to the OCS. 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 or Soft Sediment Fauna subclass. Although the Biotic 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).”

Plan view images were assigned one of the following Biotic Subclasses (definitions from FGDC 2012):

- Attached Fauna – “Areas characterized by rock substrates, gravel substrates, other hard substrates, or mixed substrates that are dominated by fauna which maintain contact with the substrate surface, including firmly attached, crawling, resting, interstitial, or clinging fauna. Fauna may be found on, between, or under rocks or other hard substrates or substrate mixes. These fauna use pedal discs, cement, byssal threads, feet, claws, appendages, spines, suction, negative density, or other means to stay in contact with the (generally) hard substrate, and may or may not be capable of slow movement over the substrate. Many attached fauna are suspension feeders and feed from the water column. Other attached fauna are benthic feeders, including herbivores, predators, detritivores, and omnivores.”

- Soft Sediment Fauna – “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). These animals may tunnel freely within the sediment or embed themselves wholly or partially in the sediment. In many cases, they will regularly leave their burrows, and may move rapidly or swim actively after doing so, but any animal that creates a semi-permanent home in the sediment can be classified as Soft Sediment Fauna. These animals may also move slowly over the sediment surface but are not capable of moving outside of the boundaries of the classification unit within one day. Most of these fauna possess specialized organs for burrowing, digging, embedding, tube-building, anchoring, or locomotory activities in soft substrates.”

- Inferred Fauna – “Areas dominated by evidence (real or inferred) of faunal activity, but where the fauna themselves are not currently present or evident, given the sampling methodology.”

- IND – an indeterminate Biotic Subclass

The Biotic Component subclasses of Attached and Soft Sediment Fauna are broad-brush tools for screening-level assessments of seafloor habitats for offshore wind development. Mapping proposed development areas 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). Depending on the results and scale of reconnaissance surveys, additional studies would likely be needed as specific siting alternatives are examined.

Attached Fauna habitats are also referred to in some documents as “live bottom.” These hard bottom habitats that support “live bottom” are considered potentially valuable and sensitive resources for regionally important taxa. Additionally, cobbles and boulders can provide habitat for a diverse range of taxa and serve as valuable habitat for corals and as a place for squid to lay their eggs. Soft coral habitats also may play a role in creating or enhancing habitat for black sea bass (*Centropristis striata*), a species of concern regarding possible habitat disturbance from offshore wind construction and operation activities (Guida et al. 2017). Hard bottom habitats are limited in distribution along the Mid-Atlantic and Northeast portions of the OCS relative to sandy and soft bottom habitats (Guida et al. 2017; USGS 2020).

Table 2.2-1. CMECS Classification Levels Used in Analysis and Classifications for the SRW Survey

CMECS Term	Scale of Classification	Classifications
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; Coarse Unconsolidated Substrate
+Substrate Group	PV	**Sand or Finer**; Gravelly; Gravel Mixes; Gravel
+Substrate Subgroup	SPI/PV	Silt/Clay; **Very Fine Sand; Fine Sand; Medium Sand**; Coarse Sand; Very Coarse Sand; Gravelly Sand; Sandy Gravel; Granule; Pebble; Cobble; Boulder
Biotic Component		
Biotic Setting	SPI/PV	Benthic/Attached Biota
Biotic Class	SPI/PV	Faunal Bed
+Biotic Subclass	SPI/PV	**Soft Sediment Fauna;** Attached Fauna; Inferred Fauna

+ Indicates variability within the surveyed area at this level of the hierarchy

Bold text indicates an overwhelming dominant classification across the surveyed area

2.2.3.5 Sensitive Taxa and Species of Concern

The image resolution of the SPI/PV survey allows for the identification of sensitive taxa. Sensitive seafloor habitats include corals, submerged aquatic vegetation beds, and valuable cobble and boulder habitat (BOEM 2019). Cobble and boulder habitat can serve as structure for hard and soft corals, nursery ground for juvenile lobster, and as preferable benthic habitat for squid to deposit their eggs. Taxa considered sensitive for this region include corals, seagrasses, squid eggs, and American lobster. In this area, species of ecological and/or concern regarding possible habitat disturbance from offshore wind construction and operation activities include black sea bass, Atlantic cod, sea scallop, and ocean quahog (Guida et al. 2017). Presence/absence of each sensitive taxa or species of concern was noted for each replicate SPI and PV image.

2.2.3.6 Non-Native Taxa

The introduction of non-native species to the water column and benthic habitat is an important concern related to offshore development. The SPI/PV survey collected baseline presence/absence data for marine non-native species within the surveyed area. A list of potential non-native species was derived from a combination of relevant resources including the Northeastern Aquatic Nuisance Species Panel (https://www.northeastans.org/) and the National Exotic Marine and Estuarine Species Information System database (NEMESIS) curated by the Smithsonian Environmental Research Center.

2.2.3.7 Macrohabitat Type

Benthic habitat types, and specifically macrohabitat types, are used here as a construct to describe repeatable physical-biological associations and were derived from CMECS classifiers and modifiers obtained from the SPI/PV analysis. Given the spatial scale of the SPI/PV data, benthic habitat types derived from replicate SPI/PV images are considered macrohabitats (*sensu* Greene et al. 2007). Each PV replicate image is between 0.2 and 0.5 m^2 and the replicate images were collected within approximately 10 m of each other. Thus, this design can provide insight into the degree of patchiness of habitat features such as boulders and cobbles within this spatial context. This sampling approach cannot capture larger habitat features such as sand waves or smaller habitat features such as cracks and crevices on a boulder. Recognizing scale is a critical component to habitat descriptions and delineations, the habitat types derived from the SPI/PV approach are most accurately described as macrohabitats, which as defined by Greene et al. 2007 as encompassing a scale of one to 10 meters.

A summary of SPI/PV parameters across the replicate images were used to inform macrohabitat type at each station. Specifically, the macrohabitat variable was generated from several SPI and PV variables as described in detail in Figure 2.2-5. This approach ensured that any gravel presence was detected, as the “Max Gravel Size” variable represents the maximum gravel size detected across all three analyzed replicates. The macrohabitat type derived from SPI/PV at each station cannot be extrapolated beyond the scale of the station. These point data will be used to ground-truth and inform future benthic habitat mapping efforts to support Essential Fish Habitat (EFH) consultation. This habitat mapping will utilize geophysical data (bathymetry, backscatter, side-scan sonar), these SPI/PV data, as well as video transect data (where available), to provide a large-scale delineation of benthic habitats across the survey area.

2.3 DATA QUALITY ASSURANCE AND QUALITY CONTROL

Measures were taken during field data collection for data quality assurance and control in alignment with INSPIRE’s standard operating procedure for sediment profile and plan view imaging sample collection (INSPIRE 2019). These included but were not limited to:

- Systems tested prior to and during survey activities to ensure calibration and operation,
- Full backup system (including tools, parts, and electronics) was carried in the field,

- Image data collected was time stamped both digitally and in hand-written logs to ensure proper identification and synchronization with navigational data,

A quality assurance review of all data and results presented in this report was performed in accordance with INSPIRE's standard operating procedure for sediment profile and plan view image analysis (INSPIRE 2019). Image analysis parameters were thoroughly checked by senior scientists to ensure quality and accuracy.

3.0 SITE SPECIFIC SURVEY RESULTS

INSPIRE scientists conducted a benthic survey April 17-May 5, 2020 aboard the utility research vessel the *Northstar Challenger.* The April/May survey consisted of a total of 375 SPI/PV stations that were located at the SRWF, along the SRWEC–OCS, and across four reference areas (Figures 2.1-1, 2.1-2, 2.1-3). An additional four stations, all located along the western portion of the SRWEC–OCS, (Stations 440, 441, 442, and 443) were sampled in August 2020 during the SRWEC–NYS survey to account for adjustments in the proposed cable corridor. Station coordinates, sampling date and time, and field comments are provided in Attachment A. Attachment B includes the field log with details on the weights and stop collar parameters used during the survey. Complete datasets of all parameters measured from each analyzed SPI and PV image are presented in Attachments C and D. Station-level summary data of geophysical and biological results were grouped and reported by area including the SRWF, the SRWEC–OCS, and the reference areas in Tables 3.1-1, 3.1-2, 3.2-1, 3.2-2, 3.3-1, and 3.3-2.

A total of 379 stations were sampled, which included 107 stations along the SRWEC–OCS, 252 stations sampled in the SRWF, and 20 stations in the four reference areas. Of the 252 stations in the SRWF, 30 stations were adaptive sampling stations, which were stations selected in real-time during the survey following image review and identification of complex habitat. Adaptive sampling increased the sampling resolution around areas of complex bottom to further characterize the spatial extent of that complex habitat. Sections 3.1, 3.2, and 3.3 report SPI/PV results from the SRWF, the SRWEC–OCS, and the reference areas, respectively.

3.1 SUNRISE WIND FARM (SRWF)

A total of 252 stations were sampled at the SRWF (Figure 2.1-1), this included 30 adaptive sampling stations (Stations 701-730), which mainly occurred in the northwest corner of the SRWF, increasing the spatial resolution in this area where complex bottom was observed. There were spatial trends in the physical and biological parameters observed across the SRWF, reported in detail in Sections 3.1.1 and 3.1.2. To facilitate discussion of particular spatial patterns, the SRWF has been divided and named by area as presented in Figure 3.1-1; these general areas, which include the northwest region, the north-central region, the west-central region, the northeast region, and the southeast region, were divided based on patterns of both biological and geophysical observation during data synthesis. Areas within the SRWF that are outside of these specific delineations are referred to in the results below by the specific station IDs.

3.1.1 Physical Features

The measured water depth across SRWF stations during the survey ranged from 39.0 to 79.0 m with an average of 49.3 m (Table 3.1-1). In general, the surface sediments in the SRWF ranged from Sand or Finer to Gravel (CMECS Substrate Groups) and from Silt/clay to Boulder (CMECS Substrate Subgroups). There was a spatial trend moving from some occurrence of coarse substrata intermixed with stations of finer sediments in the northwest and north-central to predominantly finer substrata in the southeast region of the SRWF (Figures 3.1-2, 3.1-3). Overwhelmingly, the most frequently observed CMECS Substrate Group within the SRWF was Sand or Finer (217 total stations) (Table 3.1-1; Figure 3.1-2). Of these stations most were classified by the CMECS Substrate Subgroup of either Very Fine Sand (79 total stations), Fine Sand (63 total stations), or Medium Sand (32 total stations) (Table 3.1-1; Figure 3.1-3). Representative SPI and PV images of the range of Substrate Subgroups, derived from information from SPI and PV images, across the surveyed area are provided in Figure 3.1-4. Specifically, at stations classified as Sand or Finer, the SPI grain size major mode data were used to inform the Substrate Subgroup. Many stations classified as Sand or Finer had a very thin layer of mud (silt/clay) across the surface of the sediments; the shallow depth of this silt/clay drape was evident from the SPI images. Given the patchy coverage and shallow depth, the presence of this layer of silt/clay is likely dynamic and short-term at any given location. In the northwest region there was a higher frequency of stations classified by the CMECS Substrate Subgroups Gravelly Sand, Sandy Gravel, and Boulder compared to the rest of the SRWF (Figure 3.1-3). Gravelly Sand was observed at 24 stations within the SRWF, with all but three of these stations located in the northwest region. Sandy Gravel and Boulder were observed at only a few stations: Stations 716 and 721 were classified as Sandy Gravel and Stations 003 and 227 were classified as Boulder (i.e., more than 80% cover of boulder-sized gravels in the PV images) (Table 3.1-1; Figure 3.1-3).

Boulders were infrequently observed at the SRWF but did occur at 12 of the 246 SRWF stations with PV images. All stations with documented boulders were in the northwest region, with the exception of Station 085, which was located along the southern border at approximate longitude of 71.1°W (Figure 3.1-5). In addition to boulders, cobbles and pebbles/granules were also documented. Cobble was observed as the maximum gravel size at three stations, while pebble/granules was documented as the maximum gravel size at 18 total stations at the SRWF (Figure 3.1-5; Attachment D). Stations with cobble and pebbles/granules were predominantly observed in the northwest and north-central regions of SRWF.

The presence or absence of bedforms in the PV images provides a snapshot in time of the small-scale sediment mobility in a given area. In the deeper regions of the SRWF, small scale sediment mobility was generally low, as assessed through the general lack of bedforms observed in the PV images (i.e., the southeast and west-central areas) (Figure 3.1-6). When bedforms were observed, they were characterized as sand ripples that were either large (one to three ripples within the PV field of view) or small (≥4 ripples within the PV field of view) (Figure 3.1-7). Small ripples were documented at a total of 80 stations while large ripples were observed at 68 total stations, with no discernable spatial trend in the occurrence of ripple sizes at the SRWF (Figure 3.1-6).

Mean station small-scale boundary roughness at the SRWF ranged from 0.3 to 6.7 cm, with an average of 2.2 cm (Standard Deviation [SD]±1.2) (Table 3.1-1). The vast majority of stations had relatively low mean station boundary roughness (<1.5 cm) dominated by biologically driven processes (Figure 3.1-8). By providing physical structure at the sediment–water interface, tube-building species (e.g., amphipods, polychaetes) and other emergent fauna (e.g., burrowing anemones [cerianthids]) can increase small-scale boundary roughness. These small-scale biogenic structures can be particularly important ecologically, particularly in soft bottom environments otherwise characterized by low relief and low complexity at the sediment–water interface.

Mean station prism penetration depth at the SRWF ranged from a minimum of 0.0 to a maximum of 15.9 cm, with an average of 5.4 cm (SD±2.9) (Table 3.1-1). Since the stop collar settings and the number of weights used in the camera frame were held constant for all stations, the depth to which the SPI prism penetrated the seafloor provided an indication of the sediment bearing capacity and shear strength. The majority of stations (178 of the 252) had mean station prism penetrations equal to or less than 6.0 cm (Figure 3.1-9) indicating the load bearing capacity of the sediment at stations along the SRWF was relatively strong. In general, at the SRWF coarser sediment types were associated with shallower prism penetration and finer sediment types with deeper prism penetration. The stations in the southeast had generally deeper mean prism penetration, often exceeding 10 cm, common for finer sediment areas. The deeper prism penetrations in this area of SRWF indicate sediments with less load-bearing capacity.

3.1.2 Biological and Habitat Features

At the SRWF, a total of 7 discrete macrohabitat types were documented including (1) *sand and mud,* (2) *sand,* (3) *sand and mud with ripples,* (4) *sand with ripples,* (5) *sand with pebbles/granules,* (6) *patchy cobbles and/or boulders on sand,* and (7) *cobbles and/or boulders on sand* (Figures 3.1-10, 3.1-11)*.* These classifications were derived from a combination of SPI and PV data i.e., CMECS Substrate Group, maximum gravel size (when present), surficial grain size major mode, and bedform presence/absence. There were clear spatial trends associated with macrohabitat type at the SRWF (Figure 3.1-10) that followed similar patterns observed in CMECS Substrate Subgroup (Figure 3.1-3), and the spatial distribution of commonly observed benthic taxa

(Figure 3.1-12). In the northwest corner and northern border of the SRWF, macrohabitat type was spatially heterogenous compared with the rest of the SRWF (Figure 3.1-10). Macrohabitat type in the northwest corner ranged from low complexity (*sand and mud*) to high complexity (*cobbles and/or boulders on sand*). Stations along the north-central border were generally classified as *sand with pebbles/granules* or *sand* (Figure 3.1-10). Macrohabitat type *sand with ripples* was observed across the majority of the northeastern region of the SRWF, and was often associated with CMECS Substrate Subgroup ranging from Fine Sand to Coarse Sand (Figures 3.1-3; 3.1-10). At these stations sand dollars were common (Figure 3.1-12). Macrohabitat type *sand and mud* described much of the southeast region and central-west group of stations. Burrowing anemones (cerianthids) were frequently associated with this macrohabitat type and the CMECS Substrate Subgroup Very Fine Sand (Figures 3.1-3, 3.1-12).

The predominant CMECS Biotic Subclass was overwhelmingly Soft Sediment Fauna at the SRWF, which occurred at a total of 221 total stations (88% of the SRWF stations). The CMECS Biotic Subclass Attached Fauna was observed at a total of 11 stations, while Inferred Fauna occurred at 9 total stations at the SRWF (Figure 3.1-13). The CMECS Biotic Subclass distribution across the SRWF largely tracked that of the CMECS Substrate Group and macrohabitat type spatial patterns, with Attached Fauna documented at stations with greater proportion of gravel and larger gravel, and Soft Sediment Fauna occurring in association with Sand or Finer classifications (Figures 3.1-2, 3.1-10, 3.1-13). Specifically, Attached Fauna occurred mainly in the northwest region of the SRWF and at Station 085 on the southern border of the SRWF. When Attached Fauna was observed, the percent cover of the attached fauna ranged from trace (<1%) to complete (90-100%) (Figure 3.1-14). At the SRWF, the CMECS Biotic Subclass Soft Sediment Fauna was generally composed of deep burrowing fauna, tube-building species, as well as mobile epifauna, often inferred by the presence of tracks and trails. The distribution and co-occurrence of burrows, tracks, and tubes documented in the PV images is provided in Figure 3.1-15. Burrows, tracks, and tubes were often observed together at stations composed of finer substrata, particularly in the southeast and west-central areas (Figures 3.1-3, 3.1-15). Tubes were observed in the absence of tracks and burrows at a cluster of stations in the central portion of the SRWF (Figure 3.1-15).

The mean station aRPD depth at the SRWF ranged from 1.2 to 5.5 cm, with an average of 3.0 cm (SD±0.8) (Table 3.1-1; Figure 3.1-16). Generally, the aRPD was indeterminant at stations with larger grain sizes (Table 3.1-2) likely due to lower organic content in these coarser sediments, as inferred by the optical reflectance of the sediment column; generally sandy, porous sediments have low organic content. aRPD depth was typically documented at stations characterized by the CMECS Substrate Subgroups Silt/Clay, Very Fine Sand, and Fine Sand, with generally shallower aRPD depths associated with finer grain sizes (Figures 3.1-3, 3.1-16).

The predominant Successional Stage at the SRWF was Stage 2 and Stage 2->3 (Table 3.1-2; Figure 3.1-17), with a strong association between Successional Stage and sediment composition (i.e., CMECS Substrate Subgroup) (Figures 3.1-3, 3.1-17). Generally, stations that were classified by Very Fine Sand and Fine Sand (southeast and west-central regions) were documented to be more advanced in successional state (Stage 2->3 and 2 on 3), compared with stations that were classified by Medium Sand to Coarse Sand (northeast and central regions) where intermediate successional state was more often documented (i.e., Stage 2). Successional Stage was generally indeterminant at stations characterized by greater percent cover of gravels and larger gravels compared to the soft sediment stations (e.g., northwest region). This is common in coarse sediments where prism penetration is limited or nonexistent. Successional Stage is a measure of the functional maturity of the infauna community, and a lack of prism penetration limits the ability to assess this metric.

The northern star coral, *Astrangia poculata*, a non reef-building hard coral, was the only sensitive taxa observed across the surveyed area, occurring at five stations located within the SRWF (Stations 003, 085, 227, 702, and 721) (Figure 3.1-18). The sea scallop, *Placopecten magellanicus,* was one of the species of concern (Guida et al. 2017) observed at the SRWF. Sea scallops were found at 14 stations: two stations located in the northwest region (Stations 705 and 722), two stations in the central part (Stations 259 and 033), four stations in the south-central region (Stations 729, 724, 085, and 082), and five stations in the southeast region (Stations 059, 100, 098, 121, and 120) (Figure 3.1-19). When observed, sea scallops were documented as solitary individuals, no scallop beds or high densities of scallops were observed. Although difficult to detect with PV imagery, a pair of large bivalve siphons were clearly observed at one station (Station 130) at the SRWF, which was indicative of an ocean quahog (*Arctica islandica*), a species of concern in the region (Guida et al. 2017) (Figures 3.1-19, 3.1-20). Dead clam shell valves were observed at several other stations across the surveyed area. Although not a designated species of concern, the Jonah crab is a notable taxon given its increasing importance as a targeted species by the fishing industry (Truesdale et al., 2019). A Jonah crab was observed at two stations within the SRWF (Stations 121 and 091), where Very Fine Sand (CMECS Substrate Subgroup) was dominant (Table 3.1-2; Figures 3.1-3, 3.1-4).

3.2 SUNRISE WIND EXPORT CABLE – OUTER CONTINENTAL SHELF (SRWEC–OCS)

There were 107 SPI/PV stations sampled along the SRWEC–OCS (Figures 2.1-2, 2.1-3). These stations extended from the three-mile New York State waters boundary offshore to the SRWF and continued through the SRWF to the OCS–DC location. The SRWEC–OCS encompassed Stations 135, 136, 501-578, 440-443, and 641-663. Stations 641-663 were located along a section of the planned SRWEC–OCS that has since been removed from the project envelope. The description of the results refers to two main portions of the SRWEC–OCS for easy reference: (1) the western portion, which extends from the three-mile New York State waters boundary eastward to just beyond where the planned export cable redirects northeast (Station 501 numerically through Station 540, and Stations 440, 441, 442, and 443), and (2) the eastern portion, which includes the remaining extent of the cable corridor to the OCS–DC at the SRWF, and Stations 641 through 663. The division and grouping of stations between the western and eastern portions of the SRWEC–OCS was informed by observed seafloor characteristics; moving eastward from Station 540, at approximate longitude of 71.9°W, the substratum becomes finer and sand dollars less frequently observed.

3.2.1 Physical Features

The measured water depth across SRWEC–OCS stations during the survey ranged from 27.4 to 68.3 m with an average of 51.9 m (Table 3.2-1). All stations along the SRWEC–OCS were classified with the CMECS Substrate Group Sand or Finer with the exception of Stations 537 and 662, which were classified as Gravelly (Table 3.2-1). Stations along the western portion of the SRWEC–OCS were characterized with the CMECS Substrate Subgroups Very Fine Sand, Fine Sand, or Medium Sand, with the exception of Station 537, which was Gravelly Sand, with pebble/granule being the largest gravel size documented here (Table 3.2-1; Figures 3.2-1, 3.2-2, 3.2-3). The majority of stations along the eastern portion of the SRWEC–OCS were classified as CMECS Substrate Subgroup Very Fine Sand (Figure 3.2-2). In general, within station variability was low for CMECS Substrate Group and Subgroup across the SRWEC–OCS stations, classifications across replicates within a station were generally homogenous (Attachments C and D). No boulders or cobble were observed at any stations along the SRWEC–OCS (Table 3.2-1; Attachments C and D).

The presence or absence of bedforms in the PV images provides a snapshot in time of the small-scale sediment mobility in a given area. Small-scale sediment mobility was assessed by the presence of large sand ripples (one to three ripples within the PV field of view) or small sand ripples (≥4 ripples within the PV field of view) indicating higher sediment mobility compared with no ripples. Small-scale sediment mobility was generally higher at the stations along the western portion of the SRWEC–OCS due to a higher occurrence of large and small ripples, compared with the eastern extent, where there was a large extent of stations (i.e., Stations 550 through 568) where ripples were not documented (Figures 3.2-4, 3.2-5). Although, sand ripples were observed frequently along the eastern extent of SRWEC–OCS moving towards the SRWF from Stations 569 and 652 (Figure 3.2-5). No ripples were observed at the four stations (Stations 440, 441, 442, and 443) along the western portion of the SRWEC–OCS (Figure 3.2-4) that were sampled during the SRWEC–NYS waters survey in August, despite ripples documented at nearby stations during April/May. This may suggest seasonal or short-term shifts in the presence and extent of small-scale bedforms in this area and exemplifies the generally dynamic nature of this benthic environment.

Mean station small-scale boundary roughness along the entire SRWEC–OCS ranged from 0.6 to 4.7 cm, with an average of 1.7 (SD±0.9) (Table 3.2-1). In corroboration with the distribution of small-scale bedforms along the SRWEC–OCS, in general, stations along the western portion of the SRWEC–OCS had larger boundary roughness compared to stations along the eastern portion of the SRWEC–OCS (Figures 3.2-6, 3.2-7). This spatial pattern observed in boundary roughness was similar to that observed in the distribution of sand ripples across the SRWEC–OCS, suggesting physical forces influencing the boundary roughness along the western extent while biological factors were likely more important in influencing the boundary roughness along the eastern extent.

Mean station prism penetration depth along the SRWEC–OCS ranged from a minimum of 1.0 to a maximum of 13.1 cm, with a mean of 5.6 cm (SD±2.6) (Table 3.2-1). With the exception of Stations 506 and 443, all stations along the western extent of the SRWEC–OCS had mean station prism penetrations equal to or less than 6.0 cm indicating the load bearing capacity of the sediment at stations along the SRWEC–OCS was relatively strong (Figure 3.2-8). In contrast, the stations along the eastern portion of the SRWEC–OCS had generally deeper mean station prism penetrations, which is typical of finer sediments (Figure 3.2-9).

3.2.2 Biological and Habitat Features

The macrohabitat type at the majority of stations along the eastern portion of the SRWEC–OCS was *sand and mud*, while stations along the western portion of the SRWEC–OCS were generally characterized as *sand and mud with ripples* or *sand with ripples* (Figures 3.2-10, 3.2-11). The CMECS Biotic Subclass across the entire SRWEC–OCS was Soft Sediment Fauna (Table 3.2-2). Soft Sediment Fauna in this environment included mobile epifauna including hermit crabs, sand dollars, shrimp, and sea stars as well as sessile infauna including burrowing anemones (cerianthids), tube-building worms (*Diopatra* sp.), and deep burrowing worms (Table 3.2-2; Figures 3.2-12, 3.2-13, 3.2-14).

The spatial distribution of sand dollars and burrowing anemones, two commonly observed species, closely tracked the patterns observed in macrohabitat types and CMECS Substrate Subgroups (Figures 3.2-1, 3.2-2, 3.2-10, 3.2-11, 3.2-12, 3.2-13). The stations along the western portion of the SRWEC–OCS, that were predominately composed of CMECS Substrate Subgroup Medium Sand and macrohabitat types *sand with ripples* or *sand and mud with ripples*, were characterized by high densities of sand dollars (Figure 3.2-12). From the three-mile New York State waters boundary (Station 501) out to Station 540, sand dollars were observed at every station, with the exception of a cluster of four stations (Stations 527, 528, 529, and 530). Around Station 540 the cable route redirects northeast and the Substrate Subgroup shifts from Medium Sand to Very Fine Sand (Figure 3.2-2). The stations along the eastern portion of the SRWEC–OCS, which were characterized by macrohabitat type *sand and mud* (Figure 3.2-2) were either not documented to have any sand dollars or burrowing anemones (cerianthids) or were inhabited by high densities of burrowing anemones (cerianthids) (Figure 3.2-13). In general, burrows, tracks, and tubes were present at the majority of stations along the eastern portion of the SRWEC–OCS, while along the western portion of the SRWEC–OCS, tracks and tubes were common, with less burrow observations (Figures 3.2-15, 3.2-16).

Mean station aRPD depth along the SRWEC–OCS ranged from 1.9 to 4.1 cm, with an average of 2.6 cm (SD±2.6) (Table 3.2-2). Along the western portion of the SRWEC–OCS, the aRPD depth was indeterminant at the majority of stations, due to the high porosity and likely low organic content of the sandy sediments in this area. When aRPD depth was distinguishable, at stations along the western portion of the SRWEC–OCS it was generally < 3.0 cm (Figures 3.2-17, 3.2-18). Along the eastern portion of the SRWEC–OCS, where sediments tended to be finer, the aRPD depth was measured and generally, less than 3.0 cm (Figure 3.2-18).

Successional Stage in this generally dynamic soft bottom environment largely tracked substrata composition and water depth, with coarser, shallower sediments (i.e., western portion of the SRWEC–OCS) associated with lower or indeterminant Successional Stages compared with those stations composed of finer sediments, which tended to be documented with more advanced Successional Stages (Figures 3.2-19, 3.2-20). Stations with Medium Sand (CMECS Substrate Subgroup), particularly along the western portion of the SRWEC–OCS, and specifically westward of Station 522, had indeterminant Successional Stage as infaunal species were infrequently observed. Stations east of Station 522 numerically through Station 549 were generally classified as Successional Stage of 1->2 or 2. While the remainder of the SRWEC–OCS, the eastern portion, was classified with more advanced Successional Stages (2->3 or 2 on 3), and were generally associated with small tubes documented in the SPI and large burrows observed in the PV images, indicating deep-burrowing organisms (Figures 3.2-16, 3.2-20). Burrows were documented more frequently along the eastern portion of the SRWEC–OCS compared with the western portion of the SRWEC–OCS (Figures 3.2-15, 3.2-16).

No sensitive taxa were observed at any of the stations along the SRWEC–OCS (Table 3.2-2). Sea scallops, a species of concern, were observed at seven stations along the SRWEC–OCS, which, with the exception of Station 534, were all located along the eastern portion of the SRWEC–OCS (Stations 540, 549, 562, 648, 651, and 662) (Figures 3.2-21, 3.2-22). When present, only a single scallop was observed within a single image; the mean field of view for each image was 0.3 m^2.

3.3 REFERENCE AREAS

Four reference areas, each with five stations, were sampled across the surveyed area (Table 3.3-1; Figures 2.1-1, 2.1-2, 2.1-3) (Stations 901 through 920). Reference areas were selected to capture habitats representative of those along the SRWEC–OCS and at the SRWF and were thus located north of the northwest region of the SRWF (Stations 901 through 905), south of the SRWF (Stations 906 through 910), northwest of the eastern portion of the SRWEC–OCS (Stations 911 through 915), and north of the western portion of the SRWEC–OCS (Stations 916 through 920). In general, the reference areas' physical and biological features were similar to the nearby SRWEC–OCS and SRWF stations. The biological communities observed at the reference stations corresponded with the physical characteristics of each area and generally reflected similar communities to the nearby stations within either the SRWF or along the SRWEC–OCS. SPI/PV data from the reference areas are depicted in the maps in Sections 3.1 and 3.2.

3.3.1 Physical Features

The measured water depth across the reference stations ranged from 32.9 to 62.8 m with an average of 47.3 m (Table 3.3-1). Broadly, the physical features documented at the four reference areas were similar to those observed at the stations within the respective nearby SRWEC–OCS and SRWF areas. Representative SPI and PV images depicting the CMECS Substrate Subgroups observed at each of the four reference areas are provided in Figure 3.3-1.

Generally, the northwest reference area (Stations 901 through 905) had similar physical features to the northwest region of the SRWF. The northwest reference stations were the most heterogenous compared to the other reference areas in terms of CMECS Substrate Group and Subgroup. At these reference stations, the predominant CMECS Substrate Group ranged from Sand or Finer to Gravel Mixes (Figure 3.1-2) and the predominant CMECS Substrate Subgroup ranged from Medium Sand to Mixed Sediment (Figure 3.1-3). Although no boulders were observed at any of these northwest reference stations, cobbles and pebbles were common (Figure 3.1-5). Mean station prism penetration depth was generally shallow at these stations given the coarse composition of the seabed (Figure 3.1-9). Both large and small ripples were documented at the northwest reference area (Figure 3.1-6) and the mean station small-scale boundary roughness ranged from indeterminant at stations where there was no penetration to >5.0 cm (Figure 3.1-8).

The reference area to the south of the SRWF (Stations 906 through 910) consisted of soft sediment with no substantial gravel (i.e., < 5% gravel cover) documented in this area. The stations at this reference area were all characterized by the CMECS Substrate Group Sand or Finer, with the predominant CMECS Substrate Subgroup classifications ranging from Silt/Clay to Very Coarse Sand (Figures 3.1-2, 3.1-3). Mean station prism penetration across these five reference stations was closely related to grain size with shallower penetration occurring at the stations with coarser substrata (Stations 906, 907, and 910) and deeper penetration at the station characterized by finer substrata (Station 909) (Figures 3.1-3, 3.1-9). Large ripples were documented at three of the five stations in this reference area: Stations 907, 908, and 910 (Figure 3.1-6). At these three stations, station mean boundary roughness was higher than the other two stations, suggesting physical dynamics structuring the sediment–water interface (Figure 3.1-8).

The reference stations near the eastern portion of the SRWEC–OCS (Stations 911 through 915) were all composed of the CMECS Substrate Group Sand or Finer and the CMECS Substrate Subgroup Very Fine Sand, which was similar to the substrata composition along the eastern portion of the SRWEC–OCS (Table 3.3-1; Figure 3.2-2). Mean station prism penetration was between 6.1 and 10.0 cm at all stations in this reference area (Figure 3.2-9). No small-scale bedforms were documented at this reference area and the small-scale boundary roughness across stations was relatively small (<0.5 cm), consistent with the stations along the SRWEC–OCS in this area (Figures 3.2-4, 3.2-7). As such, the mean station boundary roughness across all the stations in this reference area was small (i.e., <1.5 cm), suggesting biological factors influencing the rugosity of the seabed here.

The reference stations near the western portion of the SRWEC–OCS (Stations 916 through 920) were composed of the CMECS Substrate Group Sand or Finer and the CMECS Substrate Subgroup Fine Sand, which was generally similar to the substrata composition at the stations along the western portion of the SRWEC–OCS (Table 3.3-1; Figure 3.2-1). Mean station prism penetration was strongly related to CMECS Substrate Subgroup, with deeper penetration associated with finer substrata classification (Figures 3.2-1 and 3.2-8). Similar to the nearby SRWEC–OCS stations, both large and small sand ripples were documented across these reference stations (Figure 3.2-4). However, the mean station boundary roughness varied across these stations and was not necessarily related to the categorical size of the ripples documented in the respective PV images (Figures 3.2-4, 3.2-6).

3.3.2 Biological and Habitat Features

Broadly, the biological and habitat features documented at the four reference areas were similar to those observed at the nearby stations at either the SRWF or SRWEC–OCS. Representative SPI and PV images depicting the general biological features at each of the four reference areas are provided in Figure 3.3-2. No sensitive taxa or species of concern were documented at any of the stations across the four reference areas.

Generally, the northwest reference area (Stations 901 through 905) consisted of more heterogenous macrohabitat types and CMECS Biotic Subclass classifications compared with the other reference areas (Figures 3.1-10, 3.1-13, 3.2-10, 3.2-11). This area was the only reference area where Attached Fauna (CMECS Biotic Subclass) was observed (Stations 901 and 902), with Attached Fauna coverage ranging from sparse (1 to <30%) to Moderate (30 to <70%) between these two stations (Figure 3.1-14). The other three stations within this reference area consisted of CMECS Biotic Subclass Soft Sediment Fauna (Figure 3.1-13). The macrohabitat types at this reference area included *sand with ripples*, *sand with pebbles/granules*, and *patchy cobbles and/or boulders on sand*, representative of the variety of macrohabitat types observed in the northwest corner of the SRWF. Mean station aRPD depth was indeterminant at all five station within this reference area, likely due to low prism penetration as a result of the coarse substrata in this region (Figure 3.1-16). Similarly, in this reference area Successional Stage was generally indeterminant due to the lack of prism penetration, limiting the observation of infauna organisms required for Successional Stage classification (Figure 3.1-17).

The reference area to the south of the SRWF (Stations 906 through 910) was generally similar to the benthic environment observed in the southeast region and the west-central region of the SRWF. Here, the macrohabitat type was either *sand with ripples* or *sand and mud*; the CMECS Biotic Subclass was consistently Soft Sediment Fauna, and burrowing anemone (cerianthids) were observed at all five stations (Figures 3.1-10, 3.1-12, 3.1-13). The Successional Stage at these stations was typically Stage 2 -> 3, informed by the presence of Stage 2 tubes concurrent with large burrows in the PV images (Figures 3.1-15, 3.1-17). Mean station aRPD depth was indeterminant at three of the five stations within this reference area, likely due to the high porosity and low organic content associated with these coarser sediments. Although, at the stations where the seabed was composed of finer substrata, aRPD depth was measurable (Stations 906 and 909) (Figure 3.2-16).

The reference stations near the eastern portion of the SRWEC–OCS (Stations 911 through 915) were all classified by the macrohabitat type *sand and mud*, similar to the nearby stations along the eastern stretch of the SRWEC–OCS. Here, CMECS Biotic Subclass was Soft Sediment Fauna at all five stations and burrowing anemone (cerianthids) were observed at one of the stations (Table 3.3-2; Figure 3.2-13). Successional Stage at this reference area was largely Stage 2 -> 3, informed by the presence of Stage 2 tubes concurrent with large burrows in the PV images (Figures 3.2-16, 3.2-20). Mean station aRPD depth was between 1.6 and 3.0 cm for all stations within this reference area, which was similar to the aRPD depths measured at the nearby SRWEC–OCS stations (Figure 3.2-18).

The reference stations near the western portion of the SRWEC–OCS (Stations 916 through 920) were all classified by the macrohabitat type *sand with ripples*, similar to the nearby stations along the western stretch of the SRWEC–OCS. Sand dollars occurred at all five of these reference stations (Figure 3.2-12). Successional Stage at these stations was indeterminant, except for a single image due to the limited evidence of infauna (Figure 3.2-19). Mean station aRPD depth was indeterminant at all five station within this reference area, likely due to the high porosity and low organic content associated with these sandy sediments (Figure 3.2-17).

Table 3.1-1. Summary of Sediment Profile and Plan View Image Analysis Geophysical Results at the SRWF

Table 3.1-1 Geophysical SRWF											
Station ID	SPI Replicate (n)	Water Depth (m)	Mean Prism Penetration Depth (cm)	Mean Boundary Roughness (cm)	SPI Sediment Type (by replicate)			PV Replicate (n)	CMECS Substrate Group	CMECS Substrate Subgroup[1]	Bedforms
001	3	42.7	5.8	3.1	Medium sand	Medium sand	Medium sand	3	Sand or Finer	Medium Sand	Large ripples
002	3	41.5	2.7	4.4	Coarse sand	Coarse sand	Coarse sand	3	Gravelly	Gravelly Sand	Large ripples
003	3	43.0	0.0	IND	Indeterminate	Indeterminate	Indeterminate	3	Gravel	Boulder	None
004	3	47.6	1.7	2.2	Fine sand	Finer sediment over medium sand	Silt/clay over fine sand	3	Sand or Finer	Fine Sand	Small ripples
005	3	46.1	4.5	1.5	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
006	3	46.1	4.4	3.9	Fine sand	Fine sand	Fine sand over silt/clay	3	Sand or Finer	Fine Sand	Small ripples
007	3	43.9	5.1	1.4	Medium sand	Medium sand	Medium sand	3	Sand or Finer	Medium Sand	Small ripples
008	3	43.6	4.0	2.3	Fine sand	Granule and sand mix	Silt/clay over fine sand	3	Sand or Finer	Fine Sand	Small ripples
009	3	40.3	3.6	2.8	Coarse sand over finer sediment	Coarse sand over finer sediment	Fine sand	3	Sand or Finer	Coarse Sand	None
010	3	42.4	3.8	1.0	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	None
011	3	42.4	2.9	2.1	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
012	3	43.3	4.1	2.2	Fine sand	Fine sand	Fine sand	0	-	-	-
013	3	45.8	3.8	3.0	Medium sand	Medium sand	Medium sand	3	Sand or Finer	Medium Sand	Large ripples
014	3	43.6	5.0	2.8	Finer sediment over coarse sand	Very coarse sand	Very coarse sand	3	Sand or Finer	Very Coarse Sand	None
015	3	43.3	3.5	2.2	Silt/clay over very coarse sand	Very coarse sand	Very coarse sand	3	Sand or Finer	Very Coarse Sand	None
016	3	42.4	7.0	5.8	Very coarse sand	Very coarse sand	Very coarse sand	3	Gravelly	Gravelly Sand	None
017	3	43.3	1.8	2.1	Silt/clay over granule	Very coarse sand	Very coarse sand	3	Gravelly	Gravelly Sand	None
018	3	44.8	3.0	3.9	Silt/clay over very coarse sand	Very coarse sand	Very coarse sand	3	Sand or Finer	Very Coarse Sand	Large ripples
019	3	46.4	6.1	4.7	Coarse sand	Finer sediment over coarse sand	Finer sediment over coarse sand	3	Sand or Finer	Coarse Sand	Large ripples
020	3	49.1	7.1	1.7	Silt/clay	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	Small ripples

Table 3.1-1 Geophysical SRWF											
Station ID	**SPI Replicate (n)**	**Water Depth (m)**	**Mean Prism Penetration Depth (cm)**	**Mean Boundary Roughness (cm)**	**SPI Sediment Type (by replicate)**			**PV Replicate (n)**	**CMECS Substrate Group**	**CMECS Substrate Subgroup[1]**	**Bedforms**
021	3	50.9	7.8	0.8	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
022	3	50.6	4.2	3.6	Coarse sand and finer sediment mix	Coarse sand and finer sediment mix	Very coarse sand	3	Sand or Finer	Coarse Sand	Large ripples
023	3	47.0	3.9	3.9	Indeterminate	Very coarse sand over sand	Very coarse sand over sand	3	Sand or Finer	Very Coarse Sand	None
024	3	47.9	5.1	2.5	Coarse sand over finer sediment	Medium sand and finer sediment mix	Medium sand and finer sediment mix	3	Sand or Finer	Medium Sand	Small ripples
025	3	47.9	3.6	1.4	Finer sediment over medium sand	Medium sand	Medium sand	2	Sand or Finer	Medium Sand	Large ripples
026	3	47.6	6.1	2.1	Finer sediment over medium sand	Medium sand	Medium sand	3	Sand or Finer	Medium Sand	Small ripples
027	3	46.4	5.6	1.7	Coarse sand over finer sediment	Finer sediment over medium sand	Medium sand	2	Sand or Finer	Medium Sand	Large ripples
028	3	46.4	3.9	3.1	Medium sand	Medium sand	Medium sand	3	Sand or Finer	Medium Sand	Large ripples
029	3	47.9	4.8	1.3	Finer sediment over medium sand	Medium sand	Medium sand	3	Sand or Finer	Medium Sand	Large ripples
030	3	47.3	4.2	3.4	Finer sediment over medium sand	Medium sand	Medium sand	3	Sand or Finer	Medium Sand	Large ripples
031	3	47.3	10.4	2.9	Coarse sand	Medium sand	Medium sand	3	Sand or Finer	Medium Sand	Large ripples
032	3	46.4	6.6	1.1	Coarse sand	Coarse sand	Coarse sand over finer sediment	2	Sand or Finer	Coarse Sand	Small ripples
033	3	47.6	3.2	3.7	Granule	Granule	Granule	3	Gravelly	Gravelly Sand	None
034	3	48.2	4.0	0.8	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
035	3	49.4	4.3	4.8	Coarse sand and finer sediment mix	Medium sand	Medium sand	3	Sand or Finer	Medium Sand	Large ripples
036	3	47.6	4.9	2.2	Fine sand	Fine sand	Fine sand and silt/clay mix	3	Sand or Finer	Fine Sand	Small ripples
037	3	47.0	3.4	1.7	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	None
038	3	49.4	4.9	3.1	Very coarse sand	Very coarse sand	Very coarse sand over sand	3	Gravelly	Gravelly Sand	None
039	3	50.9	5.0	0.7	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None

Table 3.1-1 Geophysical SRWF											
Station ID	**SPI Replicate (n)**	**Water Depth (m)**	**Mean Prism Penetration Depth (cm)**	**Mean Boundary Roughness (cm)**	**SPI Sediment Type (by replicate)**			**PV Replicate (n)**	**CMECS Substrate Group**	**CMECS Substrate Subgroup[1]**	**Bedforms**
040	3	51.2	4.6	0.9	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
041	3	48.2	4.2	2.5	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
042	3	47.9	3.6	1.7	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	None
043	3	50.6	3.0	2.1	Medium sand	Medium sand	Medium sand and finer sediment mix	3	Sand or Finer	Medium Sand	Large ripples
044	3	48.8	4.2	5.1	Finer sediment over medium sand	Medium sand	Medium sand	3	Sand or Finer	Medium Sand	Large ripples
045	3	47.9	8.1	3.6	Coarse sand and finer sediment mix	Coarse sand and finer sediment mix	Coarse sand over finer sediment	3	Sand or Finer	Coarse Sand	Large ripples
046	3	48.8	4.5	2.3	Coarse sand over finer sediment	Coarse sand over finer sediment	Finer sediment over medium sand	1	Sand or Finer	Coarse Sand	Large ripples
047	3	48.2	9.7	3.4	Coarse sand over finer sediment	Coarse sand over finer sediment	Medium sand	3	Sand or Finer	Coarse Sand	Large ripples
048	3	49.4	6.8	4.0	Fine sand	Fine sand	Medium sand	3	Sand or Finer	Fine Sand	Small ripples
049	3	49.1	6.1	4.0	Coarse sand	Coarse sand	Coarse sand	1	Sand or Finer	Coarse Sand	Large ripples
050	3	50.6	2.8	1.2	Very fine sand	Very fine sand	Very fine sand	2	Sand or Finer	Very Fine Sand	Small ripples
051	3	48.8	3.9	1.0	Very fine sand	Very fine sand	Very fine sand	2	Sand or Finer	Very Fine Sand	Small ripples
052	3	50.3	4.4	2.3	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
053	3	52.5	3.3	2.4	Medium sand and finer sediment mix	Silt/clay over very fine sand	Silt/clay over very fine sand	3	Sand or Finer	Silt/clay	None
054	3	51.5	6.4	1.0	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
055	3	53.1	6.6	1.5	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
056	3	51.9	6.7	1.1	Very fine sand	Very fine sand	Very fine sand	1	Sand or Finer	Very Fine Sand	None
057	3	47.6	3.4	3.9	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Large ripples
058	3	48.8	4.5	1.8	Fine sand	Fine sand	Medium sand	3	Sand or Finer	Fine Sand	Small ripples

Table 3.1-1 Geophysical SRWF

Station ID	SPI Replicate (n)	Water Depth (m)	Mean Prism Penetration Depth (cm)	Mean Boundary Roughness (cm)	SPI Sediment Type (by replicate)			PV Replicate (n)	CMECS Substrate Group	CMECS Substrate Subgroup[1]	Bedforms
059	3	53.1	5.9	4.3	Silt/clay over very coarse sand	Very coarse sand	Very coarse sand	3	Sand or Finer	Very Coarse Sand	None
060	3	50.6	3.8	3.4	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
061	3	49.4	8.9	4.4	Coarse sand over finer sediment	Medium sand	Medium sand	3	Sand or Finer	Medium Sand	Large ripples
062	3	49.7	5.5	4.0	Coarse sand and finer sediment mix	Medium sand	Medium sand	3	Sand or Finer	Medium Sand	Large ripples
063	3	48.8	3.1	0.9	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
064	3	50.6	3.7	3.4	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
065	3	50.9	2.5	1.4	Very fine sand	Very fine sand	Very fine sand	1	Sand or Finer	Very Fine Sand	Small ripples
066	3	51.9	5.6	0.8	Very fine sand over silt/clay	Very fine sand over silt/clay	Very fine sand over silt/clay	0	-	-	-
067	3	50.9	2.8	1.2	Very fine sand	Very fine sand	Very fine sand	0	-	-	-
068	3	51.9	4.4	1.4	Very fine sand	Very fine sand	Very fine sand	1	Sand or Finer	Very Fine Sand	None
069	3	50.0	3.7	0.8	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	Small ripples
070	3	51.9	4.9	1.3	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	Small ripples
071	3	53.7	6.2	0.7	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
072	3	55.8	8.4	1.1	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
073	3	56.1	7.3	1.5	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
074	3	53.7	4.3	1.1	Very fine sand	Very fine sand	Very fine sand	2	Sand or Finer	Very Fine Sand	None
075	3	52.8	8.0	1.0	Very fine sand	Very fine sand	Very fine sand over silt/clay	3	Sand or Finer	Very Fine Sand	Small ripples
076	3	50.0	2.9	3.3	Fine sand	Fine sand	Medium sand and finer sediment mix	3	Sand or Finer	Fine Sand	Large ripples
077	3	53.7	9.6	1.3	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	Small ripples
078	3	53.1	6.0	1.6	Medium sand	Medium sand	Silt/clay over fine sand	3	Sand or Finer	Medium Sand	None
079	3	50.9	3.5	1.1	Fine sand	Fine sand	Silt/clay over fine sand	3	Sand or Finer	Fine Sand	Small ripples

Table 3.1-1 Geophysical SRWF											
Station ID	SPI Replicate (n)	Water Depth (m)	Mean Prism Penetration Depth (cm)	Mean Boundary Roughness (cm)	SPI Sediment Type (by replicate)			PV Replicate (n)	CMECS Substrate Group	CMECS Substrate Subgroup[1]	Bedforms
080	3	51.5	3.3	1.4	Fine sand and silt/clay mix	Fine sand and silt/clay mix	Fine sand and silt/clay mix	3	Sand or Finer	Fine Sand	Large ripples
081	3	50.6	4.2	2.8	Very fine sand	Very fine sand	Very fine sand	2	Sand or Finer	Very Fine Sand	None
082	3	53.1	3.7	3.4	Medium sand	Very coarse sand and sand mix	Very coarse sand over sand	3	Gravelly	Gravelly Sand	Large ripples
083	3	52.2	3.3	1.7	Fine sand over very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	Small ripples
084	3	53.4	2.8	1.6	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	Small ripples
085	3	54.3	1.5	2.6	Medium sand	Medium sand	Medium sand	3	Gravelly	Gravelly Sand	None
086	3	51.9	5.4	1.6	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
087	3	53.7	5.4	1.3	Very fine sand	Very fine sand	Very fine sand	2	Sand or Finer	Very Fine Sand	Small ripples
088	3	52.2	3.3	1.4	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
089	3	54.3	3.0	1.9	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
090	3	54.0	4.6	2.3	Very fine sand	Very fine sand	Very fine sand	1	Sand or Finer	Very Fine Sand	Small ripples
091	3	54.9	3.9	1.7	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	Small ripples
092	3	54.3	8.4	0.8	Very fine sand	Very fine sand	Very fine sand	2	Sand or Finer	Very Fine Sand	None
093	3	53.1	8.4	0.9	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
094	3	53.4	4.7	3.0	Fine sand	Fine sand	Fine sand	2	Sand or Finer	Fine Sand	Small ripples
095	3	53.1	6.9	0.9	Very fine sand over silt/clay	Very fine sand over silt/clay	Very fine sand over silt/clay	3	Sand or Finer	Very Fine Sand	None
096	3	51.9	3.8	2.2	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
097	3	56.7	10.0	1.4	Very fine sand over silt/clay	Very fine sand over silt/clay	Very fine sand over silt/clay	2	Sand or Finer	Very Fine Sand	None
098	3	56.4	12.2	1.2	Very fine sand	Very fine sand	Very fine sand over silt/clay	3	Sand or Finer	Very Fine Sand	None
099	3	55.8	8.1	2.9	Very fine sand	Very fine sand	Very fine sand	2	Sand or Finer	Very Fine Sand	None
100	3	56.1	9.6	1.3	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
101	3	52.5	6.4	3.3	Coarse sand over finer sediment	Medium sand	Medium sand	3	Sand or Finer	Medium Sand	Large ripples

Table 3.1-1 Geophysical SRWF

Station ID	SPI Replicate (n)	Water Depth (m)	Mean Prism Penetration Depth (cm)	Mean Boundary Roughness (cm)	SPI Sediment Type (by replicate)			PV Replicate (n)	CMECS Substrate Group	CMECS Substrate Subgroup[1]	Bedforms
102	3	56.7	4.7	4.2	Medium sand	Medium sand	Medium sand	3	Sand or Finer	Medium Sand	Large ripples
103	3	58.0	11.2	0.9	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
104	3	56.4	10.3	1.3	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
105	3	56.1	8.3	1.2	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
106	3	56.4	8.8	1.2	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
107	3	58.0	10.2	1.2	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
108	3	58.3	5.5	2.8	Coarse sand over finer sediment	Medium sand	Medium sand over finer sediment	3	Sand or Finer	Medium Sand	Large ripples
109	3	58.9	10.5	0.6	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
110	3	59.8	11.4	2.1	Very fine sand	Very fine sand	Very fine sand	2	Sand or Finer	Very Fine Sand	None
111	3	47.3	6.4	1.1	Coarse sand over finer sediment	Medium sand	Medium sand	3	Sand or Finer	Medium Sand	Small ripples
112	3	50.0	3.6	3.0	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
113	3	51.2	4.8	4.8	Medium sand	Medium sand	Medium sand	3	Sand or Finer	Medium Sand	Large ripples
114	3	52.8	13.7	1.7	Very fine sand	Very fine sand	Very fine sand	1	Sand or Finer	Very Fine Sand	None
115	3	49.7	5.2	1.6	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
116	3	53.7	11.5	4.2	Coarse sand	Very coarse sand and sand mix	Very coarse sand and sand mix	3	Sand or Finer	Coarse Sand	Large ripples
117	3	54.6	11.9	1.0	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
118	3	54.6	10.5	0.6	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
119	3	56.1	13.8	0.7	Very fine sand	Very fine sand over silt/clay	Very fine sand over silt/clay	3	Sand or Finer	Very Fine Sand	None
120	3	55.8	11.7	1.2	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
121	3	55.8	9.8	1.1	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
122	3	56.4	12.1	0.8	Very fine sand	Very fine sand	Very fine sand	1	Sand or Finer	Very Fine Sand	None

Table 3.1-1 Geophysical SRWF											
Station ID	**SPI Replicate (n)**	**Water Depth (m)**	**Mean Prism Penetration Depth (cm)**	**Mean Boundary Roughness (cm)**	**SPI Sediment Type (by replicate)**			**PV Replicate (n)**	**CMECS Substrate Group**	**CMECS Substrate Subgroup[1]**	**Bedforms**
123	3	56.4	11.5	1.2	Very fine sand	Very fine sand	Very fine sand	2	Sand or Finer	Very Fine Sand	None
124	3	56.1	9.5	1.2	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
125	3	57.3	11.4	1.4	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
126	3	59.5	10.9	1.2	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
127	3	58.0	10.7	0.8	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
128	3	58.6	10.0	0.9	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
129	3	59.5	10.1	1.8	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
130	3	52.5	4.6	2.4	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
131	3	52.8	5.7	1.3	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Large ripples
132	3	53.4	6.1	5.7	Coarse sand over finer sediment	Medium sand	Medium sand	3	Sand or Finer	Medium Sand	Large ripples
133	3	61.0	15.9	2.1	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
134	3	61.3	11.3	0.8	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
201	3	42.4	4.9	1.5	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
202	3	41.5	4.3	1.6	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
203	3	41.8	5.1	4.4	Coarse sand	Coarse sand	Medium sand	3	Sand or Finer	Coarse Sand	Large ripples
204	3	40.6	8.0	4.5	Coarse sand over finer sediment	Very coarse sand over sand	Very coarse sand over sand	3	Gravelly	Gravelly Sand	Large ripples
205	3	39.0	5.5	3.4	Coarse sand over finer sediment	Coarse sand over finer sediment	Very coarse sand over sand	3	Gravelly	Gravelly Sand	Large ripples
206	3	43.3	4.7	1.9	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
207	3	45.4	5.2	4.0	Granule and silt/clay mix	Granule over sand	Very coarse sand	3	Gravelly	Gravelly Sand	None
208	3	45.4	9.0	0.8	Silt/clay over very fine sand	Silt/clay over very fine sand	Silt/clay over very fine sand	1	Sand or Finer	Silt/clay	None
209	3	42.7	3.5	2.5	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples

Table 3.1-1 Geophysical SRWF											
Station ID	**SPI Replicate (n)**	**Water Depth (m)**	**Mean Prism Penetration Depth (cm)**	**Mean Boundary Roughness (cm)**	**SPI Sediment Type (by replicate)**			**PV Replicate (n)**	**CMECS Substrate Group**	**CMECS Substrate Subgroup[1]**	**Bedforms**
210	3	41.8	1.8	2.4	Coarse sand	Medium sand	Pebble	3	Gravelly	Gravelly Sand	None
211	3	40.9	5.1	5.1	Granule	Medium sand	Very coarse sand over sand	3	Gravelly	Gravelly Sand	Large ripples
212	3	47.0	4.9	1.8	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
213	3	49.1	4.3	4.3	Coarse sand	Coarse sand	Coarse sand	3	Sand or Finer	Coarse Sand	Large ripples
214	3	48.8	3.2	1.4	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	Small ripples
215	3	49.4	5.5	0.8	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	Small ripples
216	3	45.8	9.4	2.8	Medium sand	Very coarse sand	Very coarse sand	2	Sand or Finer	Very Coarse Sand	None
217	3	43.3	2.5	3.5	Coarse sand	Granule	Granule and sand mix	3	Gravelly	Gravelly Sand	None
218	3	42.4	1.7	2.1	Silt/clay over granule	Silt/clay over granule	Very coarse sand	3	Gravel Mixes	Mixed Sediment	None
219	3	42.4	3.2	4.6	Medium sand	Very coarse sand	Very coarse sand over sand	2	Sand or Finer	Very Coarse Sand	None
220	3	42.4	4.2	3.1	Coarse sand	Very coarse sand	Very coarse sand	3	Sand or Finer	Very Coarse Sand	Large ripples
221	3	41.8	6.9	3.9	Coarse sand	Very coarse sand	Very coarse sand and sand mix	3	Sand or Finer	Coarse Sand	Large ripples
222	3	42.1	2.0	2.8	Medium sand	Medium sand	Very coarse sand	3	Sand or Finer	Medium Sand	Large ripples
223	3	40.9	4.4	1.8	Fine sand	Fine sand	Fine sand	2	Sand or Finer	Fine Sand	Small ripples
224	3	50.0	5.4	1.2	Fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	Small ripples
225	3	49.4	5.9	1.2	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
226	3	47.0	3.6	1.0	Very fine sand	Very fine sand	Very fine sand	1	Sand or Finer	Very Fine Sand	Small ripples
227	3	40.0	0.1	1.0	Indeterminate	Indeterminate	Indeterminate	3	Gravel	Boulder	None
228	3	43.9	6.2	1.7	Silt/clay over very coarse sand	Very coarse sand	Very coarse sand	3	Sand or Finer	Very Coarse Sand	None
229	3	42.7	10.4	2.9	Very coarse sand	Very coarse sand	Very coarse sand	3	Sand or Finer	Very Coarse Sand	None
230	3	42.4	4.1	3.2	Very coarse sand	Very coarse sand	Very coarse sand and sand mix	3	Sand or Finer	Very Coarse Sand	None
231	3	43.6	2.7	2.6	Very coarse sand	Very coarse sand	Very coarse sand	3	Sand or Finer	Very Coarse Sand	None

Table 3.1-1 Geophysical SRWF											
Station ID	SPI Replicate (n)	Water Depth (m)	Mean Prism Penetration Depth (cm)	Mean Boundary Roughness (cm)	SPI Sediment Type (by replicate)			PV Replicate (n)	CMECS Substrate Group	CMECS Substrate Subgroup[1]	Bedforms
232	3	43.0	3.5	1.2	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
233	3	43.6	7.4	1.0	Silt/clay over very fine sand	Silt/clay over very fine sand	Very fine sand	0	-	-	-
234	3	40.6	2.2	1.6	Granule	Granule and sand mix	Granule and sand mix	3	Gravelly	Gravelly Sand	Small ripples
235	3	50.3	2.8	1.3	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
236	3	45.1	3.5	2.3	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	None
237	3	50.3	4.4	0.7	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
238	3	50.3	5.4	1.3	Very fine sand	Very fine sand	Very fine sand	2	Sand or Finer	Very Fine Sand	None
239	3	49.7	8.1	1.4	Fine sand	Fine sand	Silt/clay	3	Sand or Finer	Fine Sand	None
240	3	47.0	3.0	3.2	Coarse sand	Coarse sand	Finer sediment over coarse sand	3	Sand or Finer	Coarse Sand	Large ripples
241	3	46.7	2.4	1.0	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
242	3	44.5	2.6	1.7	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	None
243	3	44.8	6.1	3.0	Coarse sand over finer sediment	Fine sand	Silt/clay over fine sand	3	Sand or Finer	Fine Sand	Large ripples
244	3	46.1	3.8	1.2	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	None
245	3	48.2	6.8	2.9	Silt/clay over very coarse sand	Silt/clay over very coarse sand	Very coarse sand	3	Sand or Finer	Very Coarse Sand	Large ripples
246	3	46.4	5.5	2.5	Coarse sand	Very coarse sand over sand	Very coarse sand over sand	3	Sand or Finer	Very Coarse Sand	Large ripples
247	3	45.4	3.9	2.8	Fine sand	Fine sand	Fine sand	1	Sand or Finer	Fine Sand	IND
248	3	48.8	3.7	1.5	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	None
249	3	49.7	5.3	1.1	Silt/clay	Very fine sand	Very fine sand	2	Sand or Finer	Very Fine Sand	None
250	3	48.5	13.1	0.8	Silt/clay	Silt/clay	Silt/clay	2	Sand or Finer	Silt/clay	None
251	3	48.5	4.1	1.9	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	None
252	3	48.2	3.7	1.5	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None

Table 3.1-1 Geophysical SRWF											
Station ID	**SPI Replicate (n)**	**Water Depth (m)**	**Mean Prism Penetration Depth (cm)**	**Mean Boundary Roughness (cm)**	**SPI Sediment Type (by replicate)**			**PV Replicate (n)**	**CMECS Substrate Group**	**CMECS Substrate Subgroup[1]**	**Bedforms**
253	3	46.7	5.9	4.4	Silt/clay over very coarse sand	Very coarse sand	Very coarse sand	1	Sand or Finer	Very Coarse Sand	Large ripples
254	3	47.6	4.4	2.3	Finer sediment over medium sand	Finer sediment over medium sand	Medium sand	1	Sand or Finer	Silt/clay	Large ripples
255	3	47.6	4.3	1.8	Medium sand	Medium sand	Medium sand	3	Sand or Finer	Medium Sand	Small ripples
256	3	47.3	0.9	1.3	Medium sand	Medium sand	Silt/clay	3	Sand or Finer	Medium Sand	Small ripples
257	3	52.8	4.8	1.3	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
258	3	54.0	6.4	0.7	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
259	3	53.4	6.1	2.4	Very fine sand	Very fine sand	Very fine sand	2	Sand or Finer	Very Fine Sand	None
260	3	50.3	3.6	1.4	Fine sand	Fine sand	Fine sand	2	Sand or Finer	Fine Sand	Small ripples
261	3	48.8	3.7	1.2	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
262	3	48.8	3.6	2.1	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
263	3	51.2	14.7	1.0	Silt/clay	Silt/clay	Silt/clay	1	Sand or Finer	Silt/clay	None
264	3	49.1	2.4	2.0	Coarse sand	Coarse sand	Coarse sand	3	Sand or Finer	Coarse Sand	Large ripples
265	3	47.6	3.7	3.5	Fine sand	Fine sand	Fine sand	1	Sand or Finer	Fine Sand	Small ripples
266	3	51.5	5.0	0.9	Very fine sand	Very fine sand	Very fine sand	0	-	-	-
267	3	51.9	5.7	0.9	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
268	3	54.3	4.8	1.2	Very fine sand	Very fine sand	Very fine sand	2	Sand or Finer	Very Fine Sand	None
269	3	50.9	8.0	4.1	Medium sand	Medium sand	Medium sand	3	Sand or Finer	Medium Sand	Large ripples
270	3	79.0	4.3	1.4	Fine sand	Fine sand	Fine sand	2	Sand or Finer	Fine Sand	Small ripples
271	3	51.2	5.9	1.2	Very fine sand	Very fine sand over silt/clay	Very fine sand over silt/clay	0	-	-	-
272	3	49.7	1.8	1.6	Coarse sand	Coarse sand	Indeterminate	1	Sand or Finer	Coarse Sand	Large ripples
273	3	49.1	7.3	4.4	Medium sand	Medium sand	Very coarse sand over sand	2	Sand or Finer	Medium Sand	Large ripples
274	3	48.8	4.5	1.9	Fine sand	Fine sand	Fine sand	2	Sand or Finer	Fine Sand	Small ripples

Table 3.1-1 Geophysical SRWF											
Station ID	**SPI Replicate (n)**	**Water Depth (m)**	**Mean Prism Penetration Depth (cm)**	**Mean Boundary Roughness (cm)**	**SPI Sediment Type (by replicate)**			**PV Replicate (n)**	**CMECS Substrate Group**	**CMECS Substrate Subgroup[1]**	**Bedforms**
275	3	53.4	3.8	1.8	Very fine sand	Very fine sand	Very fine sand	2	Sand or Finer	Very Fine Sand	None
276	3	53.4	5.2	0.9	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
277	3	53.7	6.2	0.9	Very fine sand	Very fine sand	Very fine sand	2	Sand or Finer	Very Fine Sand	None
278	3	50.3	3.0	1.5	Very fine sand	Very fine sand	Very fine sand	1	Sand or Finer	Very Fine Sand	Small ripples
279	3	50.0	2.6	1.9	Very fine sand	Very fine sand	Very fine sand	2	Sand or Finer	Very Fine Sand	Small ripples
280	3	49.4	4.3	1.6	Fine sand	Fine sand	Very fine sand	1	Sand or Finer	Fine Sand	Small ripples
281	3	49.1	2.6	1.3	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
282	3	51.2	3.3	2.5	Fine sand	Fine sand	Fine sand	2	Sand or Finer	Fine Sand	Small ripples
283	3	51.9	5.0	3.1	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
284	3	51.5	4.5	1.2	Fine sand	Fine sand over very fine sand	Fine sand over very fine sand	3	Sand or Finer	Fine Sand	Small ripples
285	3	53.1	5.8	1.1	Very fine sand	Very fine sand	Very fine sand	2	Sand or Finer	Very Fine Sand	Small ripples
286	3	50.9	4.4	2.0	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
287	3	52.5	3.0	1.7	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	Small ripples
289	3	51.9	4.6	6.7	Coarse sand over finer sediment	Coarse sand over finer sediment	Medium sand	3	Sand or Finer	Coarse Sand	Large ripples
701	3	45.4	3.4	2.4	Indeterminate	Indeterminate	Medium sand	3	Gravelly	Gravelly Sand	Large ripples
702	2	42.7	2.0	1.2	Medium sand	Medium sand	-	3	Gravelly	Gravelly Sand	Large ripples
703	3	46.7	2.8	1.5	Fine sand	Fine sand	Fine sand	2	Sand or Finer	Fine Sand	Small ripples
704	3	41.5	2.3	2.7	Granule	Pebble	Very coarse sand	3	Gravelly	Gravelly Sand	Large ripples
705	3	42.7	5.4	3.0	Coarse sand	Coarse sand	Coarse sand	3	Sand or Finer	Coarse Sand	Large ripples
706	3	43.3	2.5	2.6	Indeterminate	Indeterminate	Very coarse sand and sand mix	3	Gravelly	Gravelly Sand	Large ripples
707	3	46.7	3.7	1.9	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
708	3	44.2	5.0	3.9	Very coarse sand	Very coarse sand	Very coarse sand	3	Gravelly	Gravelly Sand	Large ripples

Table 3.1-1 Geophysical SRWF											
Station ID	SPI Replicate (n)	Water Depth (m)	Mean Prism Penetration Depth (cm)	Mean Boundary Roughness (cm)	SPI Sediment Type (by replicate)			PV Replicate (n)	CMECS Substrate Group	CMECS Substrate Subgroup[1]	Bedforms
709	3	41.2	2.2	3.0	Indeterminate	Indeterminate	Medium sand	3	Gravelly	Gravelly Sand	Large ripples
710	3	43.0	1.8	2.2	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Large ripples
711	3	43.0	5.6	2.2	Coarse sand	Very coarse sand	Very coarse sand over sand	3	Gravelly	Gravelly Sand	Large ripples
712	3	45.4	3.7	1.8	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
713	3	40.9	0.0	0.3	Indeterminate	Indeterminate	Indeterminate	3	Gravelly	Gravelly Sand	Small ripples
714	3	40.6	1.3	1.8	Medium sand	Medium sand	Medium sand	3	Gravelly	Gravelly Sand	Large ripples
715	3	41.8	5.1	5.1	Sand over very coarse sand	Very coarse sand	Very coarse sand over sand	3	Gravelly	Gravelly Sand	Large ripples
716	2	46.4	2.2	4.8	Indeterminate	Medium sand	-	3	Gravel Mixes	Sandy Gravel	None
717	3	44.2	3.8	5.2	Medium sand	Medium sand	Medium sand	3	Sand or Finer	Medium Sand	Large ripples
718	3	46.7	5.3	3.0	Medium sand	Medium sand	Very coarse sand and sand mix	3	Sand or Finer	Medium Sand	Large ripples
719	3	48.5	5.5	3.8	Very coarse sand	Very coarse sand	Very coarse sand	3	Sand or Finer	Very Coarse Sand	Small ripples
720	2	46.7	3.4	1.3	Fine sand	Fine sand	-	3	Sand or Finer	Fine Sand	Small ripples
721	3	44.5	1.6	2.4	Indeterminate	Medium sand	Medium sand	3	Gravel Mixes	Sandy Gravel	None
722	3	46.7	8.1	2.7	Very coarse sand	Very coarse sand	Very coarse sand	3	Sand or Finer	Very Coarse Sand	Large ripples
723	3	47.6	5.8	2.3	Very coarse sand	Very coarse sand	Very coarse sand	3	Sand or Finer	Very Coarse Sand	Small ripples
724	3	53.1	4.1	2.0	Coarse sand over finer sediment	Medium sand	Medium sand	3	Sand or Finer	Medium Sand	Large ripples
725	3	53.1	4.3	2.0	Medium sand	Medium sand	Medium sand	3	Sand or Finer	Medium Sand	Large ripples
726	3	53.4	9.1	1.1	Medium sand and finer sediment mix	Silt/clay	Silt/clay	3	Sand or Finer	Silt/clay	Small ripples
727	3	52.8	4.4	1.5	Fine sand	Fine sand over very fine sand	Fine sand over very fine sand	3	Sand or Finer	Fine Sand	Small ripples
728	3	40.6	4.1	2.8	Very coarse sand	Very coarse sand and sand mix	Very coarse sand over sand	3	Sand or Finer	Very Coarse Sand	Large ripples
729	3	52.8	14.2	1.7	Silt/clay	Silt/clay	Silt/clay	2	Sand or Finer	Silt/clay	None

Table 3.1-1 Geophysical SRWF											
Station ID	**SPI Replicate (n)**	**Water Depth (m)**	**Mean Prism Penetration Depth (cm)**	**Mean Boundary Roughness (cm)**	**SPI Sediment Type (by replicate)**			**PV Replicate (n)**	**CMECS Substrate Group**	**CMECS Substrate Subgroup[1]**	**Bedforms**
730	3	52.5	4.1	2.4	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
n = SPI-252, PV-246											
	Max	**79.0**	**15.9**	**6.7**							
	Min	**39.0**	**0.0**	**0.3**							
	Mean	**49.3**	**5.4**	**2.2**							
	SD		**2.9**	**1.2**							

IND=Indeterminate
"-" Replicate image not analyzed.
[1] Variable determined from combined SPI/PV analysis.

Table 3.1-2. Summary of Sediment Profile and Plan View Image Analysis Biological Results at the SRWF

Table 3.1-2 Benthic SRWF																			
Station ID	SPI Replicate (n)	Mean aRPD Depth (cm)	Successional Stage (by replicate)[1]			PV Replicate (n)	Macrohabitat[2]	CMECS Biotic Subclasses (# of reps)	CMECS Co-occurring Biotic Subclasses (# of reps)	Maximum Attached Fauna Percent Cover (CMECS Percent Cover Modifier)	Burrow Presence	Tracks Presence	Common Taxa Type	Sensitive Taxa Type	Species of Concern	Tubes Presence[2]	Sessile Epifauna Present[2]	Mobile Epifauna Present[2]
001	3	IND	2 -> 3	3	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	No	Sand Dollar(s)	None	None	Yes	Corymorpha	Sand Dollar(s)
002	3	IND	2	2	IND	3	Patchy Cobbles and/or Boulders on Sand	Attached Fauna (1), Soft Sediment Fauna (2)	Soft Sediment Fauna (1)	Sparse (1 to <30%)	No	Yes	None	None	None	Yes	Bryozoan(s), Corymorpha, Hydroid(s), Tubularia Hydroid(s)	None
003	3	IND	IND	IND	IND	3	Cobbles and/or Boulders on Sand	Attached Fauna (3)	None	Dense (70 to <90%)	Yes	No	Ceriantheid(s)	Non Reef-Building Hard Coral	None	No	Anemone, Bryozoan(s), Hydroid(s), Northern Star Coral, Tubularia Hydroid	Sea Star(s)
004	3	IND	2	2	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	Yes	No	None	None	None	Yes	None	Shrimp
005	3	2.8	2	2	2 -> 3	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	Yes	Yes	Sand Dollar(s)	None	None	Yes	None	Gastropod(s), Hermit Crab(s), Sand Dollar(s)
006	3	3.7	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	Yes	Sand Dollar(s)	None	None	Yes	None	Sand Dollar(s)
007	3	IND	2	2	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	Yes	No	Sand Dollar(s)	None	None	Yes	None	Sand Dollar(s)
008	3	IND	IND	IND	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	No	Sand Dollar(s)	None	None	Yes	None	Nudibranch, Sand Dollar(s)
009	3	IND	IND	IND	IND	3	Sand	Soft Sediment Fauna (3)	None	None	No	Yes	Sand Dollar(s)	None	None	No	None	Sand Dollar(s)
010	3	IND	IND	IND	IND	3	Sand	Soft Sediment Fauna (3)	None	None	No	No	Sand Dollar(s)	None	None	Yes	None	Sand Dollar(s)
011	3	IND	2	2	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	IND	Yes	Sand Dollar(s)	None	None	Yes	None	Sand Dollar(s)
012	3	IND	2	2	2	0	IND	-	-	-	-	-	-	-	-	Yes	None	None
013	3	IND	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	Yes	Yes	Ceriantheid(s) and Sand Dollar(s)	None	None	Yes	None	Sand Dollar(s)
014	3	IND	2	2	2	3	Sand	Soft Sediment Fauna (3)	None	None	Yes	No	None	None	None	Yes	None	None
015	3	IND	2	2	IND	3	Sand	Soft Sediment Fauna (2)	None	None	Yes	Yes	None	None	None	Yes	None	Shrimp
016	3	IND	2	2	2	3	Sand with Pebbles/ Granules	Inferred Fauna (2), Soft Sediment Fauna (1)	None	None	No	No	None	None	None	Yes	None	Crab(s)

Table 3.1-2 Benthic SRWF

Station ID	SPI Replicate (n)	Mean aRPD Depth (cm)	Successional Stage (by replicate)[1]			PV Replicate (n)	Macrohabitat[2]	CMECS Biotic Subclasses (# of reps)	CMECS Co-occurring Biotic Subclasses (# of reps)	Maximum Attached Fauna Percent Cover (CMECS Percent Cover Modifier)	Burrow Presence	Tracks Presence	Common Taxa Type	Sensitive Taxa Type	Species of Concern	Tubes Presence[2]	Sessile Epifauna Present[2]	Mobile Epifauna Present[2]
017	3	IND	2	2	2	3	Sand with Pebbles/ Granules	Inferred Fauna (2), Soft Sediment Fauna (1)	None	None	No	No	Ceriantid(s)	None	None	Yes	None	None
018	3	IND	2	2	IND	3	Sand with Ripples	Inferred Fauna (2), Soft Sediment Fauna (1)	None	None	No	No	None	None	None	Yes	None	None
019	3	IND	2	2	2 -> 3	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	None	None
020	3	3.8	2 -> 3	2 on 3	2 on 3	3	Sand and Mud with Ripples	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	Podocerid Amphipod(s)	None
021	3	4.1	2 -> 3	2 -> 3	2 -> 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	No	None	None	None	Yes	Podocerid Amphipod(s)	None
022	3	IND	2	2	IND	3	Sand with Ripples	Inferred Fauna (1), Soft Sediment Fauna (2)	None	None	No	No	None	None	None	Yes	Podocerid Amphipod(s)	Shrimp, Snail
023	3	IND	2	2	2	3	Sand	Soft Sediment Fauna (3)	None	None	No	No	None	None	None	Yes	None	None
024	3	IND	1 -> 2	1 -> 2	1-> 2	3	Sand with Ripples	Inferred Fauna (2), Soft Sediment Fauna (1)	None	None	No	Yes	None	None	None	No	None	Shrimp
025	3	IND	2	2	2	2	Sand with Ripples	Inferred Fauna (1), Soft Sediment Fauna (1)	None	None	No	No	None	None	None	No	Tubularia Hydroid(s)	None
026	3	IND	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	Yes	Sand Dollar(s)	None	None	Yes	None	Sand Dollar(s), Shrimp
027	3	IND	2	2	IND	2	Sand with Ripples	Soft Sediment Fauna (2)	None	None	No	No	Sand Dollar(s)	None	None	Yes	None	Sand Dollar(s)
028	3	IND	1 -> 2	1 -> 2	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	Yes	Sand Dollar(s)	None	None	No	Bryozoan(s)	Sand Dollar(s)
029	3	IND	2	2	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	Yes	Sand Dollar(s)	None	None	Yes	None	Hermit Crab(s), Sand Dollar(s)
030	3	IND	1 -> 2	1 -> 2	2	3	Sand with Ripples	Inferred Fauna (1), Soft Sediment Fauna (2)	None	None	No	Yes	Sand Dollar(s)	None	None	Yes	None	Sand Dollar(s)
031	3	IND	2	IND	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	Yes	Ceriantid(s) and Sand Dollar(s)	None	None	Yes	None	Sand Dollar(s)

Table 3.1-2 Benthic SRWF

Station ID	SPI Replicate (n)	Mean aRPD Depth (cm)	Successional Stage (by replicate)[1]			PV Replicate (n)	Macrohabitat[2]	CMECS Biotic Subclasses (# of reps)	CMECS Co-occurring Biotic Subclasses (# of reps)	Maximum Attached Fauna Percent Cover (CMECS Percent Cover Modifier)	Burrow Presence	Tracks Presence	Common Taxa Type	Sensitive Taxa Type	Species of Concern	Tubes Presence[2]	Sessile Epifauna Present[2]	Mobile Epifauna Present[2]
032	3	IND	2 -> 3	IND	IND	2	Sand with Ripples	Inferred Fauna (1), Soft Sediment Fauna (1)	None	None	No	No	None	None	None	No	Bryozoan(s)	None
033	3	IND	IND	IND	IND	3	Sand with Pebbles/ Granules	Soft Sediment Fauna (3)	None	None	Yes	No	Ceriantheid(s)	None	Sea Scallop	Yes	None	Sea Scallop(s)
034	3	2.9	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	None	None
035	3	IND	1 -> 2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	Yes	No	Ceriantheid(s)	None	None	Yes	None	None
036	3	3.5	2 -> 3	2 -> 3	2 on 3	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	None	Shrimp
037	3	IND	2 -> 3	2 -> 3	2 -> 3	3	Sand	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	None	None
038	3	IND	2 -> 3	2 -> 3	IND	3	Sand with Pebbles/ Granules	Soft Sediment Fauna (3)	None	None	Yes	No	Ceriantheid(s)	None	None	Yes	None	Shrimp
039	3	IND	2 -> 3	2 -> 3	2 on 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	Tube-Building Amphipods	Sea Star(s), Shrimp
040	3	3.1	2 -> 3	2 -> 3	2 on 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	Tube-Building Amphipods	Shrimp, Snail(s)
041	3	IND	1 -> 2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	None	Shrimp
042	3	IND	2	2	2	3	Sand	Soft Sediment Fauna (3)	None	None	No	Yes	None	None	None	Yes	None	None
043	3	IND	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (2)	None	None	No	No	None	None	None	Yes	None	Hermit Crab(s), Shrimp
044	3	IND	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	Yes	Sand Dollar(s)	None	None	Yes	None	Sand Dollar(s), Shrimp
045	3	IND	2	2	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	Yes	Yes	Sand Dollar(s)	None	None	Yes	None	Sand Dollar(s), Shrimp, Snail
046	3	IND	2	IND	IND	1	IND	Soft Sediment Fauna (1)	None	None	IND	IND	Sand Dollar(s)	None	None	No	None	Sand Dollar(s)
047	3	IND	2	IND	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	Yes	Yes	Ceriantheid(s) and Sand Dollar(s)	None	None	No	None	Sand Dollar(s)
048	3	IND	2	IND	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	No	Sand Dollar(s)	None	None	Yes	None	Sand Dollar(s)
049	3	IND	IND	IND	IND	1	Sand with Ripples	Soft Sediment Fauna (1)	None	None	No	No	None	None	None	No	None	Shrimp

Table 3.1-2 Benthic SRWF

Station ID	SPI Replicate (n)	Mean aRPD Depth (cm)	Successional Stage (by replicate)[1]			PV Replicate (n)	Macrohabitat[2]	CMECS Biotic Subclasses (# of reps)	CMECS Co-occurring Biotic Subclasses (# of reps)	Maximum Attached Fauna Percent Cover (CMECS Percent Cover Modifier)	Burrow Presence	Tracks Presence	Common Taxa Type	Sensitive Taxa Type	Species of Concern	Tubes Presence[2]	Sessile Epifauna Present[2]	Mobile Epifauna Present[2]
050	3	IND	2	2	2	2	Sand and Mud with Ripples	Soft Sediment Fauna (2)	None	None	IND	IND	None	None	None	Yes	None	Gastropod(s)
051	3	2.7	2	2	2	2	Sand and Mud with Ripples	Inferred Fauna (1), Soft Sediment Fauna (1)	None	None	IND	IND	Sand Dollar(s)	None	None	Yes	None	Sand Dollar(s)
052	3	3.4	2	2	2 -> 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	Podocerid Amphipod(s)	Shrimp
053	3	3.3	1 -> 2	2	2 -> 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	None	Shrimp
054	3	3.5	2 -> 3	2 -> 3	2 -> 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	Podocerid Amphipod(s)	Shrimp
055	3	2.7	2 -> 3	2 -> 3	2 -> 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	Cerianthid(s)	None	None	Yes	None	Sea Star(s), Shrimp(s)
056	3	3.3	2 -> 3	2 -> 3	2 -> 3	1	Sand and Mud	Soft Sediment Fauna (1)	None	None	Yes	No	None	None	None	Yes	None	None
057	3	IND	2	2	2	3	Sand with Ripples	Inferred Fauna (1), Soft Sediment Fauna (2)	None	None	No	Yes	None	None	None	Yes	None	Shrimp
058	3	IND	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	Yes	None	None	None	Yes	None	Hermit Crab(s)
059	3	IND	1 -> 2	2	2	3	Sand	Soft Sediment Fauna (3)	None	None	Yes	No	Cerianthid(s)	None	Sea Scallop	Yes	Tubularia Hydroid(s)	Sea Scallop(s), Snail(s)
060	3	IND	2	2	2 -> 3	3	Sand with Ripples	Inferred Fauna (1), Soft Sediment Fauna (2)	None	None	No	No	Sand Dollar(s)	None	None	Yes	None	Sand Dollar(s)
061	3	IND	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	Yes	No	Cerianthid(s) and Sand Dollar(s)	None	None	Yes	None	Sand Dollar(s), Shrimp
062	3	IND	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	No	Sand Dollar(s)	None	None	Yes	None	Sand Dollar(s), Shrimp
063	3	2.0	2	2	2	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	No	Yes	Sand Dollar(s)	None	None	Yes	None	Sand Dollar(s), Shrimp
064	3	IND	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	Yes	No	None	None	None	Yes	None	Hermit Crab(s), Shrimp
065	3	2.5	2	2	2	1	Sand and Mud with Ripples	IND	None	None	IND	IND	None	None	None	Yes	None	None
066	3	3.8	2	2	2	0	IND	-	-	-	-	-	-	-	-	Yes	None	None
067	3	1.8	2	2	2	0	IND	-	-	-	-	-	-	-	-	Yes	None	None

Table 3.1-2 Benthic SRWF

Station ID	SPI Replicate (n)	Mean aRPD Depth (cm)	Successional Stage (by replicate)[1]			PV Replicate (n)	Macrohabitat[2]	CMECS Biotic Subclasses (# of reps)	CMECS Co-occurring Biotic Subclasses (# of reps)	Maximum Attached Fauna Percent Cover (CMECS Percent Cover Modifier)	Burrow Presence	Tracks Presence	Common Taxa Type	Sensitive Taxa Type	Species of Concern	Tubes Presence[2]	Sessile Epifauna Present[2]	Mobile Epifauna Present[2]
068	3	2.4	2	2	2 -> 3	1	Sand and Mud	Soft Sediment Fauna (1)	None	None	Yes	No	None	None	None	Yes	None	Hermit Crab(s)
069	3	2.3	2	2	2	3	Sand and Mud with Ripples	Soft Sediment Fauna (3)	None	None	Yes	No	None	None	None	Yes	Bryozoan(s)	Shrimp
070	3	2.4	2	2	2	3	Sand and Mud with Ripples	Soft Sediment Fauna (3)	None	None	No	Yes	None	None	None	Yes	None	Shrimp
071	3	IND	2	2 -> 3	2 -> 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	Sabellid	None	None	Yes	None	Sea Star(s), Shrimp, Snail
072	3	3.3	2	2 -> 3	2 -> 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	Sabellid	None	None	Yes	None	None
073	3	3.4	2 -> 3	2 -> 3	2 -> 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	None	Brittle Star
074	3	IND	2	2 -> 3	2 -> 3	2	Sand and Mud	Soft Sediment Fauna (2)	None	None	Yes	Yes	None	None	None	Yes	None	None
075	3	2.6	2 -> 3	2 -> 3	1 on 3	3	Sand and Mud with Ripples	Soft Sediment Fauna (3)	None	None	Yes	No	None	None	None	Yes	None	Nudibranch(s)
076	3	IND	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	No	None	None	None	Yes	None	None
077	3	2.9	2 -> 3	2 -> 3	2 -> 3	3	Sand and Mud with Ripples	Soft Sediment Fauna (3)	None	None	Yes	No	Ceríanthid(s)	None	None	Yes	Podocerid Amphipod(s)	None
078	3	IND	2	2	2 -> 3	3	Sand	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	None	Shrimp
079	3	IND	1 -> 2	1 -> 2	2	3	Sand with Ripples	Inferred Fauna (2), Soft Sediment Fauna (1)	None	None	Yes	Yes	None	None	None	Yes	None	Shrimp
080	3	IND	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	Sea Scallop	Yes	None	Sea Scallop(s)
081	3	3.8	2	2	2	2	Sand and Mud	Soft Sediment Fauna (2)	None	None	No	No	None	None	None	Yes	None	None
082	3	IND	IND	IND	IND	3	Sand with Pebbles/ Granules	Soft Sediment Fauna (3)	None	None	IND	IND	None	None	Sea Scallop	No	Bryozoan(s)	Hermit Crab(s), Sea Scallop(s)
083	3	1.5	2	2	2 on 3	3	Sand and Mud with Ripples	Soft Sediment Fauna (3)	None	None	No	No	None	None	None	Yes	None	None

Table 3.1-2 Benthic SRWF																		
Station ID	SPI Replicate (n)	Mean aRPD Depth (cm)	Successional Stage (by replicate)[1]			PV Replicate (n)	Macrohabitat[2]	CMECS Biotic Subclasses (# of reps)	CMECS Co-occurring Biotic Subclasses (# of reps)	Maximum Attached Fauna Percent Cover (CMECS Percent Cover Modifier)	Burrow Presence	Tracks Presence	Common Taxa Type	Sensitive Taxa Type	Species of Concern	Tubes Presence[2]	Sessile Epifauna Present[2]	Mobile Epifauna Present[2]
084	3	2.2	2	2	IND	3	Sand and Mud with Ripples	Soft Sediment Fauna (3)	None	None	Yes	No	Sabellid	None	None	Yes	None	Shrimp
085	3	IND	2	2	IND	3	Patchy Cobbles and/or Boulders on Sand	Attached Fauna (1), Soft Sediment Fauna (2)	None	Dense (70 to < 90%)	No	No	None	Non Reef-Building Hard Coral	Sea Scallop	Yes	Barnacles, Bryozoan(s), Northern Star Coral	Hermit Crab(s), Sea Scallop(s)
086	3	3.5	2	2	2	3	Sand with Ripples	IND	None	None	IND	IND	None	None	None	Yes	None	None
087	3	2.9	2	2 -> 3	2 on 3	2	Sand and Mud with Ripples	Soft Sediment Fauna (1)	None	None	IND	IND	None	None	None	Yes	None	None
088	3	1.9	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	Yes	No	None	None	None	Yes	None	None
089	3	IND	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	No	None	None	None	Yes	None	Sea Star(s), Shrimp(s)
090	3	2.4	2	2 -> 3	2 -> 3	1	Sand and Mud with Ripples	Soft Sediment Fauna (1)	None	None	IND	IND	None	None	None	Yes	None	Sea Star(s)
091	3	3.0	2	2 -> 3	2 -> 3	3	Sand and Mud with Ripples	Soft Sediment Fauna (3)	None	None	No	No	None	None	None	Yes	None	Jonah Crab, Sea Star(s)
092	3	3.5	2	2	2 -> 3	2	Sand and Mud	Soft Sediment Fauna (2)	None	None	Yes	Yes	Sabellid	None	None	Yes	None	None
093	3	1.9	2 -> 3	2 -> 3	2 -> 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	No	Ceriantid(s)	None	None	Yes	None	Shrimp
094	3	3.2	2	2	2	2	Sand with Ripples	Soft Sediment Fauna (2)	None	None	No	Yes	None	None	None	Yes	None	None
095	3	4.0	2 -> 3	2 -> 3	2 on 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	No	Sabellid	None	None	Yes	None	Shrimp
096	3	IND	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	Yes	No	None	None	None	Yes	None	Shrimp
097	3	2.6	2 -> 3	2 on 3	2 on 3	2	Sand and Mud	Soft Sediment Fauna (2)	None	None	Yes	Yes	Sabellid	None	None	Yes	None	Shrimp
098	3	3.4	2 -> 3	1 on 3	2 on 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	Sabellid	None	Sea Scallop	Yes	None	Sea Scallop(s)
099	3	IND	2	2 -> 3	2 on 3	2	Sand and Mud	Soft Sediment Fauna (2)	None	None	Yes	No	Sabellid	None	None	Yes	None	Shrimp
100	3	3.7	2 -> 3	2 -> 3	2 -> 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	Sabellid	None	Sea Scallop	Yes	Bryozoan(s), Hydroid(s)	Sea Scallop, Shrimp

Table 3.1-2 Benthic SRWF

Station ID	SPI Replicate (n)	Mean aRPD Depth (cm)	Successional Stage (by replicate)[1]			PV Replicate (n)	Macrohabitat[2]	CMECS Biotic Subclasses (# of reps)	CMECS Co-occurring Biotic Subclasses (# of reps)	Maximum Attached Fauna Percent Cover (CMECS Percent Cover Modifier)	Burrow Presence	Tracks Presence	Common Taxa Type	Sensitive Taxa Type	Species of Concern	Tubes Presence[2]	Sessile Epifauna Present[2]	Mobile Epifauna Present[2]
101	3	IND	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	Yes	Yes	Ceriantheid(s) and Sand Dollar(s)	None	None	Yes	None	Sand Dollar(s), Shrimp
102	3	IND	1 -> 2	1 -> 2	1-> 2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	Yes	Ceriantheid(s)	None	None	Yes	None	Nudibranch(s)
103	3	2.7	2	2 -> 3	2 -> 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	Ceriantheid(s)	None	None	Yes	None	None
104	3	IND	1 on 3	2 on 3	2 on 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	Sabellid	None	None	Yes	None	Shrimp, Snail(s)
105	3	3.0	2 -> 3	2 -> 3	2 -> 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	Sabellid	None	None	Yes	Podocerid Amphipod(s)	Shrimp
106	3	2.4	2 -> 3	1 on 3	2 on 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	No	Sabellid	None	None	Yes	None	Shrimp
107	3	3.4	2 on 3	2 on 3	2 on 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	Ceriantheid(s)	None	None	Yes	None	None
108	3	IND	2	2	2 on 3	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	None	Hermit Crab(s), Sea Star(s), Shrimp
109	3	2.6	2 -> 3	2 -> 3	2 -> 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	No	Ceriantheid(s)	None	None	Yes	None	Sea Star(s), Shrimp(s)
110	3	2.2	2 -> 3	2 on 3	2 on 3	2	Sand and Mud	Soft Sediment Fauna (2)	None	None	Yes	No	Ceriantheid(s)	None	None	Yes	None	Shrimp
111	3	IND	IND	IND	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	None	Shrimp
112	3	IND	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	Yes	No	None	None	None	Yes	None	Shrimp
113	3	IND	1	1	2	3	Sand with Ripples	Inferred Fauna (1)	None	None	No	No	None	None	None	Yes	None	Shrimp
114	3	3.4	2 -> 3	2 -> 3	2 on 3	1	Sand and Mud	Soft Sediment Fauna (1)	None	None	Yes	No	None	None	None	Yes	Podocerid Amphipod(s)	None
115	3	IND	1 -> 2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	Yes	None	None	None	Yes	Podocerid Amphipod(s)	Shrimp
116	3	IND	2 -> 3	2 -> 3	2 -> 3	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	Yes	No	Ceriantheid(s)	None	None	Yes	None	None
117	3	3.0	2 on 3	2 on 3	2 on 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	No	Ceriantheid(s)	None	None	Yes	None	Shrimp
118	3	3.2	2 on 3	2 on 3	2 on 3	3	Sand and Mud	Soft Sediment Fauna (2)	None	None	Yes	Yes	Ceriantheid(s)	None	None	Yes	Podocerid Amphipod(s)	None
119	3	2.4	2 -> 3	2 on 3	2 on 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	No	Ceriantheid(s)	None	None	Yes	None	None

Table 3.1-2 Benthic SRWF

Station ID	SPI Replicate (n)	Mean aRPD Depth (cm)	Successional Stage (by replicate)[1]			PV Replicate (n)	Macrohabitat[2]	CMECS Biotic Subclasses (# of reps)	CMECS Co-occurring Biotic Subclasses (# of reps)	Maximum Attached Fauna Percent Cover (CMECS Percent Cover Modifier)	Burrow Presence	Tracks Presence	Common Taxa Type	Sensitive Taxa Type	Species of Concern	Tubes Presence[2]	Sessile Epifauna Present[2]	Mobile Epifauna Present[2]
120	3	2.4	2 -> 3	1 on 3	2 on 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	No	Ceriantheid(s)	None	Sea Scallop	Yes	Bryozoan(s)	Crab(s), Sea Scallop(s), Shrimp
121	3	2.1	2 -> 3	1 on 3	2 on 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	Cerianthid(s)	None	Sea Scallop	Yes	None	Jonah Crab, Sea Scallop(s), Shrimp
122	3	2.7	2 on 3	2 on 3	2 on 3	1	Sand and Mud	Soft Sediment Fauna (1)	None	None	Yes	Yes	Cerianthid(s)	None	None	Yes	None	Shrimp, Snail
123	3	2.5	2 on 3	2 on 3	2 on 3	2	Sand and Mud	Soft Sediment Fauna (2)	None	None	Yes	No	Cerianthid(s) and Sabellid	None	None	Yes	None	Sea Star(s)
124	3	IND	2 -> 3	2 on 3	2 on 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	Cerianthid(s)	None	None	Yes	None	Sea Star(s), Shrimp
125	3	2.6	2 -> 3	2 on 3	2 on 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	Cerianthid(s)	None	None	Yes	None	Shrimp
126	3	2.8	2 -> 3	2 on 3	2 on 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	Cerianthid(s)	None	None	Yes	None	Sea Star(s), Shrimp
127	3	IND	2 -> 3	2 -> 3	2 on 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	Cerianthid(s)	None	None	Yes	None	Sea Star(s), Shrimp(s)
128	3	2.4	2 -> 3	2 -> 3	2 -> 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	Corymorpha	Sea Star(s)
129	3	IND	2 -> 3	2 on 3	2 on 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	Ampelisca Amphipod(s), Corymorpha	None
130	3	IND	2	2	1 on 3	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	Yes	No	Sand Dollar(s)	None	Ocean Quahog	Yes	Bryozoan(s)	Sand Dollar(s), Shrimp
131	3	IND	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	Yes	None	None	None	Yes	None	Shrimp
132	3	IND	1 -> 2	1 -> 2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	No	None	None	None	Yes	None	Hermit Crab(s), Shrimp
133	3	1.7	2 -> 3	1 on 3	1 on 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	Cerianthid(s)	None	None	Yes	None	Shrimp
134	3	1.8	2 on 3	2 on 3	2 on 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	Cerianthid(s)	None	None	Yes	None	None
201	3	IND	1 -> 2	1 -> 2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	No	None	None	None	Yes	None	Shrimp
202	3	IND	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	Yes	None	None	None	Yes	None	None
203	3	IND	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	Yes	None	None	None	Yes	Barnacle(s)	Snail(s)
204	3	IND	1	2	IND	3	Sand with Pebbles/ Granules	Soft Sediment Fauna (2)	None	None	No	No	None	None	None	Yes	Bryozoan(s), Tubularia Hydroid(s)	None

Table 3.1-2 Benthic SRWF

Station ID	SPI Replicate (n)	Mean aRPD Depth (cm)	Successional Stage (by replicate)[1]			PV Replicate (n)	Macrohabitat[2]	CMECS Biotic Subclasses (# of reps)	CMECS Co-occurring Biotic Subclasses (# of reps)	Maximum Attached Fauna Percent Cover (CMECS Percent Cover Modifier)	Burrow Presence	Tracks Presence	Common Taxa Type	Sensitive Taxa Type	Species of Concern	Tubes Presence[2]	Sessile Epifauna Present[2]	Mobile Epifauna Present[2]
205	3	IND	2	IND	IND	3	Sand with Pebbles/ Granules	Soft Sediment Fauna (2)	None	None	No	No	None	None	None	Yes	Tubularia Hydroid(s)	None
206	3	IND	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	No	None	None	None	Yes	Ampelisca Amphipod(s)	None
207	3	IND	IND	IND	IND	3	Patchy Cobbles and/or Boulders on Sand	Soft Sediment Fauna (2)	None	None	No	No	None	None	None	Yes	Bryozoan(s), Tubularia Hydroid(s)	None
208	3	4.4	2	2 -> 3	2 -> 3	1	Sand and Mud	Soft Sediment Fauna (1)	None	None	Yes	Yes	None	None	None	Yes	None	None
209	3	IND	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	Ampelisca Amphipod(s)	Shrimp, Snail
210	3	IND	IND	IND	IND	3	Patchy Cobbles and/or Boulders on Sand	Attached Fauna (2), Soft Sediment Fauna (1)	Attached Fauna (1)	Moderate (30 to < 70%)	Yes	Yes	None	None	None	Yes	Bryozoan(s), Hydroid(s), Sea Whip(s), Sponge(s), Tubularia Hydroid(s)	None
211	3	IND	2	2	2 -> 3	3	Sand with Pebbles/ Granules	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	Bryozoan(s), Hydroid(s)	Shrimp
212	3	IND	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	Yes	No	None	None	None	Yes	None	Shrimp
213	3	IND	IND	IND	IND	3	Sand with Ripples	Inferred Fauna (1), Soft Sediment Fauna (2)	None	None	No	Yes	None	None	None	Yes	None	Shrimp
214	3	1.8	2	2	2	3	Sand and Mud with Ripples	Soft Sediment Fauna (3)	None	None	No	No	None	None	None	Yes	None	Shrimp
215	3	4.0	2 -> 3	2 -> 3	2 -> 3	3	Sand and Mud with Ripples	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	Podocerid Amphipod(s), Tube-Building Amphipods	Shrimp, Snail(s)
216	3	IND	IND	IND	IND	2	Sand	Soft Sediment Fauna (2)	Attached Fauna (1)	Sparse (1 to <30%)	No	No	None	None	None	Yes	Bryozoan(s), Hydroids, Tubularia Hydroid(s)	Sand Dollar(s)
217	3	IND	IND	IND	IND	3	Sand with Pebbles/ Granules	Inferred Fauna (2)	None	None	No	Yes	None	None	None	No	None	None
218	3	IND	2	2	IND	3	Sand with Pebbles/ Granules	Soft Sediment Fauna (2)	None	None	Yes	Yes	None	None	None	Yes	Bryozoan(s), Tubularia Hydroid(s)	None
219	3	IND	IND	IND	IND	2	Sand	Soft Sediment Fauna (2)	None	None	Yes	Yes	None	None	None	Yes	Bryozoan(s)	Shrimp

Table 3.1-2 Benthic SRWF

Station ID	SPI Replicate (n)	Mean aRPD Depth (cm)	Successional Stage (by replicate)[1]			PV Replicate (n)	Macrohabitat[2]	CMECS Biotic Subclasses (# of reps)	CMECS Co-occurring Biotic Subclasses (# of reps)	Maximum Attached Fauna Percent Cover (CMECS Percent Cover Modifier)	Burrow Presence	Tracks Presence	Common Taxa Type	Sensitive Taxa Type	Species of Concern	Tubes Presence[2]	Sessile Epifauna Present[2]	Mobile Epifauna Present[2]
220	3	IND	IND	IND	IND	3	Sand with Ripples	Inferred Fauna (1), Soft Sediment Fauna (2)	None	None	No	Yes	None	None	None	Yes	None	Shrimp
221	3	IND	IND	IND	IND	3	Sand with Ripples	Inferred Fauna (1), Soft Sediment Fauna (2)	None	None	No	No	None	None	None	Yes	None	None
222	3	IND	2	2	2	3	Sand with Pebbles/ Granules	Soft Sediment Fauna (3)	None	None	No	No	None	None	None	Yes	None	None
223	3	2.7	2	2	2	2	Sand with Ripples	Soft Sediment Fauna (2)	None	None	Yes	Yes	None	None	None	Yes	None	Shrimp
224	3	2.5	2 -> 3	2 -> 3	2 -> 3	3	Sand and Mud with Ripples	Soft Sediment Fauna (3)	None	None	Yes	No	None	None	None	Yes	Tube-Building Amphipods	Shrimp
225	3	3.2	2 -> 3	2 -> 3	2 -> 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	Tube-Building Amphipods	Shrimp
226	3	IND	2	2	2	1	Sand and Mud with Ripples	Soft Sediment Fauna (1)	None	None	Yes	No	None	None	None	Yes	Tube-Building Amphipods	None
227	3	IND	IND	IND	IND	3	Cobbles and/or Boulders on Sand	Attached Fauna (3)	None	Complete (90-100%)	Yes	No	Cerianthid(s)	Non Reef-Building Hard Coral	None	Yes	Barnacles, Bryozoan(s), Caprellid Amphipods, Hydroid(s), Mussels, Northern Star Coral, Tunicates	Brittle Star(s), Sea Star(s), Snails
228	3	IND	2	2	IND	3	Sand	Soft Sediment Fauna (3)	None	None	Yes	Yes	Cerianthid(s)	None	None	Yes	None	None
229	3	IND	2	IND	IND	3	Sand	Inferred Fauna (2), Soft Sediment Fauna (1)	None	None	Yes	Yes	None	None	None	Yes	None	None
230	3	IND	2	2	2	3	Sand	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	None	None
231	3	IND	2	2	2	3	Sand	Inferred Fauna (1), Soft Sediment Fauna (2)	None	None	Yes	No	Cerianthid(s)	None	None	Yes	None	Shrimp
232	3	IND	2	2	2	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	None	Shrimp
233	3	4.7	2	2 -> 3	2 -> 3	0	IND	-	-	-	-	-	-	-	-	Yes	None	None

Table 3.1-2 Benthic SRWF																		
Station ID	SPI Replicate (n)	Mean aRPD Depth (cm)	Successional Stage (by replicate)[1]			PV Replicate (n)	Macrohabitat[2]	CMECS Biotic Subclasses (# of reps)	CMECS Co-occurring Biotic Subclasses (# of reps)	Maximum Attached Fauna Percent Cover (CMECS Percent Cover Modifier)	Burrow Presence	Tracks Presence	Common Taxa Type	Sensitive Taxa Type	Species of Concern	Tubes Presence[2]	Sessile Epifauna Present[2]	Mobile Epifauna Present[2]
234	3	IND	IND	IND	IND	3	Sand with Pebbles/ Granules	Soft Sediment Fauna (3)	None	None	No	No	Sand Dollar(s)	None	None	Yes	None	Nudibranch, Sand Dollar(s)
235	3	3.2	2	2	2 -> 3	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	Podocerid Amphipod(s)	Shrimp, Snail(s)
236	3	IND	2	2	2 -> 3	3	Sand	Soft Sediment Fauna (3)	None	None	Yes	Yes	Ceriantheid(s) and Sand Dollar(s)	None	None	Yes	None	Sand Dollar(s), Snail
237	3	IND	2 -> 3	2 -> 3	2 on 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	Tube-Building Amphipods	None
238	3	2.7	2 -> 3	2 on 3	2 on 3	2	Sand and Mud	Soft Sediment Fauna (2)	None	None	Yes	Yes	Cerianthid(s)	None	None	Yes	None	None
239	3	4.8	2 on 3	2 on 3	2 on 3	3	Sand	Soft Sediment Fauna (3)	None	None	Yes	Yes	Sabellid	None	None	Yes	None	Moon Snail(s), Shrimp, Snail
240	3	IND	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	Yes	None	None	None	Yes	None	Shrimp
241	3	IND	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	Yes	Yes	Sand Dollar(s)	None	None	Yes	None	Sand Dollar(s), Shrimp, Snail
242	3	IND	IND	IND	IND	3	Sand	Soft Sediment Fauna (3)	None	None	Yes	Yes	Sand Dollar(s)	None	None	Yes	None	Sand Dollar(s)
243	3	3.6	2	IND	IND	3	Sand with Ripples	Inferred Fauna (1), Soft Sediment Fauna (2)	None	None	Yes	Yes	Cerianthid(s) and Sand Dollar(s)	None	None	Yes	None	Sand Dollar(s), Shrimp
244	3	IND	2 -> 3	2 -> 3	2 -> 3	3	Sand	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	None	Shrimp
245	3	IND	2	2	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	Yes	No	Cerianthid(s) and Sand Dollar(s)	None	None	Yes	Corymorpha	Chaetognath, Sand Dollar(s)
246	3	IND	2	2	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	No	None	None	None	Yes	None	Chaetognath(s), Shrimp
247	3	IND	IND	IND	IND	1	IND	Soft Sediment Fauna (1)	None	None	IND	IND	Sand Dollar(s)	None	None	No	None	Sand Dollar(s)
248	3	IND	IND	IND	IND	3	Sand	Soft Sediment Fauna (3)	None	None	No	Yes	None	None	None	Yes	None	Shrimp
249	3	4.7	2	2	2 on 3	2	Sand and Mud	Soft Sediment Fauna (2)	None	None	Yes	Yes	None	None	None	Yes	Corymorpha	Shrimp
250	3	5.2	2 -> 3	1 on 3	1 on 3	2	Sand and Mud	Soft Sediment Fauna (2)	None	None	Yes	Yes	Sabellid and Sand Dollar(s)	None	None	Yes	Corymorpha	Sand Dollar(s)
251	3	IND	2	2	2	3	Sand	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	None	Sea Star(s), Shrimp(s)

Table 3.1-2 Benthic SRWF

Station ID	SPI Replicate (n)	Mean aRPD Depth (cm)	Successional Stage (by replicate)[1]			PV Replicate (n)	Macrohabitat[2]	CMECS Biotic Subclasses (# of reps)	CMECS Co-occurring Biotic Subclasses (# of reps)	Maximum Attached Fauna Percent Cover (CMECS Percent Cover Modifier)	Burrow Presence	Tracks Presence	Common Taxa Type	Sensitive Taxa Type	Species of Concern	Tubes Presence[2]	Sessile Epifauna Present[2]	Mobile Epifauna Present[2]
252	3	IND	2	2	2	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	None	Chaetognath, Shrimp, Snail
253	3	IND	IND	IND	IND	1	Sand with Ripples	Soft Sediment Fauna (1)	None	None	IND	IND	None	None	None	No	None	None
254	3	IND	IND	IND	IND	1	Sand and Mud with Ripples	Soft Sediment Fauna (1)	None	None	No	No	None	None	None	Yes	None	None
255	3	IND	IND	IND	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	No	Sand Dollar(s)	None	None	Yes	None	Hermit Crab(s), Sand Dollar(s), Shrimp
256	3	IND	IND	IND	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	No	Sand Dollar(s)	None	None	Yes	Bryozoan(s), Hydroid(s)	Hermit Crab(s), Sand Dollar(s)
257	3	IND	2 -> 3	2 -> 3	2 -> 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	Sabellid	None	None	Yes	None	Chaetognath(s), Shrimp
258	3	3.5	2 -> 3	2 -> 3	2 -> 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	None	Chaetognath(s), Sea Star(s), Shrimp
259	3	1.9	2	2 -> 3	2 -> 3	2	Sand and Mud	Soft Sediment Fauna (2)	None	None	Yes	Yes	Sabellid	None	Sea Scallop	Yes	None	Sea Scallop(s)
260	3	3.1	2	2	2	2	Sand with Ripples	Soft Sediment Fauna (2)	None	None	No	Yes	None	None	None	Yes	None	Chaetognath, Hermit Crab(s), Shrimp
261	3	IND	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	None	Snail(s)
262	3	IND	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	No	None	None	None	Yes	None	Shrimp
263	3	1.2	1	2 -> 3	1 on 3	1	Sand and Mud	Soft Sediment Fauna (1)	None	None	Yes	Yes	None	None	None	Yes	None	Shrimp
264	3	IND	IND	IND	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	No	None	None	None	Yes	Bryozoan(s), Hydroid(s)	None
265	3	2.8	1 -> 2	2	IND	1	Sand with Ripples	Soft Sediment Fauna (1)	None	None	No	No	None	None	None	Yes	Ampelisca Amphipod(s)	None
266	3	IND	2	2 -> 3	2 on 3	0	IND	-	-	-	-	-	-	-	-	Yes	None	None
267	3	3.8	2 -> 3	2 -> 3	2 -> 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	None	Shrimp
268	3	3.7	2	2 -> 3	2 -> 3	2	Sand and Mud	Soft Sediment Fauna (2)	None	None	Yes	No	None	None	None	Yes	None	None
269	3	IND	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	None	Chaetognath(s), Hermit Crab(s)
270	3	IND	2	2	2	2	Sand with Ripples	Soft Sediment Fauna (2)	None	None	No	No	None	None	None	Yes	None	None
271	3	1.6	2	2 -> 3	2 on 3	0	IND	-	-	-	-	-	-	-	-	Yes	None	None

Table 3.1-2 Benthic SRWF

Station ID	SPI Replicate (n)	Mean aRPD Depth (cm)	Successional Stage (by replicate)[1]			PV Replicate (n)	Macrohabitat[2]	CMECS Biotic Subclasses (# of reps)	CMECS Co-occurring Biotic Subclasses (# of reps)	Maximum Attached Fauna Percent Cover (CMECS Percent Cover Modifier)	Burrow Presence	Tracks Presence	Common Taxa Type	Sensitive Taxa Type	Species of Concern	Tubes Presence[2]	Sessile Epifauna Present[2]	Mobile Epifauna Present[2]
272	3	IND	IND	IND	IND	1	Sand with Ripples	Soft Sediment Fauna (1)	None	None	No	No	None	None	None	No	None	Hermit Crab(s)
273	3	IND	IND	IND	IND	2	Sand with Ripples	Soft Sediment Fauna (2)	None	None	No	Yes	Sand Dollar(s)	None	None	No	None	Sand Dollar(s)
274	3	2.9	2	2	IND	2	Sand with Ripples	Soft Sediment Fauna (2)	None	None	Yes	No	Sand Dollar(s)	None	None	Yes	None	Sand Dollar(s)
275	3	2.7	2	2 -> 3	2 -> 3	2	Sand and Mud	Soft Sediment Fauna (2)	Attached Fauna (1)	Trace (<1%)	Yes	Yes	None	None	None	Yes	Bryozoan(s)	None
276	3	IND	2 -> 3	2 -> 3	2 -> 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	None	Chaetognath(s), Sea Star(s)
277	3	3.5	2	2 on 3	2 on 3	2	Sand and Mud	Soft Sediment Fauna (2)	None	None	Yes	No	None	None	None	Yes	None	None
278	3	IND	2	2	2	1	Sand and Mud with Ripples	Soft Sediment Fauna (1)	None	None	No	No	None	None	None	Yes	None	None
279	3	IND	2	2	2	2	Sand and Mud with Ripples	IND	None	None	IND	IND	None	None	None	Yes	None	None
280	3	IND	2	2	2	1	Sand with Ripples	Soft Sediment Fauna (1)	None	None	No	No	None	None	None	Yes	Ampelisca Amphipod(s)	None
281	3	IND	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	No	None	None	None	Yes	Ampelisca Amphipod(s)	None
282	3	IND	2	2	IND	2	Sand with Ripples	Soft Sediment Fauna (2)	None	None	No	No	None	None	None	Yes	None	None
283	3	IND	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (1)	None	None	No	No	None	None	None	Yes	None	Shrimp
284	3	2.7	2	2	2 on 3	3	Sand with Ripples	IND	None	None	No	No	None	None	None	Yes	None	None
285	3	2.1	2	2	2	2	Sand and Mud with Ripples	IND	None	None	No	No	None	None	None	Yes	None	None
286	3	IND	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	No	Sand Dollar(s)	None	None	Yes	None	Sand Dollar(s)
287	3	1.6	2	2	2	3	Sand and Mud with Ripples	Soft Sediment Fauna (3)	None	None	No	No	None	None	None	Yes	None	None
289	3	IND	2	2	2 -> 3	3	Sand with Ripples	Inferred Fauna (1), Soft Sediment Fauna (2)	None	None	Yes	No	None	None	None	Yes	None	None

Table 3.1-2 Benthic SRWF

Station ID	SPI Replicate (n)	Mean aRPD Depth (cm)	Successional Stage (by replicate)[1]			PV Replicate (n)	Macrohabitat[2]	CMECS Biotic Subclasses (# of reps)	CMECS Co-occurring Biotic Subclasses (# of reps)	Maximum Attached Fauna Percent Cover (CMECS Percent Cover Modifier)	Burrow Presence	Tracks Presence	Common Taxa Type	Sensitive Taxa Type	Species of Concern	Tubes Presence[2]	Sessile Epifauna Present[2]	Mobile Epifauna Present[2]
701	3	IND	IND	IND	IND	3	Sand with Pebbles/ Granules	Soft Sediment Fauna (3)	None	None	No	No	None	None	None	Yes	Tubularia Hydroid(s)	None
702	2	IND	IND	IND	-	3	Patchy Cobbles and/or Boulders on Sand	Attached Fauna (2), Soft Sediment Fauna (1)	Attached Fauna (1), Soft Sediment Fauna (1)	Dense (70 to < 90%)	No	No	None	Non Reef-Building Hard Coral	None	Yes	Anemone(s), Bryozoan(s), Corymorpha, Hydroid(s), Northern Star Coral, Tubularia Hydroid(s)	None
703	3	2.1	2	2	2	2	Sand with Ripples	Soft Sediment Fauna (2)	None	None	No	Yes	None	None	None	Yes	None	None
704	3	IND	IND	IND	IND	3	Sand with Pebbles/ Granules	Soft Sediment Fauna (2)	None	None	No	No	None	None	None	No	Tubularia Hydroid(s)	None
705	3	IND	IND	IND	IND	3	Sand with Pebbles/ Granules	Soft Sediment Fauna (3)	Inferred Fauna (1)	None	No	Yes	None	None	Sea Scallop	Yes	Tubularia Hydroid(s)	Sea Scallop(s)
706	3	IND	IND	IND	IND	3	Patchy Cobbles and/or Boulders on Sand	Attached Fauna (2), Soft Sediment Fauna (1)	Soft Sediment Fauna (2)	Moderate (30 to < 70%)	No	Yes	Ceriantheid(s)	None	None	Yes	Bryozoan(s), Corymorpha, Hydroid(s), Sponge(s), Tubularia Hydroid(s)	Squid
707	3	2.8	2	2 -> 3	2 -> 3	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	None	Snail(s)
708	3	IND	IND	IND	IND	3	Patchy Cobbles and/or Boulders on Sand	Attached Fauna (2), Soft Sediment Fauna (1)	Inferred Fauna (1), Soft Sediment Fauna (2)	Moderate (30 to < 70%)	Yes	Yes	Ceriantheid(s)	None	None	Yes	Bryozoan(s), Tubularia Hydroid(s)	None
709	3	IND	IND	IND	IND	3	Patchy Cobbles and/or Boulders on Sand	Attached Fauna (2), Soft Sediment Fauna (1)	Soft Sediment Fauna (1)	Moderate (30 to < 70%)	No	No	None	None	None	Yes	Anemone(s), Bryozoan(s), Sponge(s), Tubularia Hydroid(s), Tunicates	None
710	3	IND	1 -> 2	1 -> 2	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	Attached Fauna (1), Inferred Fauna (1)	Sparse (1 to <30%)	No	Yes	None	None	None	Yes	Anemone(s), Bryozoan(s)	None
711	3	IND	IND	IND	IND	3	Sand with Pebbles/ Granules	Soft Sediment Fauna (3)	None	None	No	No	None	None	None	Yes	Tubularia Hydroid(s)	None
712	3	2.8	2	2	2 -> 3	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	None	Nudibranch(s)
713	3	IND	IND	IND	IND	3	Patchy Cobbles and/or Boulders on Sand	Attached Fauna (2), Soft Sediment Fauna (1)	None	Moderate (30 to < 70%)	Yes	Yes	None	None	None	Yes	Bryozoan(s), Hydroids, Sponge(s), Tubularia Hydroid(s)	Nudibranch(s)

Table 3.1-2 Benthic SRWF

Station ID	SPI Replicate (n)	Mean aRPD Depth (cm)	Successional Stage (by replicate)[1]			PV Replicate (n)	Macrohabitat[2]	CMECS Biotic Subclasses (# of reps)	CMECS Co-occurring Biotic Subclasses (# of reps)	Maximum Attached Fauna Percent Cover (CMECS Percent Cover Modifier)	Burrow Presence	Tracks Presence	Common Taxa Type	Sensitive Taxa Type	Species of Concern	Tubes Presence[2]	Sessile Epifauna Present[2]	Mobile Epifauna Present[2]
714	3	IND	2	IND	IND	3	Sand with Pebbles/ Granules	Attached Fauna (1), Soft Sediment Fauna (1)	Inferred Fauna (1), Soft Sediment Fauna (1)	Trace (<1%)	No	Yes	None	None	None	Yes	Tubularia Hydroid(s)	None
715	3	IND	IND	IND	IND	3	Patchy Cobbles and/or Boulders on Sand	Attached Fauna (1), Soft Sediment Fauna (2)	None	Dense (70 to < 90%)	No	No	None	None	None	Yes	Bryozoan(s), Tubularia Hydroid(s)	None
716	2	IND	2 on 3	IND	-	3	Patchy Cobbles and/or Boulders on Sand	Attached Fauna (3)	Soft Sediment Fauna (2)	Complete (90-100%)	No	No	None	None	None	Yes	Bryozoan(s), Hydroids, Tubularia Hydroid(s)	None
717	3	IND	IND	IND	IND	3	Patchy Cobbles and/or Boulders on Sand	Attached Fauna (1), Soft Sediment Fauna (2)	Soft Sediment Fauna (1)	Moderate (30 to < 70%)	No	Yes	None	None	None	Yes	Bryozoan(s), Hydroids, Tubularia Hydroid(s)	None
718	3	IND	2	2	IND	3	Sand with Ripples	Inferred Fauna (1), Soft Sediment Fauna (1)	None	None	No	Yes	None	None	None	Yes	Tubularia Hydroid(s)	Moon Snail(s)
719	3	IND	IND	IND	IND	3	Sand with Pebbles/ Granules	Inferred Fauna (1), Soft Sediment Fauna (1)	None	None	No	Yes	None	None	None	Yes	None	Snail(s)
720	2	2.8	2	2	-	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	None	Shrimp
721	3	IND	2	IND	IND	3	Patchy Cobbles and/or Boulders on Sand	Attached Fauna (3)	Soft Sediment Fauna (1)	Dense (70 to < 90%)	No	No	None	Non Reef-Building Hard Coral	None	Yes	Bryozoan(s), Northern Star Coral, Tubularia Hydroid(s)	Sea Star(s)
722	3	IND	2	IND	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	No	None	None	Sea Scallop	Yes	Tubularia Hydroid(s)	Sea Scallop(s)
723	3	IND	2 -> 3	IND	IND	3	Sand with Ripples	Soft Sediment Fauna (2)	None	None	Yes	Yes	None	None	None	Yes	Tubularia Hydroid(s)	None
724	3	IND	2	IND	IND	3	Sand with Pebbles/ Granules	Inferred Fauna (1), Soft Sediment Fauna (2)	None	None	No	Yes	None	None	Sea Scallop	Yes	Bryozoan(s), Tubularia Hydroid(s)	Sea Scallop(s)
725	3	IND	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	Yes	None	None	None	Yes	Bryozoan(s), Tubularia Hydroid(s)	None
726	3	3.7	1 on 3	2 on 3	2 on 3	3	Sand and Mud with Ripples	Soft Sediment Fauna (3)	None	None	Yes	Yes	Ceriantheid(s)	None	None	Yes	None	None
727	3	2.3	2	2 -> 3	2 -> 3	3	Sand with Ripples	Soft Sediment Fauna (3)	Inferred Fauna (2)	None	Yes	Yes	None	None	None	Yes	Tubularia Hydroid(s)	Sea Star(s), Snail(s)

Table 3.1-2 Benthic SRWF

Station ID	SPI Replicate (n)	Mean aRPD Depth (cm)	Successional Stage (by replicate)[1]			PV Replicate (n)	Macrohabitat[2]	CMECS Biotic Subclasses (# of reps)	CMECS Co-occurring Biotic Subclasses (# of reps)	Maximum Attached Fauna Percent Cover (CMECS Percent Cover Modifier)	Burrow Presence	Tracks Presence	Common Taxa Type	Sensitive Taxa Type	Species of Concern	Tubes Presence[2]	Sessile Epifauna Present[2]	Mobile Epifauna Present[2]
728	3	IND	IND	IND	IND	3	Sand with Pebbles/ Granules	Soft Sediment Fauna (2)	Attached Fauna (1)	Sparse (1 to <30%)	Yes	Yes	None	None	None	Yes	Tubularia Hydroid(s)	None
729	3	5.5	2 on 3	2 on 3	2 on 3	2	Sand and Mud	Soft Sediment Fauna (2)	None	None	Yes	No	Cerianthid(s)	None	Sea Scallop	Yes	Tubularia Hydroid(s)	Sea Scallop(s)
730	3	IND	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	Yes	No	None	None	None	Yes	None	Podocerid Amphipod(s)
n = SPI-252, PV-246																		
Max		**5.5**																
Min		**1.2**																
Mean		**3.0**																
SD		**0.8**																

IND=Indeterminate
"-" Replicate image not analyzed.
[1] Successional Stage: “->” indicates one Stage is progressing to another Stage (i.e., 2 -> 3).
[2] Variable determined from combined SPI/PV analysis.

Table 3.2-1. Summary of Sediment Profile and Plan View Image Analysis Geophysical Results at the SRWEC–OCS

Table 3.2-1 Geophysical SRWEC–OCS											
Station ID	SPI Replicate (n)	Water Depth (m)	Mean Prism Penetration Depth (cm)	Mean Boundary Roughness (cm)	SPI Sediment Type (by replicate)			PV Replicate (n)	CMECS Substrate Group	CMECS Substrate Subgroup[1]	Bedforms
135	3	54.3	6.6	1.2	Very fine sand	Very fine sand	Very fine sand	2	Sand or Finer	Very Fine Sand	None
136	3	51.2	4.0	1.9	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
440	3	27.4	3.9	0.7	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	None
441	3	30.5	5.3	1.7	Medium sand	Medium sand	Medium sand	3	Sand or Finer	Medium Sand	None
442	3	30.5	5.7	2.0	Medium sand	Medium sand	Medium sand	3	Sand or Finer	Medium Sand	None
443	3	32.0	8.9	1.3	Medium sand	Medium sand	Medium sand	3	Sand or Finer	Medium Sand	None
501	3	27.8	3.5	2.1	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	Small ripples
502	3	29.6	3.3	1.6	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
503	3	29.6	3.7	2.1	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	Small ripples
504	3	30.8	3.1	1.4	Very fine sand	Very fine sand	Very fine sand	2	Sand or Finer	Very Fine Sand	Small ripples
505	3	32.9	2.2	1.2	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
506	3	32.9	6.4	1.7	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
507	3	31.4	5.1	3.0	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
508	3	32.0	5.3	2.0	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
509	3	32.6	5.0	2.9	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Large ripples
510	3	32.9	3.7	3.2	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
511	3	33.2	5.0	3.4	Fine sand	Fine sand	Medium sand over finer sediment	3	Sand or Finer	Fine Sand	Small ripples
512	3	34.5	4.0	1.8	Fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	Small ripples
513	3	34.8	3.9	2.3	Fine sand	Fine sand	Medium sand over finer sediment	3	Sand or Finer	Fine Sand	Small ripples
514	3	33.2	4.7	3.2	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
515	3	36.3	4.6	1.4	Fine sand	Indeterminate	Indeterminate	3	Sand or Finer	Fine Sand	Large ripples
516	3	41.2	4.3	2.6	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	None
517	3	40.3	5.7	3.2	Medium sand	Medium sand	Medium sand	3	Sand or Finer	Medium Sand	Small ripples
518	3	40.6	4.9	4.7	Medium sand	Medium sand	Medium sand	3	Sand or Finer	Medium Sand	Large ripples

Table 3.2-1 Geophysical SRWEC–OCS

Station ID	SPI Replicate (n)	Water Depth (m)	Mean Prism Penetration Depth (cm)	Mean Boundary Roughness (cm)	SPI Sediment Type (by replicate)			PV Replicate (n)	CMECS Substrate Group	CMECS Substrate Subgroup[1]	Bedforms
519	3	41.5	4.2	2.9	Medium sand	Medium sand	Medium sand	3	Sand or Finer	Medium Sand	Small ripples
520	3	43.3	5.3	3.1	Medium sand	Medium sand	Medium sand	3	Sand or Finer	Medium Sand	Large ripples
521	3	44.2	4.5	1.5	Fine sand	Fine sand	Fine sand and silt/clay mix	3	Sand or Finer	Fine Sand	None
522	3	47.0	5.3	3.0	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
523	3	50.3	5.3	1.1	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	Small ripples
524	3	49.7	3.8	1.4	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	Small ripples
525	3	48.2	4.0	1.4	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	Small ripples
526	3	48.8	3.5	1.5	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	Small ripples
527	3	49.4	3.2	2.0	Fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	Small ripples
528	3	49.4	4.2	1.2	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
529	3	50.6	5.6	1.2	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
530	3	51.2	4.0	2.0	Fine sand	Fine sand	Fine sand over silt/clay	3	Sand or Finer	Fine Sand	Small ripples
531	3	51.2	5.9	1.1	Fine sand	Medium sand	Medium sand	3	Sand or Finer	Medium Sand	Small ripples
532	3	50.6	5.0	1.7	Fine sand	Fine sand	Fine sand and silt/clay mix	3	Sand or Finer	Fine Sand	Small ripples
533	3	51.9	4.5	2.0	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
534	3	51.9	4.0	2.4	Medium sand	Medium sand	Medium sand	3	Sand or Finer	Medium Sand	Large ripples
535	3	51.2	3.9	1.8	Coarse sand and finer sediment mix	Coarse sand and finer sediment mix	Medium sand	3	Sand or Finer	Coarse Sand	Large ripples
536	3	50.9	5.0	1.8	Medium sand	Medium sand	Medium sand	3	Sand or Finer	Medium Sand	Large ripples
537	3	51.2	5.3	1.4	Medium sand	Medium sand	Medium sand	3	Gravelly	Gravelly Sand	Large ripples
538	3	51.9	3.9	2.7	Medium sand	Medium sand	Medium sand	3	Sand or Finer	Medium Sand	Large ripples
539	3	52.8	2.9	2.8	Medium sand	Medium sand	Medium sand	3	Sand or Finer	Medium Sand	Small ripples
540	3	54.6	1.0	1.7	Finer sediment over medium sand	Medium sand	Medium sand	3	Sand or Finer	Medium Sand	Large ripples

Table 3.2-1 Geophysical SRWEC–OCS											
Station ID	SPI Replicate (n)	Water Depth (m)	Mean Prism Penetration Depth (cm)	Mean Boundary Roughness (cm)	SPI Sediment Type (by replicate)			PV Replicate (n)	CMECS Substrate Group	CMECS Substrate Subgroup[1]	Bedforms
541	3	55.2	3.8	1.5	Fine sand	Very fine sand	Very fine sand	2	Sand or Finer	Very Fine Sand	Small ripples
542	3	56.7	4.8	0.9	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
543	3	56.4	2.7	1.3	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
544	3	57.6	3.2	1.2	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	Small ripples
545	3	55.5	1.4	2.6	Coarse sand	Indeterminate	Medium sand	3	Sand or Finer	Medium Sand	Large ripples
546	3	55.5	2.9	3.3	Medium sand	Medium sand	Medium sand	3	Sand or Finer	Medium Sand	Large ripples
547	3	57.3	1.6	4.3	Indeterminate	Medium sand	Medium sand	3	Sand or Finer	Medium Sand	Large ripples
548	3	61.0	5.4	1.1	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
549	3	61.9	4.6	1.3	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	Small ripples
550	3	66.5	11.4	1.0	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
551	3	67.1	13.1	1.0	Very fine sand	Very fine sand	Very fine sand	2	Sand or Finer	Very Fine Sand	None
552	3	67.7	10.1	0.8	Very fine sand	Very fine sand	Very fine sand	2	Sand or Finer	Very Fine Sand	None
553	3	68.3	10.5	1.0	Very fine sand	Very fine sand	Very fine sand	2	Sand or Finer	Very Fine Sand	None
554	3	65.0	8.4	1.3	Very fine sand	Very fine sand	Very fine sand	1	Sand or Finer	Very Fine Sand	None
555	3	65.0	8.6	0.8	Very fine sand	Very fine sand	Very fine sand	1	Sand or Finer	Very Fine Sand	None
556	3	65.0	4.7	2.0	Very fine sand	Very fine sand	Very fine sand	2	Sand or Finer	Very Fine Sand	None
557	3	66.8	11.4	1.1	Very fine sand	Very fine sand	Very fine sand	2	Sand or Finer	Very Fine Sand	None
558	3	65.6	10.1	1.7	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
559	3	65.0	10.4	1.0	Very fine sand	Very fine sand	Very fine sand	1	Sand or Finer	Very Fine Sand	None
560	3	65.3	11.0	0.9	Very fine sand	Very fine sand	Very fine sand	1	Sand or Finer	Very Fine Sand	None
561	3	63.7	7.2	1.4	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
562	3	63.4	9.5	0.8	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	Small ripples
563	3	64.1	12.3	1.2	Very fine sand	Very fine sand	Very fine sand	2	Sand or Finer	Very Fine Sand	None
564	3	62.2	7.9	1.3	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
565	3	61.6	7.1	1.3	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
566	3	61.3	9.5	1.0	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
567	3	60.4	5.9	2.1	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
568	3	59.5	3.7	1.8	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
569	3	57.0	4.2	1.1	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	Small ripples
570	3	57.3	5.5	1.5	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
571	3	56.7	3.7	0.6	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	Small ripples
572	3	56.7	3.6	3.3	Very coarse sand	Very coarse sand	Very coarse sand	3	Sand or Finer	Very Coarse Sand	Large ripples

Table 3.2-1 Geophysical SRWEC–OCS

Station ID	SPI Replicate (n)	Water Depth (m)	Mean Prism Penetration Depth (cm)	Mean Boundary Roughness (cm)	SPI Sediment Type (by replicate)			PV Replicate (n)	CMECS Substrate Group	CMECS Substrate Subgroup[1]	Bedforms
573	3	54.9	5.0	0.7	Very fine sand	Very fine sand	Very fine sand	2	Sand or Finer	Very Fine Sand	Small ripples
574	3	54.3	6.3	4.4	Coarse sand over finer sediment	Coarse sand over finer sediment	Medium sand	3	Sand or Finer	Coarse Sand	Large ripples
575	3	53.7	10.1	1.6	Very fine sand	Very fine sand over silt/clay	Very fine sand over silt/clay	3	Sand or Finer	Very Fine Sand	None
576	3	53.1	3.7	1.2	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
577	3	54.3	4.9	0.8	Very fine sand	Very fine sand	Very fine sand	2	Sand or Finer	Very Fine Sand	None
578	3	53.4	5.5	1.1	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
641	3	65.6	12.4	1.0	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
642	3	65.0	9.3	0.8	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
643	3	64.1	8.3	1.0	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
644	3	63.1	9.2	1.8	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
645	3	62.8	10.3	0.8	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
646	2	61.0	8.1	0.9	Very fine sand	Very fine sand	-	3	Sand or Finer	Very Fine Sand	None
647	3	59.8	6.1	0.9	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
648	3	60.1	3.6	3.2	Medium sand	Medium sand	Medium sand	3	Sand or Finer	Medium Sand	Large ripples
649	3	59.8	3.8	1.2	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	Small ripples
650	3	59.8	6.4	1.3	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
651	3	60.1	5.5	1.1	Silt/clay	Very fine sand	Very fine sand	2	Sand or Finer	Very Fine Sand	None
652	3	59.5	6.8	1.7	Very fine sand	Very fine sand	Very fine sand	2	Sand or Finer	Very Fine Sand	Small ripples
653	3	58.0	5.8	1.4	Very fine sand	Very fine sand	Very fine sand	2	Sand or Finer	Very Fine Sand	Small ripples
654	3	56.7	4.3	1.8	Medium sand	Medium sand	Medium sand	3	Sand or Finer	Medium Sand	Large ripples
655	3	56.4	2.0	1.6	Fine sand	Indeterminate	Very fine sand	3	Sand or Finer	Very Fine Sand	Small ripples
656	3	54.9	4.6	2.2	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
657	3	54.0	3.3	1.6	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
658	3	52.5	3.8	2.9	Coarse sand	Medium sand	Medium sand	3	Sand or Finer	Medium Sand	None
659	3	53.4	5.4	1.3	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	Small ripples
660	3	53.4	7.3	0.8	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	Small ripples
661	3	52.5	3.0	1.6	Fine sand	Fine sand	Fine sand	2	Sand or Finer	Fine Sand	Small ripples
662	3	51.5	5.4	1.5	Granule over sand	Indeterminate	Very coarse sand over sand	3	Gravelly	Gravelly Sand	Large ripples

Table 3.2-1 Geophysical SRWEC–OCS											
Station ID	**SPI Replicate (n)**	**Water Depth (m)**	**Mean Prism Penetration Depth (cm)**	**Mean Boundary Roughness (cm)**	**SPI Sediment Type (by replicate)**			**PV Replicate (n)**	**CMECS Substrate Group**	**CMECS Substrate Subgroup[1]**	**Bedforms**
663	3	49.7	4.1	2.4	Fine sand	Fine sand	Fine sand	2	Sand or Finer	Fine Sand	Small ripples
	n = 107										
	Max	**68.3**	**13.1**	**4.7**							
	Min	**27.4**	**1.0**	**0.6**							
	Mean	**51.9**	**5.6**	**1.7**							
	SD		**2.6**	**0.9**							

IND=Indeterminate
"-" Replicate image not analyzed.
[1] Variable determined from combined SPI/PV analysis.

Table 3.2-2. Summary of Sediment Profile and Plan View Image Analysis Biological Results at the SRWEC–OCS

Table 3.2-2 Benthic SRWEC–OCS																		
Station ID	SPI Replicate (n)	Mean aRPD Depth (cm)	Successional Stage (by replicate)[1]			PV Replicate (n)	Macrohabitat[2]	CMECS Biotic Subclasses (# of reps)	CMECS Co-occurring Biotic Subclasses (# of reps)	Maximum Attached Fauna Percent Cover (CMECS Percent Cover Modifier)	Burrow Presence	Tracks Presence	Common Taxa Type	Sensitive Taxa Type	Species of Concern	Tubes Presence[2]	Sessile Epifauna Present[2]	Mobile Epifauna Present[2]
135	3	2.6	2	2 -> 3	2 on 3	2	Sand and Mud	Soft Sediment Fauna (2)	None	None	Yes	Yes	None	None	None	Yes	Bryozoan(s), Hydroid(s)	Hermit Crab(s)
136	3	IND	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (2)	None	None	No	No	None	None	None	Yes	None	None
440	3	IND	2	IND	IND	3	Sand	Soft Sediment Fauna (3)	None	None	Yes	No	Sand Dollar(s)	None	None	Yes	None	Hermit Crab(s), Nudibranch(s), Sand Dollar(s), Snail(s)
441	3	IND	1 -> 2	1 -> 2	IND	3	Sand	Soft Sediment Fauna (3)	Inferred Fauna (2)	None	No	Yes	Sand Dollar(s)	None	None	Yes	None	Hermit Crab(s), Sand Dollar(s), Snail(s)
442	3	IND	1	1	2	3	Sand	Soft Sediment Fauna (3)	Inferred Fauna (1)	None	No	Yes	Sand Dollar(s)	None	None	Yes	None	Sand Dollar(s), Snail(s)
443	3	IND	1 -> 2	1 -> 2	1 -> 2	3	Sand	Soft Sediment Fauna (3)	Inferred Fauna (2)	None	No	Yes	Sand Dollar(s)	None	None	Yes	None	Hermit Crab(s), Sand Dollar(s), Snail(s)
501	3	IND	IND	IND	IND	3	Sand and Mud with Ripples	Soft Sediment Fauna (3)	None	None	No	Yes	Diopatra and Sand Dollar(s)	None	None	Yes	None	Sand Dollar(s)
502	3	2.7	IND	IND	IND	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	No	No	Sand Dollar(s)	None	None	Yes	None	Sand Dollar(s)
503	3	IND	IND	IND	IND	3	Sand and Mud with Ripples	Soft Sediment Fauna (3)	None	None	No	No	Diopatra and Sand Dollar(s)	None	None	Yes	None	Gastropod(s), Sand Dollar(s)
504	3	IND	IND	IND	IND	2	Sand and Mud with Ripples	Soft Sediment Fauna (2)	None	None	No	No	Sand Dollar(s)	None	None	No	None	Sand Dollar(s)
505	3	IND	IND	IND	IND	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	No	No	Sand Dollar(s)	None	None	Yes	None	Gastropod(s), Sand Dollar(s)
506	3	1.9	IND	IND	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	No	Sand Dollar(s)	None	None	Yes	None	Sand Dollar(s)
507	3	IND	IND	IND	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	Inferred Fauna (1)	None	No	Yes	Sand Dollar(s)	None	None	No	None	Sand Dollar(s)
508	3	IND	IND	IND	IND	3	Sand with Ripples	Inferred Fauna (1), Soft Sediment Fauna (2)	Soft Sediment Fauna (1)	None	Yes	Yes	Sand Dollar(s)	None	None	No	None	Sand Dollar(s)
509	3	IND	IND	IND	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	Yes	Sand Dollar(s)	None	None	No	None	Sand Dollar(s)
510	3	IND	IND	IND	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	Yes	Diopatra and Sand Dollar(s)	None	None	Yes	None	Gastropod(s), Sand Dollar(s)
511	3	IND	IND	IND	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	Yes	Sand Dollar(s)	None	None	Yes	None	Sand Dollar(s)

Table 3.2-2 Benthic SRWEC–OCS

Station ID	SPI Replicate (n)	Mean aRPD Depth (cm)	Successional Stage (by replicate)[1]			PV Replicate (n)	Macrohabitat[2]	CMECS Biotic Subclasses (# of reps)	CMECS Co-occurring Biotic Subclasses (# of reps)	Maximum Attached Fauna Percent Cover (CMECS Percent Cover Modifier)	Burrow Presence	Tracks Presence	Common Taxa Type	Sensitive Taxa Type	Species of Concern	Tubes Presence[2]	Sessile Epifauna Present[2]	Mobile Epifauna Present[2]
512	3	IND	IND	IND	IND	3	Sand and Mud with Ripples	Soft Sediment Fauna (3)	None	None	No	No	Sand Dollar(s)	None	None	No	None	Gastropod(s), Sand Dollar(s)
513	3	IND	IND	IND	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	Inferred Fauna (1)	None	No	Yes	Sand Dollar(s)	None	None	No	None	Sand Dollar(s)
514	3	IND	2	IND	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	Inferred Fauna (1)	None	No	Yes	Sand Dollar(s)	None	None	Yes	None	Gastropod(s), Sand Dollar(s)
515	3	IND	IND	IND	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	No	Sand Dollar(s)	None	None	No	None	Hermit Crab(s), Sand Dollar(s)
516	3	IND	IND	IND	IND	3	Sand	Soft Sediment Fauna (3)	Inferred Fauna (3)	None	No	Yes	Sand Dollar(s)	None	None	No	None	Hermit Crab(s), Sand Dollar(s)
517	3	IND	IND	IND	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	Yes	Yes	Sand Dollar(s)	None	None	No	None	Sand Dollar(s)
518	3	IND	IND	IND	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	Inferred Fauna (1)	Trace (<1%)	No	Yes	Sand Dollar(s)	None	None	Yes	Barnacle(s)	Gastropod(s), Sand Dollar(s)
519	3	IND	IND	IND	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	Attached Fauna (2), Inferred Fauna (1)	Sparse (1 to <30%)	No	Yes	Sand Dollar(s)	None	None	Yes	Hydroid(s), Sponge(s)	Hermit Crab(s), Sand Dollar(s)
520	3	IND	IND	IND	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	Yes	Sand Dollar(s)	None	None	No	None	Gastropod(s), Sand Dollar(s)
521	3	IND	IND	IND	IND	3	Sand	Soft Sediment Fauna (3)	None	None	No	No	Sand Dollar(s)	None	None	No	None	Sand Dollar(s)
522	3	IND	1	1	1	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	Yes	Sand Dollar(s)	None	None	No	None	Sand Dollar(s), Sea Star(s)
523	3	2.6	2 -> 3	2 -> 3	2 -> 3	3	Sand and Mud with Ripples	Soft Sediment Fauna (3)	None	None	Yes	No	Sand Dollar(s)	None	None	Yes	None	Hermit Crab(s), Sand Dollar(s), Sea Star(s)
524	3	2.2	2	2	2	3	Sand and Mud with Ripples	Soft Sediment Fauna (3)	None	None	Yes	No	Sand Dollar(s)	None	None	Yes	None	Sand Dollar(s), Sea Star(s), Shrimp
525	3	2.4	2	2	2	3	Sand and Mud with Ripples	Soft Sediment Fauna (3)	None	None	Yes	Yes	Sand Dollar(s)	None	None	Yes	None	Hermit Crab(s), Sand Dollar(s), Sea Star(s)
526	3	1.9	2	2	2 -> 3	3	Sand and Mud with Ripples	Soft Sediment Fauna (3)	None	None	Yes	Yes	Sand Dollar(s)	None	None	Yes	None	Sand Dollar(s), Sea Star(s)
527	3	2.0	1 -> 2	2	2	3	Sand and Mud with Ripples	Soft Sediment Fauna (3)	Inferred Fauna (1)	None	No	Yes	None	None	None	Yes	None	Sea Star(s)
528	3	2.4	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	No	None	None	None	Yes	None	Sea Star(s), Shrimp(s)
529	3	2.4	1 -> 2	1 -> 2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	No	None	None	None	Yes	None	Sea Star(s)
530	3	2.5	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	Inferred Fauna (1)	None	No	Yes	None	None	None	Yes	None	Sea Star(s)

Table 3.2-2 Benthic SRWEC–OCS

Station ID	SPI Replicate (n)	Mean aRPD Depth (cm)	Successional Stage (by replicate)[1]			PV Replicate (n)	Macrohabitat[2]	CMECS Biotic Subclasses (# of reps)	CMECS Co-occurring Biotic Subclasses (# of reps)	Maximum Attached Fauna Percent Cover (CMECS Percent Cover Modifier)	Burrow Presence	Tracks Presence	Common Taxa Type	Sensitive Taxa Type	Species of Concern	Tubes Presence[2]	Sessile Epifauna Present[2]	Mobile Epifauna Present[2]
531	3	2.5	1 -> 2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	Yes	Yes	Sand Dollar(s)	None	None	Yes	None	Sand Dollar(s)
532	3	2.6	IND	IND	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	No	Sand Dollar(s)	None	None	Yes	None	Hermit Crab(s), Sand Dollar(s)
533	3	IND	IND	IND	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	No	Sand Dollar(s)	None	None	Yes	None	Sand Dollar(s)
534	3	IND	2	2	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	Inferred Fauna (1)	None	No	Yes	Sand Dollar(s)	None	Sea Scallop	Yes	None	Hermit Crab(s), Sand Dollar(s), Sea Scallop(s), Shrimp
535	3	IND	IND	IND	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	No	Sand Dollar(s)	None	None	No	None	Sand Dollar(s)
536	3	IND	IND	IND	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	Inferred Fauna (2)	None	No	Yes	Sand Dollar(s)	None	None	No	None	Hermit Crab(s), Sand Dollar(s)
537	3	IND	IND	IND	IND	3	Sand with Pebbles/Granules	Soft Sediment Fauna (3)	None	None	No	No	Sand Dollar(s)	None	None	Yes	Bryozoan(s)	Sand Dollar(s)
538	3	IND	IND	IND	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	Yes	Sand Dollar(s)	None	None	No	None	Sand Dollar(s)
539	3	IND	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	Yes	No	Ceriantheid(s) and Sand Dollar(s)	None	None	Yes	None	Sand Dollar(s)
540	3	IND	IND	IND	IND	3	Sand with Ripples	Inferred Fauna (1), Soft Sediment Fauna (2)	None	Trace (<1%)	No	Yes	Sand Dollar(s)	None	Sea Scallop	Yes	Bryozoan(s), Hydroid(s)	Sand Dollar(s), Sea Scallop(s), Sea Star(s)
541	3	IND	2	2	2	2	Sand and Mud with Ripples	Soft Sediment Fauna (2)	None	Trace (<1%)	No	No	None	None	None	Yes	Bryozoan(s)	Chaetognath(s), Sea Star(s)
542	3	3.5	2	2	2	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	No	Yes	None	None	None	Yes	None	Sea Star(s)
543	3	IND	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	No	None	None	None	Yes	None	Hermit Crab(s), Sea Star(s)
544	3	IND	2	2	2	3	Sand and Mud with Ripples	Soft Sediment Fauna (3)	None	None	No	Yes	Cerianthid(s)	None	None	Yes	None	Gastropod(s), Sea Star(s)
545	3	IND	1 -> 2	1 -> 2	1-> 2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	No	Sand Dollar(s)	None	None	Yes	None	Sand Dollar(s), Sea Star(s)
546	3	IND	2	IND	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	Yes	No	Sand Dollar(s)	None	None	Yes	None	Sand Dollar(s), Sea Star(s)
547	3	IND	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	No	Sand Dollar(s)	None	None	Yes	Hydroid(s)	Sand Dollar(s)
548	3	2.9	2	2	2	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	No	None	None	None	Yes	Hydroid(s)	Sea Star(s)

Table 3.2-2 Benthic SRWEC–OCS

Station ID	SPI Replicate (n)	Mean aRPD Depth (cm)	Successional Stage (by replicate)[1]			PV Replicate (n)	Macrohabitat[2]	CMECS Biotic Subclasses (# of reps)	CMECS Co-occurring Biotic Subclasses (# of reps)	Maximum Attached Fauna Percent Cover (CMECS Percent Cover Modifier)	Burrow Presence	Tracks Presence	Common Taxa Type	Sensitive Taxa Type	Species of Concern	Tubes Presence[2]	Sessile Epifauna Present[2]	Mobile Epifauna Present[2]
549	3	2.6	2	2	2	3	Sand and Mud with Ripples	Soft Sediment Fauna (3)	None	Sparse (1 to <30%)	Yes	No	None	None	Sea Scallop	Yes	Bryozoan(s), Hydroid(s)	Sea Scallop(s), Sea Star(s), Shrimp(s)
550	3	2.6	2 on 3	2 on 3	2 on 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	No	None	None	None	Yes	Ampelisca Amphipod(s), Corymorpha, Tubularia Hydroid(s)	Sea Star(s)
551	3	2.1	2 -> 3	2 -> 3	2 on 3	2	Sand and Mud	Soft Sediment Fauna (2)	None	None	Yes	Yes	None	None	None	Yes	None	Sea Star(s)
552	3	2.3	2 -> 3	2 on 3	2 on 3	2	Sand and Mud	Soft Sediment Fauna (2)	None	None	Yes	Yes	None	None	None	Yes	None	Sea Star(s)
553	3	3.3	2 -> 3	2 -> 3	2 -> 3	2	Sand and Mud	Soft Sediment Fauna (2)	None	None	Yes	Yes	None	None	None	Yes	None	Sea Star(s)
554	3	2.6	2	2	2 -> 3	1	Sand and Mud	Soft Sediment Fauna (1)	None	None	Yes	No	None	None	None	Yes	Corymorpha	Sea Star(s)
555	3	2.8	2 -> 3	2 -> 3	2 on 3	1	Sand and Mud	Soft Sediment Fauna (1)	None	None	Yes	No	None	None	None	Yes	None	Sea Star(s)
556	3	2.2	2	2 on 3	2 on 3	2	Sand and Mud	Soft Sediment Fauna (2)	None	None	Yes	Yes	None	None	None	Yes	Ampelisca Amphipod(s), Hydroid(s)	Sea Star(s)
557	3	2.3	2 -> 3	2 -> 3	2 on 3	2	Sand and Mud	Soft Sediment Fauna (2)	None	None	Yes	Yes	None	None	None	Yes	None	Sea Star(s)
558	3	2.3	2 -> 3	2 -> 3	2 -> 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	No	None	None	None	Yes	Corymorpha	Crab(s)
559	3	2.3	2 -> 3	2 -> 3	2 -> 3	1	Sand and Mud	Soft Sediment Fauna (1)	None	None	Yes	Yes	None	None	None	Yes	None	None
560	3	2.5	2 -> 3	2 -> 3	2 -> 3	1	Sand and Mud	Soft Sediment Fauna (1)	Inferred Fauna (1)	None	Yes	Yes	None	None	None	Yes	None	None
561	3	2.5	2 -> 3	2 -> 3	2 -> 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	None	None
562	3	2.7	2 -> 3	2 -> 3	2 -> 3	3	Sand and Mud with Ripples	Soft Sediment Fauna (3)	Inferred Fauna (1)	None	Yes	Yes	None	None	Sea Scallop	Yes	Bryozoan(s), Tubularia Hydroid(s)	Sea Scallop(s)
563	3	4.1	2 -> 3	2 -> 3	2 -> 3	2	Sand and Mud	Soft Sediment Fauna (2)	Inferred Fauna (1)	None	Yes	Yes	None	None	None	Yes	Hydroid(s)	Hermit Crab(s)
564	3	2.6	2 -> 3	2 -> 3	2 on 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	None	None
565	3	2.5	2 -> 3	2 -> 3	2 -> 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	Corymorpha	Cowrie, Hermit Crab(s), Snail(s)
566	3	3.0	2 -> 3	2 -> 3	2 on 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	Corymorpha	None
567	3	3.1	2 -> 3	2 -> 3	2 on 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	None	None

Table 3.2-2 Benthic SRWEC–OCS

Station ID	SPI Replicate (n)	Mean aRPD Depth (cm)	Successional Stage (by replicate)[1]			PV Replicate (n)	Macrohabitat[2]	CMECS Biotic Subclasses (# of reps)	CMECS Co-occurring Biotic Subclasses (# of reps)	Maximum Attached Fauna Percent Cover (CMECS Percent Cover Modifier)	Burrow Presence	Tracks Presence	Common Taxa Type	Sensitive Taxa Type	Species of Concern	Tubes Presence[2]	Sessile Epifauna Present[2]	Mobile Epifauna Present[2]
568	3	2.4	2	2	2	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	None	None
569	3	2.5	2	2	2 -> 3	3	Sand and Mud with Ripples	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	Ampelisca Amphipod(s)	Nudibranch(s)
570	3	2.7	2	2 -> 3	2 -> 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	No	None	None	None	Yes	Ampelisca Amphipod(s)	Moon Snail(s)
571	3	IND	2 -> 3	2 -> 3	2 -> 3	3	Sand and Mud with Ripples	Soft Sediment Fauna (3)	Inferred Fauna (1)	None	Yes	Yes	None	None	None	Yes	None	Crab(s)
572	3	IND	IND	IND	IND	3	Sand with Ripples	Soft Sediment Fauna (2)	None	None	Yes	No	None	None	None	Yes	None	Hermit Crab(s)
573	3	1.9	2	2 -> 3	2 -> 3	2	Sand and Mud with Ripples	Soft Sediment Fauna (2)	None	None	Yes	No	None	None	None	Yes	None	None
574	3	IND	1 -> 2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	Yes	None	None	None	Yes	Bryozoan(s), Hydroid(s)	Nudibranch(s), Shrimp
575	3	3.3	2 -> 3	2 -> 3	2 -> 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	Ampelisca Amphipod(s)	None
576	3	1.9	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	No	None	None	None	Yes	None	Crab(s)
577	3	2.9	2	2 -> 3	2 -> 3	2	Sand and Mud	Soft Sediment Fauna (2)	None	None	Yes	No	Cerianthid(s)	None	None	Yes	None	Snail(s)
578	3	2.9	2 -> 3	2 -> 3	2 -> 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	None	Hermit Crab(s), Sea Star(s)
641	3	3.0	2 -> 3	2 on 3	2 on 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	None	None
642	3	2.4	2 on 3	2 on 3	2 on 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	None	Chaetognath(s)
643	3	2.5	2 -> 3	2 on 3	2 on 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	Ampelisca Amphipod(s)	Sea Star(s)
644	3	2.6	2 -> 3	2 -> 3	2 -> 3	3	Sand and Mud	Soft Sediment Fauna (3)	Inferred Fauna (1)	None	Yes	Yes	None	None	None	Yes	None	Hermit Crab(s)
645	3	3.1	2 -> 3	2 -> 3	2 on 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	No	None	None	None	Yes	Corymorpha	None
646	2	2.3	2 -> 3	2 on 3	-	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	No	None	None	None	Yes	Corymorpha	Sea Star(s)
647	3	2.8	2 -> 3	2 -> 3	2 -> 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	None	Sea Star(s)
648	3	IND	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	Yes	Cerianthid(s) and Sand Dollar(s)	None	Sea Scallop	Yes	Corymorpha	Moon Snail(s), Sand Dollar(s), Sea Scallop(s)

Table 3.2-2 Benthic SRWEC–OCS

Station ID	SPI Replicate (n)	Mean aRPD Depth (cm)	Successional Stage (by replicate)[1]			PV Replicate (n)	Macrohabitat[2]	CMECS Biotic Subclasses (# of reps)	CMECS Co-occurring Biotic Subclasses (# of reps)	Maximum Attached Fauna Percent Cover (CMECS Percent Cover Modifier)	Burrow Presence	Tracks Presence	Common Taxa Type	Sensitive Taxa Type	Species of Concern	Tubes Presence[2]	Sessile Epifauna Present[2]	Mobile Epifauna Present[2]
649	3	2.0	2 -> 3	2 -> 3	2 -> 3	3	Sand and Mud with Ripples	Soft Sediment Fauna (3)	None	None	Yes	No	Ceriantheid(s)	None	None	Yes	Corymorpha, Hydroid(s)	Sea Star(s)
650	3	2.7	2 -> 3	2 -> 3	2 -> 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	No	Ceriantheid(s)	None	None	Yes	Ampelisca Amphipod(s), Corymorpha	Hermit Crab(s)
651	3	IND	2	2 -> 3	2 -> 3	2	Sand and Mud	Soft Sediment Fauna (2)	None	None	Yes	No	Ceriantheid(s)	None	Sea Scallop	Yes	None	Sea Scallop(s), Shrimp
652	3	2.9	2 -> 3	2 -> 3	2 on 3	2	Sand and Mud with Ripples	Soft Sediment Fauna (2)	None	None	Yes	No	Ceriantheid(s)	None	None	Yes	None	None
653	3	2.5	2 -> 3	2 -> 3	2 on 3	2	Sand and Mud with Ripples	Soft Sediment Fauna (2)	None	None	No	No	None	None	None	Yes	None	Snail(s)
654	3	IND	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	Yes	Sand Dollar(s)	None	None	Yes	Podocerid Amphipod(s)	Sand Dollar(s)
655	3	IND	2	2	2	3	Sand and Mud with Ripples	Soft Sediment Fauna (2)	None	None	Yes	No	Ceriantheid(s)	None	None	Yes	None	Snail(s)
656	3	2.8	2	2	2 -> 3	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	Yes	No	None	None	None	Yes	None	None
657	3	IND	2	2	2	3	Sand with Ripples	Soft Sediment Fauna (2)	None	None	No	No	None	None	None	Yes	None	None
658	3	IND	2	2	IND	3	Sand	Soft Sediment Fauna (2)	None	None	No	No	None	None	None	Yes	None	Moon Snail(s)
659	3	2.8	2	2	2	3	Sand and Mud with Ripples	Soft Sediment Fauna (3)	None	None	No	No	None	None	None	Yes	None	None
660	3	3.2	2 on 3	2 on 3	2 on 3	3	Sand and Mud with Ripples	Soft Sediment Fauna (3)	None	None	Yes	No	Ceriantheid(s)	None	None	Yes	None	Snail(s)
661	3	IND	2	2	2 -> 3	2	Sand with Ripples	Soft Sediment Fauna (1)	None	None	Yes	No	None	None	None	Yes	None	None
662	3	IND	2 -> 3	IND	IND	3	Sand with Pebbles/Granules	Soft Sediment Fauna (3)	None	None	Yes	No	Ceriantheid(s)	None	Sea Scallop	Yes	None	Sea Scallop(s), Snail(s)
663	3	IND	2	IND	IND	2	Sand with Ripples	Soft Sediment Fauna (1)	None	None	No	No	None	None	None	Yes	None	None
n = 107																		
Max		**4.1**																
Min		**1.9**																
Mean		**2.6**																
SD		**0.4**																

IND=Indeterminate

"-" Replicate image not analyzed.

[1] Successional Stage: "->" indicates one Stage is progressing to another Stage (i.e., 2 -> 3).

[2] Variable determined from combined SPI/PV analysis.

Table 3.3-1. Summary of Sediment Profile and Plan View Image Analysis Geophysical Results at the Reference Areas

Table 3.3-1 Geophysical Reference Areas												
Station ID	SPI Replicate (n)	Water Depth (m)	Mean Prism Penetration Depth (cm)	Mean Boundary Roughness (cm)	SPI Sediment Type (by replicate)			PV Replicate (n)	CMECS Substrate Group	CMECS Substrate Subgroup[1]	Bedforms
901	3	38.7	0.0	IND	Fine sand	Indeterminate	Indeterminate	3	Gravelly	Gravelly Sand	Small ripples
902	3	40.0	0.0	IND	Indeterminate	Indeterminate	Indeterminate	3	Sand or Finer	IND	Small ripples
903	3	38.4	5.3	1.9	Fine sand	Medium sand over finer sediment	Medium sand over finer sediment	3	Sand or Finer	Medium Sand	Large ripples
904	3	39.0	4.9	4.9	Coarse sand and finer sediment mix	Coarse sand and finer sediment mix	Fine sand	3	Sand or Finer	Fine Sand	Large ripples
905	3	37.8	0.7	5.1	Granule	Indeterminate	Indeterminate	3	Gravel Mixes	Mixed Sediment	Large ripples
906	3	53.1	4.0	1.2	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
907	3	54.0	2.2	2.2	Coarse sand	Very coarse sand	Very coarse sand	3	Sand or Finer	Very Coarse Sand	Large ripples
908	3	53.7	4.7	3.7	Coarse sand over finer sediment	Medium sand	Medium sand	3	Sand or Finer	Medium Sand	Large ripples
909	3	54.3	10.4	1.2	Medium sand over finer sediment	Silt/clay	Silt/clay	1	Sand or Finer	Silt/clay	None
910	3	54.0	4.0	3.2	Coarse sand	Coarse sand	Medium sand	3	Sand or Finer	Coarse Sand	Large ripples
911	3	62.5	6.9	1.1	Very fine sand	Very fine sand	Very fine sand	1	Sand or Finer	Very Fine Sand	None
912	3	62.5	7.0	1.1	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
913	3	62.8	7.5	1.2	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
914	3	62.5	6.7	1.3	Very fine sand	Very fine sand	Very fine sand	3	Sand or Finer	Very Fine Sand	None
915	3	62.8	8.1	1.4	Very fine sand	Very fine sand	Very fine sand	1	Sand or Finer	Very Fine Sand	None
916	3	32.9	4.1	4.5	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Large ripples
917	3	33.6	4.2	3.1	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
918	3	34.2	5.3	1.5	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Large ripples
919	3	34.5	6.6	3.6	Fine sand	Fine sand	Medium sand over finer sediment	3	Sand or Finer	Fine Sand	Large ripples

Table 3.3-1 Geophysical Reference Areas											
Station ID	**SPI Replicate (n)**	**Water Depth (m)**	**Mean Prism Penetration Depth (cm)**	**Mean Boundary Roughness (cm)**	**SPI Sediment Type (by replicate)**			**PV Replicate (n)**	**CMECS Substrate Group**	**CMECS Substrate Subgroup[1]**	**Bedforms**
920	3	35.1	5.4	1.3	Fine sand	Fine sand	Fine sand	3	Sand or Finer	Fine Sand	Small ripples
	n = 20										
	Max	**62.8**	**10.4**	**5.1**							
	Min	**32.9**	**0.0**	**1.1**							
	Mean	**47.3**	**4.9**	**2.4**							
	SD		**2.7**	**1.4**							

IND=Indeterminate
[1] Variable determined from combined SPI/PV analysis.

Table 3.3-2. Summary of Sediment Profile and Plan View Image Analysis Biological Results at the Reference Areas

Table 3.3-2 Benthic Reference Areas

Station ID	SPI Replicate (n)	Mean aRPD Depth (cm)	Successional Stage (by replicate)[1]			PV Replicate (n)	Macrohabitat[2]	CMECS Biotic Subclasses (# of reps)	CMECS Co-occurring Biotic Subclasses (# of reps)	Maximum Attached Fauna Percent Cover (CMECS Percent Cover Modifier)	Burrow Presence	Tracks Presence	Common Taxa Type	Sensitive Taxa Type	Species of Concern	Tubes Presence[2]	Sessile Epifauna Present[2]	Mobile Epifauna Present[2]
901	3	IND	IND	IND	IND	3	Patchy Cobbles and/or Boulders on Sand	Attached Fauna (2), Soft Sediment Fauna (1)	Attached Fauna (1), Soft Sediment Fauna (2)	Moderate (30 to < 70%)	Yes	No	None	None	None	Yes	Bryozoan(s), Tubularia Hydroid(s)	Moon Snail(s)
902	3	IND	IND	IND	IND	3	Patchy Cobbles and/or Boulders on Sand	Attached Fauna (1), Soft Sediment Fauna (1)	Attached Fauna (1), Soft Sediment Fauna (1)	Sparse (1 to <30%)	No	No	None	None	None	Yes	Bryozoan(s)	None
903	3	IND	2	IND	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	No	None	None	None	Yes	None	None
904	3	IND	IND	IND	IND	3	Patchy Cobbles and/or Boulders on Sand	Soft Sediment Fauna (3)	None	None	No	Yes	None	None	None	Yes	None	Shrimp
905	3	IND	IND	IND	IND	3	Patchy Cobbles and/or Boulders on Sand	Soft Sediment Fauna (2)	Inferred Fauna (1)	None	No	Yes	None	None	None	Yes	Bivalve(s), Bryozoan(s), Tubularia Hydroid(s)	Shrimp
906	3	2.9	2	2 -> 3	2 -> 3	3	Sand and Mud	Soft Sediment Fauna (2)	None	None	Yes	No	Ceriianthid(s)	None	None	Yes	None	None
907	3	IND	2	2 -> 3	2 -> 3	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	Yes	No	Ceriianthid(s)	None	None	Yes	Bryozoan(s), Tubularia Hydroid(s)	None
908	3	IND	2 -> 3	2 -> 3	2 -> 3	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	Yes	Yes	Ceriianthid(s)	None	None	Yes	Tubularia Hydroid(s)	Shrimp
909	3	1.0	1	1	1 on 3	1	Sand and Mud	Soft Sediment Fauna (1)	None	None	Yes	No	Ceriianthid(s)	None	None	Yes	None	None
910	3	IND	1	2	2 -> 3	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	Yes	No	Ceriianthid(s)	None	None	Yes	None	None
911	3	2.3	2	2	2 on 3	1	Sand and Mud	Soft Sediment Fauna (1)	None	None	Yes	No	None	None	None	Yes	None	None
912	3	2.1	2 -> 3	2 -> 3	2 on 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	None	Sea Star(s)
913	3	2.7	2 -> 3	2 -> 3	2 on 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	None	None	None	Yes	Tubularia Hydroid(s)	None
914	3	1.8	2 -> 3	2 -> 3	2 on 3	3	Sand and Mud	Soft Sediment Fauna (3)	None	None	Yes	Yes	Ceriianthid(s)	None	None	Yes	Hydroid(s)	Hermit Crab(s), Nudibranch(s)
915	3	3.0	2	2 -> 3	2 on 3	1	Sand and Mud	Soft Sediment Fauna (1)	None	None	Yes	Yes	None	None	None	Yes	None	None
916	3	IND	2	IND	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	No	Sand Dollar(s)	None	None	Yes	None	Sand Dollar(s)

Table 3.3-2 Benthic Reference Areas

Station ID	SPI Replicate (n)	Mean aRPD Depth (cm)	Successional Stage (by replicate)[1]			PV Replicate (n)	Macrohabitat[2]	CMECS Biotic Subclasses (# of reps)	CMECS Co-occurring Biotic Subclasses (# of reps)	Maximum Attached Fauna Percent Cover (CMECS Percent Cover Modifier)	Burrow Presence	Tracks Presence	Common Taxa Type	Sensitive Taxa Type	Species of Concern	Tubes Presence[2]	Sessile Epifauna Present[2]	Mobile Epifauna Present[2]
917	3	IND	IND	IND	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	No	Sand Dollar(s)	None	None	Yes	None	Sand Dollar(s)
918	3	IND	IND	IND	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	No	Sand Dollar(s)	None	None	Yes	None	Sand Dollar(s)
919	3	IND	IND	IND	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	No	Sand Dollar(s)	None	None	Yes	None	Sand Dollar(s)
920	3	IND	IND	IND	IND	3	Sand with Ripples	Soft Sediment Fauna (3)	None	None	No	No	Sand Dollar(s)	None	None	No	None	Sand Dollar(s)
n = 20																		
Max		**3.0**																
Min		**1.0**																
Mean		**2.3**																
SD		**0.7**																

IND=Indeterminate

[1] Successional Stage: “->” indicates one Stage is progressing to another Stage (i.e., 2 -> 3).

[2] Variable determined from combined SPI/PV analysis.

4.0 SITE SPECIFIC SURVEY SUMMARY

The purpose of the SPI/PV survey was to provide data about the surficial sediments and characterize the benthic habitats and fauna at the SRWF, along the proposed export cable route within federal waters (SRWEC–OCS), and at four reference areas. Results from the SPI/PV survey will support spatial planning decisions, reduce uncertainty associated with baseline conditions, and inform future habitat mapping. This study carefully considered all BOEM guidelines and NOAA Habitat recommendations; SPI and PV images provide important data pertaining to several of these guidelines and recommendations (Table 4.0-1). The data from this study were collected and interpreted in consideration of these guidelines to assist Sunrise Wind in providing the best available information for review by state and federal regulators.

At the SRWF, spatial trends in sediment composition were observed: the northwest region consisted of a higher frequency of stations with gravels; the southeast and west-central regions were characterized by Very Fine Sand and low small-scale sediment mobility; the northeast region was generally composed of Fine to Coarse Sand with sand ripples common. This spatial distribution in grain sizes and sediment composition at the SRWF was documented to correspond with spatial trends in the biological parameters, including: CMECS Biotic Subclass, Successional Stage, epifauna and infauna observed, and macrohabitat types. Similarly, the distribution of CMECS Substrate Subgroups along the SRWEC–OCS, which ranged from predominantly Very Fine Sand along the eastern portion of the SRWEC–OCS to either Fine Sand or Medium Sand along the western portion of the SRWEC–OCS, was closely coupled with the biological parameters documented along the SRWEC–OCS. The reference areas were generally similar in both physical and biological features to the nearby SRWEC–OCS or SRWF stations. Specifics regarding the link between spatial trends in the physical characteristics and the biological attributes are described in more detail below for each surveyed area (SRWF, SRWEC–OCS, and reference areas).

The majority of the SRWF was characterized as Sand or Finer (CMECS Substrate Group) and either Very Fine Sand, Fine Sand, or Medium Sand (CMECS Substrate Subgroups). Very Fine Sand generally occurred in deeper regions (e.g., the southeast and west-central regions of the SRWF), while Fine Sand and Medium Sand occurred in the northeast and central regions (Figure 3.1-3). The sediments in the northwest region of the SRWF were more spatially variable with coarser grain sizes and greater proportion of gravels compared to the rest of the surveyed area; most stations in this area were classified as Gravelly Sand and included *patchy boulders and cobbles on sand* (Figures 3.1-3, 3.1-10). Boulders were infrequently observed at the SRWF but did occur at 12 of the stations, all of which were in the northwest region, with the exception of Station 085, which was located along the southern border at approximate longitude of 71.1°W (Figure 3.1-5). The biological characterization of the SRWF followed similar spatial trends to the physical characterization. Stations in the southeast region of the SRWF, which were predominantly Very Fine Sand (CMECS Substrate Subgroup) and *sand and mud* (macrohabitat type), had high occurrences of burrowing anemones (cerianthids) and sabellid worms (Table 3.1-2; Figures 3.1-3, 3.1-10, 3.1-12). Stations in the northeast region of the SRWF, which were predominantly Medium Sand or Fine Sand (CMECS Substrate Subgroup) and *sand with ripples* (macrohabitat type), had high occurrences of sand dollars (Figures 3.1-3, 3.1-10, 3.1-12). The northwest region of the SRWF, which was more heterogenous in seabed composition but included higher frequency of Gravelly Sand and Sandy Gravel (CMECS Substrate Subgroups) compared to the rest of the SRWF, and was generally more complex in macrohabitat types (e.g., *sand with pebbles/granule*, *patchy cobbles and/or boulders on sand*), was inhabited by attached epifauna (e.g., hydroids [*Tubularia* spp.], sea stars, and bryozoa) (Table 3.1-2; Figures 3.1-3, 3.1-10, 3.1-13, 3.1-14).

There were two distinct regions of the SRWEC–OCS that differed based on sediment composition and benthic community: (1) the western stations extending from the three-mile New York State boundary to where the planned cable corridor redirects northeast-ward and (2) the eastern stations that include the remaining stations along the SRWEC–OCS extending to the SRWF. There were spatial trends associated with the physical features along the SRWEC–OCS, notably a transition from Medium Sand and Fine Sand (CMECS Substrate Subgroups) with ripples in the western extent to Very Fine Sand with limited small-scale bedforms along the eastern portion of the SRWEC–OCS (Figures 3.2-1, 3.2-2). This spatial distribution of seabed composition was also reflected in the biological component of the benthic environment along the SRWEC–OCS. Generally, the western portion of the SRWEC–OCS was characterized by high densities of sand dollars while the eastern portion of the SRWEC–OCS was inhabited by burrowing anemones (cerianthids) and sea stars (Figures 3.2-12 and 3.2-13). Gravel did not make up a substantial proportion of the sediments along the SRWEC–OCS and was not greater than 5% cover at any station, with the exception of two stations both of which were composed of Gravelly Sand (CMECS Substrate Subgroup; i.e., 5-30% cover of gravel): Station 537 in the central part of the SRWEC–OCS and Station 662 located adjacent to the SRWF (Figure 3.2-2). At both of these stations the macrohabitat type was documented to be *sand with pebbles/granules* (Figure 3.2-11), the maximum gravel size was pebble/granule, and there was no observed attached epifaunal growth (Tables 3.2-1, 3.2-2). No boulders were observed at any of the stations along the SRWEC–OCS (Table 3.2-1).

The northern star coral, *Astrangia poculata*, a non reef-building hard coral, was the only sensitive taxa observed across the surveyed area, occurring only at five stations, all of which were located within the SRWF (Stations 003, 085, 227, 702, and 721) (Figure 3.1-18). The sea scallop, *Placopecten magellanicus*, a species of concern in the region, was found at 21 stations across the surveyed area interspersed at the SRWF and along the eastern portion of the SRWEC–OCS. An ocean quahog (*Arctica islandica*), another species of concern in the region, was observed at one station (Station 130), while several stations had dead clam shell valves on the sediment surface (Figures 3.1-19, 3.2-21). Additionally, the Jonah Crab, a notable species given its increasing importance as a targeted species by the fishing industry, was observed at two stations within the SRWF (Stations 091 and 121), both of which were characterized by the *sand and mud* macrohabitat type (Figures 3.1-4, 3.1-10).

In general, physical and biological features characterizing the four reference areas were similar to the nearby stations at the SRWF or SRWEC–OCS. The northwest reference area was the most heterogenous in terms of documented substrata composition and macrohabitat types, which included *patchy cobbles and/or boulders on sand*, *sand with ripples,* and *sand with pebbles/granules* (Figures 3.1-10, 3.3-2)*.* This northwest reference area was similar to the benthic environment observed in the northwest region of the SRWF, with cobbles observed at four of the five stations (Figure 3.1-5) and Attached Fauna documented as the CMECS Biotic Subclass at two of these stations (Figures 3.1-13, 3.1-14). The reference area to the south of the SRWF was more similar in physical and biological characterization to the southeast and northeast regions of the SRWF with either *sand with ripples* or *sand and mud* (macrohabitat types) observed (Figures 3.1-10, 3.3-2). At the reference area in proximity to the western portion of the SRWEC–OCS, stations were mainly composed of either Fine Sand, Very Fine Sand, or Medium Sand (CMECS Substrate Subgroups) and characterized as *sand with ripples* or *sand and mud with ripples* (macrohabitat types) (Figures 3.2-1 and 3.2-10); these stations were inhabited by Soft Sediment Fauna (CMECS Biotic Subclass) including sand dollars and tube-building infauna (Table 3.3-2; Figures 3.2-12, 3.2-15). The reference area in close proximity to the eastern portion of the SRWEC–OCS was composed of Very Fine Sand (CMECS Substrate Subgroup) and *sand and mud* (macrohabitat type) and inhabited by Soft Sediment Fauna (CMECS Biotic Subclass) including burrowing infauna, tube-building infauna, and mobile epifauna (Table 3.3-2; Figures 3.2-13, 3.2-16).

Table 4.0-1. Summary of SPI/PV Approaches and Results as they Relate to BOEM Guidelines

Table 4.0-1		
BOEM COP Guidelines	**SPI/PV Survey Approach and Parameter(s)**	**Results Summary**
Classification of CMECS sediment type	PV: CMECS Substrate Group and Subgroup, Gravel measurements	• Majority of the surveyed area was Sand or Finer (CMECS Substrate Group) and either Very Fine Sand or Fine Sand (CMECS Substrate Subgroup). • Coarser Substrate Groups/Subgroups documented in the northwest region of SRWF (e.g., Sandy Gravel, Gravelly Sand, and Gravel Mixes). • Where gravel was observed to be >5% cover (i.e., CMECS Substrate Group was coarser than Sand), the maximum gravel size was most frequently pebble/granules. • Substrate Subgroups along SRWEC–OCS were generally Fine Sand or Medium Sand in the western portion of the cable corridor, transitioned to Very Fine Sand in the eastern portion after redirecting northeastward.
Identification of distinct horizons in subsurface sediment	SPI: Sediment type (based on Grain Size major mode), aRPD depth	• At stations where Substrate Group was classified as Sand or Finer, SPI analysis (i.e., grain size major mode) was used to resolve the Substrate Subgroup. • Numerous stations had thin drape of ephemeral gray silt/clay overlying fine to medium sand. • aRPD depth frequently indeterminant at stations with coarser sediments due to high porosity and low organic content. • Finer sediments, aRPD depth was generally between 1.6 and 5.0 cm at the SRWF and between 1.6 and 3.0 cm along the SRWEC–OCS.
Identification of bedforms Characterization of physical hydrodynamic properties	PV: Bedform type and measurements	• Ripple bedforms were observed frequently. • Large ripples (1 to 3 ripples in a PV image field of view [0.3 m^2]) and small ripples (> 4 ripples in a PV image field of view [0.3 m^2]) were common at majority of soft-sediment stations. • No small-scale bedforms were observed in the southeast and central-west region of the SRWF, which was generally deeper and composed of Very Fine Sand (CMECS Substrate Subgroup). • Distinct large ripples (i.e., a single large ripple observed in the PV image field of view (0.3 m^2)) were observed in the northeast region of the SRWF with medium to coarse sand on the crests and fine to very fine sand in the troughs.
Identification of rock outcrops and boulders	PV: Boulder presence	• Boulders were documented at 12 stations within the SRWF, 11 of which were in the northwest corner and one was located on the southern border of the SRWF. • No boulders were observed at any of the stations along the SRWEC–OCS or at any of the reference areas.
Identification of potentially sensitive seafloor habitat	SPI and PV: Sensitive Taxa, Epifauna	• Non reef-building hard coral (northern star coral, *Astrangia poculata*) documented at 5 stations, three of which were in the northwest region of the

Table 4.0-1		
BOEM COP Guidelines	**SPI/PV Survey Approach and Parameter(s)**	**Results Summary**
		SRWF, another along the north border of the SRWF, and the other along the southern border. • Sea scallops, a species of concern, were observed at 14 stations interspersed across the SRWF and 7 stations along the SRWEC–OCS, generally offshore (eastern portion). • Many stations had clam shell valves (dead clams) and at a few stations, large double siphons indicative of clam presence. • Ocean quahog siphons were documented at one station within the SRWF.
Characterization of macrofaunal community and any submerged aquatic vegetation (seagrass and macroalgae) Identification of taxa diversity	SPI and PV: Epifauna SPI: Tubes/Voids, Successional Stage PV: CMECS Dominant and Co-occurring Biotic Subclass and Group, Attached Flora/Fauna Percent Cover, Burrows/Tubes/Tracks, Infauna, Flora	• Sand dollars were commonly observed at stations characterized as Medium Sand or Fine Sand at the SRWF, particularly in the northeast region; very high densities of sand dollars observed along the western portion of the SRWEC–OCS. • Burrowing anemones (cerianthids) were commonly observed at stations characterized as Very Fine Sand (CMECS Substrate Subgroup), particularly in the southeast region of the SRWF and eastern portion of the SRWEC–OCS. • Corymorpha and Tubularia hydroids were common at soft sediment and hard bottom stations, respectively. • Stations with coarser sediments and gravel (boulders and cobble) tended to have more diverse epifaunal assemblages including bryozoa, sponges, barnacles, mobile crustaceans. • Burrows, tubes, and tracks were commonly observed across the surveyed area, particularly at Very Fine Sand and Fine Sand stations.
Identification of invasive taxa	SPI and PV: Invasive Taxa	• No invasive species documented.
Classification of CMECS sediment type	PV: CMECS Substrate Group and Subgroup, Gravel measurements	• Majority of the surveyed area was Sand or Finer (Substrate Group) and Very Fine Sand, Fine Sand, or Medium Sand (Substrate Subgroups). • Coarser Substrate Groups/Subgroups documented in the northwest region of SRWF (e.g., Sandy Gravel, Gravelly Sand, and Gravel Mixes). • Stations with gravel generally had higher heterogeneity both across replicates (intra-station variability) and within a replicate (orientation of sediment grains/poorly sorted sediments). • Substrate Groups along SRWEC–OCS were overwhelmingly dominated by Sand or Finer; the western portion of the cable corridor was either Fine Sand or Medium Sand (CMECS Substrate Subgroups) and transitioned to Very Fine Sand along the eastern portion after redirecting northeastward.

5.0 REGIONAL BENTHIC ENVIRONMENT

This section places the site-specific benthic assessment reported above into a broader regional context through a compilation and synthesis of previous studies and datasets characterizing the physical and biological benthic environment of the continental shelf in this region. The results of the SPI/PV survey within New York State waters are reported in detail in the New York State Waters Benthic Resource Characterization Report, which includes a similar synthesis section that includes general information on the habitats and benthic species inhabiting the New Your state waters portion of the Project (INSPIRE 2020).

Several similar benthic resource characterization studies have been conducted in the vicinity of the SRWF in support of other wind farm developments, including Revolution Wind and South Fork Wind (DWW Rev I, LLC 2020; Deepwater Wind South Fork, LLC 2019), both located to the north of SRWF, and Bay State Wind (Bay State Wind, 2019), which is located to the northeast of SRWF, although portions of Bay State Wind once overlapped with the northeast portion of SRWF. These studies as well as other regional benthic assessments (Stokesbury 2014, 2012; Guida et al. 2017; Greene et al. 2010, NYSERDA 2017) and the geophysical site investigation studies conducted at SRWF and SRWEC (Fugro 2020) provide additional information on the regional benthic environment of the Northwest Atlantic OCS off Southern New England (Figure 5.1-1). This section provides a description of the predominant benthic habitats observed across this region (Section 5.1), the benthic invertebrate assemblages present including benthic communities and resources associated with soft bottom and hard bottom environments (Section 5.2), and climate change drivers that may alter the spatial distributions of particular benthic organisms in the region (Section 5.3).

5.1 BENTHIC HABITAT CHARACTERIZATION

The habitat types observed during the site-specific SPI/PV survey are summarized and discussed here in concert with previously collected data on surface sediments, biota, and habitat types found and likely to be found in the region (Stokesbury 2012, 2014; NYSERDA 2017, Bay State Wind 2019; Deepwater Wind South Fork, LLC 2019; DWW Rev I, LLC 2020) (Figure 5.1-1). Benthic macrohabitat types are used here as a construct to describe repeatable physical-biological associations and were derived from CMECS classifiers and modifiers obtained from the initial PV analysis. Given the spatial scale of the SPI/PV point data, benthic habitat types derived from replicate SPI/PV images are considered macrohabitats (*sensu* Greene et al. 2007). Benthic habitat mapping, which will be provided in a supplemental filing in August 2021, will be completed using a combination of the high-resolution acoustic data, the SPI/PV data reported here, and supplemental video survey data, which was collected at targeted locations of complex bottom at the SRWF.

Seven benthic macrohabitat types were documented during the site-specific SPI/PV survey as characterized based on the comprehensive SPI and PV analyses of select physical and biological attributes: (1) *sand and mud*, (2) *sand*, (3) *sand and mud with ripples,* (4) *sand with ripples,* (5) *sand with pebbles/granules*, (6) *patchy cobbles and/or boulders on sand*, and (7) *cobbles and/or boulders on sand* (Table 5.1-1; Figures 3.1-9, 3.2-10, 3.2-11). The species found in these types of benthic habitats are typically described as infaunal species, those living in the sediments (e.g., polychaetes, amphipods, mollusks), and epifaunal species, those living on the seafloor surface (mobile, e.g., sea stars, sand dollars, sand shrimp) or attached to substrates (sessile, e.g., barnacles, anemones, tunicates).

The distribution of the seven macrohabitat types are described and mapped in Section 3.0. These benthic macrohabitat types vary spatially across the region, differing in sediment composition as well as benthic community assemblages and resources, as discussed further below. The frequency and magnitude of hydrodynamic forcing on the seabed also varied across these macrohabitat types with *sand and mud with ripples, sand with ripples,* and *sand with pebbles/granules* having attributes indicative of a mobile and relatively high energy environment (e.g., sand ripples and washed gravel). While *sand and mud* without ripples (or indistinct ripples) is presumed to have lower hydrodynamic energy, creating a more stable benthic environment, suggested by the lack of small-scale bedforms (e.g., ripples). The hydrodynamic energy associated with macrohabitats with small and large gravels with attached epifaunal growth is less clear. The growth (e.g., Tubularia hydroids) on small gravels (i.e., pebbles/granules) may suggest lower energy as these small gravels are stable enough for organisms to grow (movement of the gravel or sand will abrade the organisms). While larger gravels (i.e., cobbles and boulders) with extensive growth of encrusting organisms (e.g., bryozoa, hydroids, northern star coral) are more likely to suggest a high energy setting, with the size of the gravels preventing the physical movement of these substrata.

Mud and sand, with and without small-scale bedforms (i.e., ripples), was the primary benthic habitat observed across the surveyed area during the site-specific SPI/PV survey. This is corroborated by other studies in the eastern part of the region (Stokesbury 2012, 2014; Bay State Wind 2019). In general, the deeper regions of the surveyed area (e.g., the southeast and west-central regions of the SRWF, and the eastern portion of the SRWEC–OCS) appeared to be lower energy, indicated by a lack of rippling on the seabed and fine grain sizes (primarily CMECS Substrate Subgroup of Very Fine Sand) (Figures 3.1-2, 3.1-9, 3.1-5). At SRWF, *mud and sand* macrohabitat was characterized by tube-building infauna, burrowing infauna (including burrowing anemone, cerianthids), and mobile epifauna (including sea stars) (Table 5.1-1). Tracks, burrows, and tubes are commonly associated with this macrohabitat (Figure 3.1-14). *Mud and sand,* without ripples, was also observed along the eastern portion of the SRWEC–OCS, where CMECS Substrate Subgroup was consistently Very Fine Sand (Figures 3.2-1, 3.2-2, 3.2-10, 3.2-11). The other soft bottom habitats that were frequently observed across the surveyed area was *sand with ripples* and *sand and mud with ripples* (Figures 3.1-9, 3.2-10. 3.2-11). These macrohabitats were typically associated with more mobile sediments, as implied by the presence of regular and irregular small and large sand ripples (e.g., the northeast region of the SRWF and the western portion of the SRWEC–OCS) (Figures 3.1-5, 3.2-3, 3.2-4). These higher energy habitats are typically inhabited by tube-building infauna, filter-feeding bivalves, and sand dollars (Table 5.1-1). This is corroborated by at least one additional study in the western part of the region (NYSERDA 2017). The dynamic nature of these environments results in high turnover of infauna, and, combined with the low organic loads found particularly in medium and coarse sands, typically results in low prevalence of head-down deposit feeding infauna and higher abundances of suspension feeders (e.g., sand dollars and bivalves).

Sand with pebbles/granules, *patchy cobbles and/or boulders on sand,* and *cobbles and/or boulders on sand* were three macrohabitat types that were generally more complex than the soft-bottom habitats, and were mainly observed in the northwest corner and north-central border of the SRWF, where stations were classified with CMECS Substrate Groups/Subgroups with greater than 5% gravel cover (Figures 3.1-2, 3.1-9). *Sand with pebbles/granules* was characterized by clusters of generally small-sized gravels (granules, pebbles, and small cobbles) that are influenced by bottom currents (tides, storms) and are transported often enough, appearing “washed clean”. Due to the frequent disturbance from hydrodynamic forces, biota here are not able to attach and grow on the gravel surfaces in this habitat. The habitats *sand* and *sand with pebbles/granules* both experience frequent hydrodynamic forcing and subsequent sediment mobility that creates a dynamic environment for biota. Therefore, these habitats do not commonly include attached flora or sessile attached epifauna. Instead, these habitats are inhabited by mobile epifauna, such as sea stars, Jonah crabs, American lobster, and small tube-building and burrowing infauna (Table 5.1-1). However, there is still potential, specifically in the *sand with pebbles/granules* macrohabitats, that hydrozoans, attached anemones, and encrusting sponges will be present in low densities, particularly when in close proximity to boulders and cobbles.

Patchy cobbles and/or boulders on sand and *cobbles and/or boulders on sand* macrohabitat types were observed primarily in the northwestern region of the SRWF (Figure 3.1-10). Benthic habitat assessments at Revolution Wind (particularly the southwest region of the Revolution Wind lease area) and South Fork Wind both reported similar heterogenous habitat types composed of generally coarse substrata, which were associated with Pleistocene Moraine Deposits (O'Hara and Oldale 1980; Deepwater Wind South Fork, LLC 2019; DWW Rev I, LLC 2020). Given the close proximity of the northwest region of SRWF to these previously studied areas, the origin of this patchy cobble and boulders is likely similar. The restriction of this habitat to the northwestern edge would suggest the extreme southern extent of glacial moraine in this part of Rhode Island Sound (O'Hara and Oldale 1980). The large gravel associated with these habitat types, generally supports increasingly diverse epifaunal assemblages as grain sizes increase and the gravels become more physically stable. Cobbles and boulders provide substrata and stability for biota to attach and grow; additionally, these habitats provide variable topography that creates complexity and additional niches for fauna to occupy. Where present, these large gravels were often colonized by attached epifauna, predominantly anemones, encrusting sponges, bryozoa, hydroids, and non reef-building hard corals, as well as diverse mobile epifauna such as hermit crabs, sea stars, and gastropods. Because the presence of cobbles and boulders is often patchy, these areas are interspersed with sand, further increasing niche space and diversity within these areas. Where coarser gravel (i.e., cobbles and boulders) on sandy substrates were documented at the SRWF, epifaunal organisms were typically found growing on the physical substrate, including hydroids, bryozoa, barnacles, and occasional anemones. There was not a high occurrence of boulders across the surveyed area. Boulders were only observed at 12 stations within the SRWF, 11 of which were located in the northwest corner while the remaining station was along the southern border of the SRWF at approximate longitude of 71.1°W (Figure 3.1-4). No boulders were observed at any of the reference areas or at any stations along the SRWEC–OCS.

Table 5.1-1. Description of General Habitat Types Observed at the SRWF, SRWEC–OCS, and Reference Areas

Table 5.1-1					
Macrohabitat Type	**Physical Habitat Stability**	**CMECS Substrate Group/Subgroups**	**CMECS Benthic Biotic Subclass**	**Specific Benthic Taxa Likely Present (see Table 5.2-2 for a comprehensive list)**	**Spatial Prevalence in Surveyed Area**
Sand and mud	Stable	Sand or Finer/Very Fine Sand, Fine Sand	Soft Sediment Fauna	Burrowing Anemone (cerianthids); Jonah crab (*Cancer borealis*); Horseshoe crab (*Limulus polyphemus*); Ocean quahog (*Arctica islandica*); Sand dollar (*Echinorachnius parma)*; Sea scallop (*Placopecten magellanicus*); surfclam (*Spisula solidissima*); Channeled whelk (*Busycotypus canaliculatus*); Amphipods species; Sea star species	Very common

Example PV Image Replicates: ***Sand and mud***

Table 5.1-1

Macrohabitat Type	Physical Habitat Stability	CMECS Substrate Group/Subgroups	CMECS Benthic Biotic Subclass	Specific Benthic Taxa Likely Present (see Table 5.2-2 for a comprehensive list)	Spatial Prevalence in Surveyed Area
Sand with Ripples	Mobile	Sand or Finer/Fine Sand, Medium Sand, Coarse Sand	Soft Sediment Fauna	Jonah crab (*Cancer borealis*); Horseshoe crab (*Limulus polyphemus*); Ocean quahog (*Arctica islandica*); Sand dollar (*Echinorachnius parma)*; Sea scallop (*Placopecten magellanicus*); surfclam (*Spisula solidissima*); Channeled whelk (*Busycotypus canaliculatus*); Amphipods species; Sea star species; Sand shrimp	Very common

Example PV Image Replicates: *Sand with Ripples*

Table 5.1-1

Macrohabitat Type	Physical Habitat Stability	CMECS Substrate Group/Subgroups	CMECS Benthic Biotic Subclass	Specific Benthic Taxa Likely Present (see Table 5.2-2 for a comprehensive list)	Spatial Prevalence in Surveyed Area
Sand with Pebbles/Granules	Mobile	Gravelly Sand, Sandy Gravel	Soft Sediment Fauna	Sea grape tunicate (*Mogula* sp.); Lobster (*Homarus americanus*); Jonah crab (*Cancer borealis*); Sea scallop (*Placopecten magellanicus*); Hermit crab (*Paguroid* spp.); shrimp; cerianthid; moon snail; Amphipods (Podoceridae); hydroids (*Tubularia sp.*)	Limited

Example PV Image Replicates: *Sand with Pebbles/Granules*

Table 5.1-1

Macrohabitat Type	Physical Habitat Stability	CMECS Substrate Group/Subgroups	CMECS Benthic Biotic Subclass	Specific Benthic Taxa Likely Present (see Table 5.2-2 for a comprehensive list)	Spatial Prevalence in Surveyed Area
Patchy Cobbles and/or Boulders on Sand	Mix of mobile & stable	Sandy Gravel, Gravelly Sand, Gravel Mixes, Boulder	Attached Fauna; Soft Sediment Fauna	Anemones; Lobster (*Homarus americanus*); Jonah crab (*Cancer borealis*); Sea pens (Pennatulidae); Sea scallops (*Placopecten magellanicus*); Shrimp; Squid (Loliginidae); Sponge species (*Polymastia* sp.); shrimp; sea stars; Northern Star coral (*Astrangia poculata*); hydroids (*Tubularia sp.*)	Limited

Example PV Image Replicates: *Patchy Cobbles and/or Boulders on Sand*

5.2 BENTHIC INVERTEBRATE ASSEMBLAGES

Benthic invertebrate assemblages in the Northwest Atlantic OCS provide important ecosystem functions. Benthic communities serve as critical trophic links between plankton and higher-order consumers, including some managed species. Benthic organisms, particularly attached epifauna and emergent infauna, may also add complexity to the seafloor, providing structural biogenic habitat for other species. For example, in soft sediment environments with low physical complexity, emergent infauna, such as burrowing anemones (cerianthids), tube-building polychaetes, or tube-building amphipods, provide biogenic structure to the environment, creating a unique habitat in an otherwise structurally void environment. In addition to trophic links and biogenic structure, benthic species can also serve important roles in facilitating nutrient and carbon cycling in the sediments through functions such as water filtration, biodeposition, bioirrigation, and bioturbation.

Benthic community assemblages and their associated ecological functions vary spatially and temporally across the Northwest Atlantic OCS and across the surveyed area. The physical attributes of the benthic environment, such as sediment composition, hydrodynamics, temperature, salinity, current velocity, and light availability, in addition to biological factors such as predation and competition, determine the species composition of benthic communities. The majority of the SRWF and SRWEC–OCS is primarily characterized by medium to very fine sand (USGS 2020; Greene et al. 2010; Guida et al. 2017) with the exception of coarser material, including pebbles, cobbles, and boulders over sand, in the northwest region of the SRWF (Figures 3.1-3, 3.2-1, and 3.2-2; Section 3.0).

A list of species commonly associated with the benthic habitats and the depth ranges found at the SRWF and along the SRWEC–OCS are provided in Table 5.2-1 (flora), Table 5.2-2 (fauna), and Table 5.2-3 (ecological and economically important shellfish).

5.2.1 Soft Bottom Benthic Resources

The vast majority of the surveyed area (SRWF, SRWEC–OCS, and reference areas) was classified as soft bottom with less than 5% gravel (i.e., CMECS Group Sand or Finer). This is in agreement with other studies that have documented primarily soft bottom habitats in this region (Guida et al. 2017). Soft bottom in the Northwest Atlantic OCS are generally inhabited by deep burrowing polychaetes, tube-building amphipods and polychaetes, as well as epifaunal species including sand shrimp and sand dollars (Guida et al. 2017; NYSERDA 2017; Stokesbury 2012, 2014; Deepwater Wind South Fork, LLC 2019; DWW Rev I, LLC 2020). During the site-specific SPI/PV survey high occurrences of sand dollars were observed particularly in regions where mobile sand was documented (Figures 3.1-9, 3.1-11, 3.2-10, 3.2-11, 3.2-12, 3.2-13). This was consistent with results from NYSERDA, 2017 (Figure 5.1-1).

During the site-specific SPI/PV survey high occurrences of sea stars were observed in soft bottom habitats, particularly along the eastern portion of the SRWEC–OCS. Sea stars inhabiting soft bottom sediments prey on bivalves and their presence may be indicative of a productive bivalve population. Soft bottom habitats (e.g., *mud and sand* with and without ripples, *sand* with and without ripples, and *sand with pebbles/granules*) are suitable for the following ecologically and economically important shellfish species: Atlantic sea scallop, Jonah crab, Atlantic rock crab, channeled whelk, ocean quahog clam, Atlantic surfclam, and horseshoe crab (Table 5.2-3). Additionally, longfin squid may utilize sand with pebbles/granules habitats. Table 5.2-3 includes a summary of these species, likelihood of presence, and the potential time of year that they could be present in the region.

Ecologically and economically important bivalves including sea scallops, ocean quahogs, and surfclams inhabit soft bottom habitats in the Northwest Atlantic OCS. Ocean quahogs (*Arctica islandica*) are known to be distributed across the planned SRWEC–OCS and the SRWF, with their EFH overlapping with portions of the planned components of the Project (NOAA Fisheries 2020a) and were reported within the SRWF during the

Bay State Wind benthic assessments (Bay State Wind 2019). Ocean quahogs are considered a species of concern regarding possible habitat disturbance from offshore wind construction and operation activities in this region (Guida et al. 2017); the ocean quahog is also an ecologically and economically important managed shellfish species (NOAA Fisheries 2020a). Although difficult to detect using SPI/PV, the presence of ocean quahogs within the surveyed area was apparent by the high occurrences of empty quahog shells on sandy and muddy sediment surfaces as well as large siphons detected in PV images, indicative of a live buried quahog (Figure 3.1-19C).

EFH for sea scallop (*Placopecten magellanicus*), another commercially and ecologically important benthic bivalve, overlaps with the planned export cable corridor as well as the western portion of the SRWF (NOAA Fisheries 2020b). Atlantic sea scallop occur along the continental shelf, typically at depths ranging from 59 to 360 ft (18 to 110 m), and are generally found in seabed areas with coarse substrates consisting of firm sand, gravel, shells, and rocks (Hart and Chute 2004). During the site-specific SPI/PV survey, sea scallops were observed at 13 stations at the SRWF and 6 stations along the eastern portion of the SRWEC–OCS (Figures 3.1-18, 3.2-21, 3.2-22).

EFH for Atlantic surfclam (*Spisula soliddissima),* another commercially and ecologically important benthic bivalve, occurs around the nearshore portions of the planned export cable corridor. Surfclam prefer sandy habitats along the continental shelf (Cargnelli et al. 1999a), and is most abundant on Georges Bank, the south shore of Long Island, and along the coasts of New Jersey and the Delmarva Peninsula (NOAA Fisheries 2020c). Surfclams generally occur from the beach zone to a depth of about 200 ft (656 m), but beyond about 125 ft (52 m) abundance is low. Surfclams can be found up to 3 ft (1 m) below the sediment water interface (MAFMC 1998). Although no live surfclams were observed during the site-specific SPI/PV survey, whole clam valves were observed on the sediment surfaces at some stations.

5.2.2 Hard Bottom Benthic Resources

Hard bottom habitats are limited in regional distribution in the Northwest Atlantic OCS compared to sandy and soft bottom habitats (CoastalVision and Germano and Associates 2010, Greene et al. 2010). These habitats are commonly referred to as “live bottom” when encrusted by attached epifauna, typically communities of bryozoa, hydroids, tunicates, and sponges in this region. These structurally complex habitats are considered to be potentially valuable and sensitive for regionally important taxa including targeted species, such as Atlantic cod, longfin squid, and American lobster (Scott 1982; Gotceitas and Brown 1993; Griswold and Prezioso 1981). The structure provided by the cobbles and boulders in these habitats can serve as nursery habitat for juvenile lobster, feeding ground for fish such as cod and black sea bass, and substrate upon which squid (including longfin squid, *Doryteuthis (Amerigo) pealeii*) lay their eggs (Griswold and Prezioso 1981; Roper et al. 1984). Further, the presence of boulders in mixed bottom types has been noted as an important feature for understanding the distribution of lobsters (*Homarus americanus*) and Jonah crab (*Cancer borealis*) in the vicinity of the SRWF (Table 5.2-3; Collie and King 2016). Both lobster and squid have highly specific habitat requirements and are also economically important species in New England. For these reasons, federal and state agencies consider evidence of these taxa to indicate the presence of potentially sensitive habitats (BOEM 2019). Notably, the lobster industry in Southern New England and New York are transitioning to targeting Jonah crabs, which may also seek refuge in hard bottom habitats, but are also known to occupy muddy habitats (Truesdale et al. 2019). A Jonah crab was observed burrowed in the substrata at a soft bottom station at SRWF during the site-specific SPI/PV survey (Figure 3.1-3A).

Sensitive taxa including corals are often associated with hard bottom habitats. Legally protected reef-building coral species are not found in the RI-MA or MA WEAs (Guida et al. 2017). However, the northern star coral, *Astrangia poculata*, a non reef-building taxon, was observed at the SRWF, although in limited spatial distribution; it was only observed growing on boulders at five stations (Figure 3.1-17). The northern star coral was also documented, although also in limited distribution and only associated with boulders, at both the South Fork Wind area (Deepwater Wind South Fork, LLC 2019) and the Revolution Wind area (DWW Rev I, LLC 2020), which are located just north of the SRWF. *Astrangia* spp. has a broad geographical distribution, and its low relief and non reef-building life history strategy provides a population level resiliency to disturbance. *Astrangia* spp. is also not documented to provide essential fish habitat (Dimond and Carrington 2007). Any impacts to the star coral from construction should be minimal, localized, and recovery should be rapid (Aronson et al. 2008).

As discussed in Section 3.1, the northwest portion of the SRWF was the only area where gravel was observed consistently across stations. Gravel in this area ranged in size from "washed" pebbles and granules to patchy cobbles and boulders on sand, which were encrusted by epifauna (e.g., bryozoa and hydroids). Adaptive sampling in the area revealed the seafloor physical composition was heterogenous with CMECS Substrate Subgroups ranging from Silt/Clay to Boulder. "Live bottom" was also observed at Station 085, located along the southern border of the SRWF at a longitude of approximately 71.1°W. Adaptive sampling in the vicinity of Station 085 revealed the extent of this hard bottom was very limited.

Table 5.2-1. Common Macroalgal Species within the Vicinity of Proposed Project and Their Potential to Occur at the SRWF and Along the SRWEC–OCS

Table 5.2-1					
Species	**Preferred Habitat**	**Depth Range**	**Growth Type**	**Potential for Presence at the SRWF**	**Potential for Presence along the SRWEC–OCS**
Shotgun kelp *Agarum cribrosum*	Rocks, cobble	Subtidal to approximately 131 ft (40 m)	Single blade up to 59 inches (150 cm) with stipe attached to a holdfast	Limited potential for occurrence, due to limited cobbles and boulders present in the surveyed area and depth restrictions. [a,b]	Limited potential because no cobbles or boulders present in surveyed area. [a,b]
Coral weed (*Corallina officinalis*)	Rocks, cobble, large gravel, shells	Lower intertidal and subtidal	Coralline red algae that can encrust on rocks and shells; grows to about 4 inches (10 cm)	No potential due to depth restrictions.	No potential due to depth restrictions.
Coralline red algae (Order Corallinales)	Rocks, cobble, large gravel, or epiphytic on shells or algae	Subtidal	Algal crusts	Potential presence, within depth range. [a,b]	Potential presence, within depth range. [a,b]
Encrusting macroalgae (*Hildenbrandia* sp.)	Rocks, cobble, large gravel, shells	Subtidal	Algal crusts	Potential presence on hard substrata. [e]	Potential presence on hard substrata. [e]
Foliose red algae (Phylum Rhodophyta)	Rocks, cobble, large gravel, or epiphytic on shells or algae	Subtidal	Low-growing, foliose red algae	Potential presence, known to occur in the region within depth ranges. [a,b]	Potential presence, known to occur in the region within depth ranges, but limited cobbles, boulders. [a,b]
Green thread (*Chaetomorpha linum*)	Free floating or drifting; often entangled with other algae	Upper Intertidal, and free-floating mats	Filamentous clumps and tangles	Potential for occasional presence as free-floating mat. [c]	Potential for occasional presence as free-floating mat. [c]
Gut weed (*Ulva intestinalis*)	Rocks, mud, sand, tide pools, epiphyte on other algae and shells	Intertidal- Upper Intertidal and free-floating mats	Unbranched, flattened, gas-filled tubes with undulating edges to approximately 16 inches (40 cm) long	Potential for occasional presence as free-floating mat. [c,d]	Potential for occasional presence as free-floating mat. [c,d]
Hooked red weed (*Bonnemaisonia hamifera*)	Rocks, cobble, large gravel, often epiphytic on shells and algae	Subtidal	Small, highly branched red foliose algae growing to 4 inches (10 cm)	Potential presence. Known to occur in the region within depth ranges, and potentially suitable habitat is present. [c]	Potential presence. Known to occur in the region within depth ranges. [a,b]
Horsetail kelp (*Laminaria digitata*)	Rocks, large cobble	Subtidal in wave exposed areas	Large, wide, brown blade with central holdfast; grows to 39 inches (1 m)	Very limited potential for occurrence because of unsuitable depth, habitat, and offshore location; only possible where boulders are present. [c]	No potential due to limited boulders and cobble. [c]

Table 5.2-1					
Species	**Preferred Habitat**	**Depth Range**	**Growth Type**	**Potential for Presence at the SRWF**	**Potential for Presence along the SRWEC–OCS**
Irish moss (*Chondrus crispus*)	Rocks	Lower intertidal and shallow subtidal	Shrub-like, densely branched; grows to 6 inches (15 cm)	No potential due to depth restrictions.	No potential due to depth restrictions.
Kelp (*Saccharina latissimi, S. longicruris*)	Rocks, large cobble, rocky reef	Subtidal to approximately 115 ft (35 m)	Single blades with stipe that grow to 36 ft (11 m) (S. longicruris)	Very limited potential because of because of unsuitable depth, habitat, and offshore location; only possible where boulders are present. [a,c]	Very limited potential for occurrence because limited to no hard bottom. [a,c]
Lacy red weed (*Callophyllis cristata*)	Rocks, cobble, large gravel, or epiphytic on shells or algae	Subtidal, deeper waters	Small, highly branched red foliose algae growing to 2 inches (5 cm)	Potential presence. Known to occur in the region within depth ranges, and potentially suitable habitat. [c]	Potential presence. Known to occur in the region within depth ranges. [c]
Purple claw weed (*Cystoclonium purpureum*)	Hard substrata such as rocks and shells over sand and mud	Intertidal and shallow subtidal	Soft cylindrical, purplish fronds, 0.1 inch (3 mm) wide up to 23.6 inches (60 cm) long	Very limited potential for occurrence due to depth limitations.	Very limited potential for occurrence due to depth limitations.
Red alga (*Gracilaria vermiculophylla*)	Hard substrata such as rocks and shells over sand and mud	Intertidal and upper sublittoral zones.	Coarsely branched, loose lying or attached, cylindrical and up to 19.7 inches (50 cm) long	Very limited potential for occurrence due to depth limitations.	Very limited potential for occurrence due to depth limitations.
Sargasso weed (*Sargassum filipendula*)	Free floating	Open water and embayments	Multi-branched with small, gas-filled nodules	Potential for occasional presence as free-floating mats. [c]	Potential for occasional presence as free-floating mats. [c]
Sea lettuce (*Ulva lactuca, U. compressa, U. rigida)*	Rocks and rocky reefs, epiphyte on other algae and shells	Intertidal- Upper Intertidal and free-floating mats	Attached via holdfast; grows to approximately 7.1 inches (18 cm) in length	Very limited potential for species to occur as free-floating mats because of the distance to nearshore habitat where this species occurs.	Very limited potential for species to occur as free-floating mats because of the distance to nearshore habitat where this species occurs.
Wire weed (*Ahnfeltia plicata*)	Rocks and drift	Subtidal	Branched algae attached to bottom substrate or drifting	Limited potential for species to occur as drift algae because of the distance to nearshore habitat where this species occurs.	Limited potential for species to occur as drift algae because of the distance to nearshore habitat where this species occurs.

[a] Vadas and Steneck 1988
[b] McGonigle et al. 2011
[c] Van Patten and Yarish 2009
[d] Shimada et al. 2003
[e] DiPreta 2019

Table 5.2-2. Common Benthic Species by Substrata Type

Table 5.2-2			
Substrata Type	**Phylum or Class**	**Species (With Common Name if Available)**	**References**
Sand substrates	Arthropoda	Horseshoe crab (*Limulus polyphemus*)	ASMFC 2020a; Collie et al. 2008; NJDEP 2016; Smith et al. 2017
	Asteroidea	Blood star	DWW 2012
	Bivalvia	Atlantic sea scallop (*Plactopecten magellanicus*), ocean quahog (*Artica islandica*), Atlantic nut clam (*Nucula proxima)*, Waved astarte (*Astarte undata*), chestnut astarte (*A. castanea*), Atlantic surf clam (*Spisula solidissima*), dwarf surfclam (*Mulinia lateralis)*, hard clam (*Mercenaria mercenaria*), gem clam (*Gemma gemma*), clams (*Lyonsia arenosa, Macoma tenta, Periploma fragile, Pitar morrhuana, Solemya velum, Tellina agilis, Yoldia limatula)*	Steimle 1982; Zajac et al. 1998; Fay et al. 1983; Meyer et al. 1981; Cargnelli et al. 1999a; Henry and Nixon 2008; Calabretta and Oviatt 2008; URI GSO 2019
	Cnidaria	Tube-dwelling anemone (*Ceriantheopsis americana)*	URI GSO 2019
	Cephalopoda	Squid egg masses and newly hatched larvae	Macy and Brodziak 2001; NEFSC 2005
	Crustacea	Tube forming amphipods: including *Ampelisca agassizi, A. abdita, A. vadorum,*and *Microdeutopus gryllotalpa* Free-living amphipods: Caprellidae and Podoceridae	Steimle 1982; Wigley 1968; DWW 2012; URI GSO 2019
	Crustacea	American lobster, Atlantic rock crab, sand shrimp (*Crangon septemspinosis*), hermit crabs, Genus *Haustorid, Phoxocephalid, Leptocuma, Chiridotea, and Cancer* spp. Jonah crab (*Cancer borealis*) lady crab (*Ovalipes ocellatus*), commensal crabs *Pinnixia sayana*, Cumaceans *Diastylis sculpta* and *Leucon americanus*	Robichaud et al. 2000; Williams and Wigley 1977; Collie et al. 2008; Calabretta and Oviatt 2008; Shumchenia et al. 2016; URI GSO 2019
	Echinoidea	Hairy sea cucumber (*Sclerodactyla briareus*), Sand dollar.(*Echinarachnius parma*)	Wigley 1968; DWW 2012; URI GSO 2019
	Gastropoda	Northern moon snail (*Lunatia heros*), *Nassarius* spp., *Ilyanassa trivittata*, channeled whelk (*Busycotypus canaliculatus*), common slipper shell, *Turbonilla*	Wigley 1968; DWW 2012; Peemoeller and Stevens 2013; URI GSO 2019
	Ophiuroidea	More detailed taxonomy not provided	Poppe et al. 2014
	Sipunculoidea	Peanut worm (*Phascolopsis gouldii*)	URI GSO 2019

Table 5.2-2			
Substrata Type	**Phylum or Class**	**Species (With Common Name if Available)**	**References**
Gravel/granule substrates	Asteroidea	Sea star, blood star, common sea star	Collie et al. 1997; Redmond and Scott 1989; Dickinson et al. 1980
	Bivalvia	Waved astarte, chestnut astarte, Genus *Placopecten,* including Atlantic sea scallop, ocean quahog, jingle shell, *Anomia simplex*	Collie et al. 1997; Redmond and Scott 1989; Dickinson et al. 1980; Wigley 1968; Jenkins et al. 1997; Hargis and Haven 1999; URI GSO 2019
	Cephalopoda	Squid egg masses, including longfin squid and newly hatched larvae	Macy and Brodziak 2001; NEFSC 2005
	Crustacea	Tube-forming Amphipods: *Ampelisca agassizi, A. abdita and A. vadorum*; Free-living Amphipods: Caprellidae and Podoceridae, American lobster, sand shrimp, hermit crabs, Genus *Haustorid, Phoxocephalid, Leptocuma, Chiridotea*, and *Cancer* spp., Jonah crab (*Cancer borealis*), Atlantic rock crab	Collie et al. 1997; Redmond and Scott 1989; Dickinson et al. 1980; Cobb and Wahle 1994; Shumchenia et al. 2016; Wahle et al. 2015
	Gastropoda	Northern moon snail, *Nassarius* spp., channeled whelk, common slipper shell	Collie et al. 1997; Redmond and Scott 1989; Dickinson et al. 1980
	Ophiuroidea	Genus *Ophiopholis* and *Ophiacantha*	Collie et al. 1997; Wigley 1968
	Polychaeta	Tube-forming: *Phyllochaetopterus socialis*, *Spiochaetopterus oculatus*, *Filograna implexa, Chone infundibuliformis, Protula tubalaria* Carnivorous and omnivorous: *Nephtys incisa*, *Eunice norvegica* Deposit feeding: *Thelephus cincinnatus*	Collie et al. 1997; Redmond and Scott 1989; Dickinson et al. 1980; URI GSO 2019
Cobbles, boulders, rocky reef, rock outcrop	Anthozoa	Sea anemones: Order Alcyonacea (both gorgonians and non-gorgonians) tulacea[b]; schleractinian coral *Astrangia poculata*	Poppe et al. 2011; Northeast Ocean Data 2019; DWW 2012; Grace 2017
	Asteroidea	Blood star, common sea star, Genus *Solaster* and *Crossaster*	DWW 2012; Wigley 1968; Collie et al. 1997
	Bivalvia	Horse mussel (*Modiolus modiolus*), eastern oyster, Atlantic sea scallop, waved astarte, chestnut astarte, genus *Brachiopoda, Placopecten, Anomia,* and *Musculus*	DWW 2012; Wigley 1968; Jenkins et al. 1997; Hargis and Haven 1999
	Bryozoa	More detailed taxonomy not provided	DWW 2012
	Cephalopoda	Squid egg masses and newly hatched larvae including longfin squid	Macy and Brodziak 2001; NEFSC 2005
	Chordata	Tunicates (*Boltenia* spp.); *Didemnum vexilllum*	Wigley 1968; Grace 2017; Auker 2019
	Crustacea	Tube-forming Amphipods: *Ampelisca agassizi* and *A. vadorum* Free-living Amphipods: Caprellidae and Podoceridae Barnacles (Infraclass Cirripedia and genus *Balanus*), America lobster, sand shrimp, hermit crabs., Genus *Cancer* and *Hyas,* Jonah crab, Atlantic rock crab, green crab *Carcinus maenas*, Asian shore crab *Hemigrapsis sangineus*	DWW 2012; Wigley 1968; Wahle et al. 2015; Jaini et al. 2018
	Echinoidea	Green sea urchin (*Strongylocentrotus droebachiensis*)	Collie et al. 1997; Wigley 1968
	Gastropoda	Northern moon snail, *Nassarius* spp., limpet, channeled whelk, knobbed whelk (*Busycon carica*), whelk (*Sinistrofulgur sinistrum*), common slipper shell, genus *Neptunea, Dendronotus*, and *Doris*	Poppe et al. 2014; Wigley 1968

Table 5.2-2

Substrata Type	Phylum or Class	Species (With Common Name if Available)	References
Cobbles, boulders, rocky reef, rock outcrop (continued)	Hydrozoa	Hydroids, including genera Eudendrium, Sertularia, and Bougainvilia	Poppe et al. 2011; DWW 2012
	Ophiuroidea	*Ophiopholis aculeate* and *Ophiacantha* spp.	Collie et al. 1997; Wigley 1968
	Polychaeta	Tube-forming and suspension feeding: *Phyllochaetopterus socialis, Filograna implexa, Chone infundibuliformis, Protula tubalaria*, genus *Serpula* and *Spiorbis*, *Ninoe nigripes* Carnivorous and omnivorous: *Nephtys incisa, Eunice norvegica*	Wigley 1968; DWW 2012; URI GSO 2019
	Porifera	Encrusting sponges of genera *Halichondria, Clathria, Polymastia, Clionia,* and *Myxilla, Suberites* spp.	Poppe et al. 2011; DWW 2012; Wigley 1968; Grace 2017; URI GSO 2017

Table 5.2-3. Ecologically and Economically Important Benthic Shellfish Species and Their Potential to Occur at the SRWF and Along the SRWEC–OCS

Table 5.2-3						
Species	**Life Stage Present**	**Preferred Habitat**	**Potential Time of Year in Region**	**Potential Presence at the SRWF**	**Potential for Presence along the SRWEC–OCS**	**References**
American lobster (*Homarus americanus*)	All	Prefers rocky habitat, including mixed bottom types, but may burrow in featureless sand or mud habitat.	Year-round	Potential presence in the vicinity of rocky areas; may seasonally pass through during migratory movements.	Potential presence in the vicinity of rocky areas along the SRWEC–OCS near the SRWF; may seasonally pass through during migratory movements.	Collie and King 2016; ASMFC 2020b; Cobb and Wahle 1994; MADMF 2019; RIDEM 2019; URI GSO 2017; Tanaka and Chen 2015
Atlantic rock crab (*Cancer irroratus*)	All	Prefers depths ranging from 20 to 1,496 ft (6 to 456 m), but most common in waters less than 65 ft (20 m) deep. Prefers rocky and gravely substrate but also occurs in sand.	Year-round	Limited potential for presence because species prefers areas that are shallower than the SRWF.	Limited potential for presence along the SRWEC–OCS near the SRWF because species prefers areas that are shallower.	Krouse 1980; Robichaud et al. 2000; Williams and Wigley 1977; URI GSO 2017
Atlantic sea scallop (*Plactopecten magellanicus*)	All	Found on sand, gravel, shells, and other rocky habitat. Larvae settle out on gravel and rocky substrate. Found from mean low water to depths of 656 ft (200 m). This species also has designated EFH in the SRWF and along the SRWEC–OCS and SRWEC–NYS routes see Appendix N1).	Year-round	Potential for presence throughout the SRWF	Potential for presence throughout SRWEC–OCS	NEFSC 2004; Mullen and Moring 1986; Tanaka et al. 2020
Atlantic surf clam (*Spisula solidissima*)	All	Prefers depths ranging from 26 to 216 ft (8 to 66 m) in medium-grained sand, but may also occur in finer-grained sediments. Burrows up to 3 ft (0.9 m) below the sediment-water interface. This species also has designated EFH along the SRWEC–OCS route (see Appendix N1).	Year-round	Potential for presence in sandy substrates.	Potential for presence in sandy substrates.	Fay et al. 1983; Meyer et al. 1981; Cargnelli et al. 1999a

Table 5.2-3						
Species	**Life Stage Present**	**Preferred Habitat**	**Potential Time of Year in Region**	**Potential Presence at the SRWF**	**Potential for Presence along the SRWEC–OCS**	**References**
Channeled whelk (*Busycotypus canaliculatus and B. carica*)	All	Commonly found in nearshore and offshore environments, but preferred depth range is not known. Occurs in sandy and fine-grained sediments where they can bury themselves. Eggs are laid on sand in intertidal and subtidal areas.	Year-round	Potential for presence in sandy substrates.	Potential for presence in sandy substrates.	Fisher 2009; Peemoeller and Stevens 2013; URI GSO 2017
Eastern oyster (*Crassostera virginica*)	All	Larvae and adults can be found on hard bottom substrate or shell substrate to a depth of 36 ft (11 m) but is most common between 8 to 18 ft (2.5 to 5.5 m) deep.	Year-round	Not expected to occur, as no oyster reefs are known to occur in the vicinity.	Not expected to occur, as no oyster reefs are known to occur in the vicinity.	Jenkins et al. 1997; Hargis and Haven 1999
Hard clam (*Mercenaria mercenaria*)	All	Adults and juveniles are commonly found in intertidal and shallow subtidal waters. Eggs and larvae are planktonic and settlement occurs over sandy substrata.	Year-round	Not expected to occur as clam beds are not known to occur in the vicinity and depths are too great.	Not expected to occur as clam beds are not known to occur in the vicinity and depths are too great.	Henry and Nixon 2008; Kraeuter et al. 2005
Hermit crab (*Pagurus pollicaris*)	All	Adults and juveniles are common in shallow subtidal sandy habitats and salt marshes. Eggs and larvae are planktonic.	Year-round	Potential presence but may be restricted by depth.	Potential presence but may be restricted by depth.	URI GSO 2017

Table 5.2-3

Species	Life Stage Present	Preferred Habitat	Potential Time of Year in Region	Potential Presence at the SRWF	Potential for Presence along the SRWEC–OCS	References
Horseshoe crab (*Limulus polyphemus*)	All	Prefer depths shallower than 98 ft (30 m) but known to occur in depths greater than 656 ft (200 m). Occurs commonly on sandy substrate but is a habitat generalist and may be found on gravel and cobbles as adult. During full moon tides in spring and summer, migrates inshore to shallow bays and sandy beaches to spawn. Juveniles use shallow nearshore areas as nurseries before moving into deeper waters.	Year-round	Potential presence throughout.	Potential presence throughout.	NJDEP 2016; ASMFC, 2020a; URI GSO 2017; Smith et al. 2017
Jonah crab (*Cancer borealis*)	Adults	Prefers depths ranging from 164 to 984 ft (50 to 300 m), but also occurs in shallower waters, perhaps associated with circadian rhythms. Found across sediment types, from sand, to small gravel, to rocky areas.	Year-round	Potential presence at the SRWF. Studies found higher abundances in fine sand, followed by coarse sand, and boulders on sand.	Potential presence along the SRWEC–OCS. Studies found higher abundances in fine sand, followed by coarse sand, and boulders on sand.	Collie and King 2016; Robichaud and Frail 2006; Jeffries 1966; Truesdale et al. 2019
Longfin squid (*Doryteuthis pealeii*)	All	May-November found in inshore waters, and adults are demersal during the day. Eggs are laid on a variety of substrates, including sand and hard bottom. Newly hatched squid become demersal then migrate to offshore waters. December-April: Offshore waters between 328 and 550 ft (100 and 168 m) deep. This species also has designated EFH in portions of the SRWF and SRWEC–OCS and SRWEC–NYS routes (see Appendix N1).	May-November	Presence where rocky and gravelly areas are found between May-November. Not expected to be present between December and April.	Potential presence where rocky and gravelly areas are found between May-November; eggs may be laid along the SRWEC–OCS. Not expected to be present between December and April.	Macy and Brodziak 2001; NEFSC 2005; URI GSO 2017; Hatfield and Cadrin 2002

Table 5.2-3						
Species	**Life Stage Present**	**Preferred Habitat**	**Potential Time of Year in Region**	**Potential Presence at the SRWF**	**Potential for Presence along the SRWEC–OCS**	**References**
Northern shortfin squid (*Illex illecebrosus)*	Adults	Prefers depths ranging from 328 to 656 ft (100 to 200 m) but is also known to occur in waters shallower than 60 ft (18 m). Egg masses are thought to be neutrally buoyant. This species also has designated EFH along the SRWEC–OCS (see Appendix N1).	Year-round	Preferred depth range is deeper than the SRWF, but may occasionally be present within this area. Neutrally buoyant egg masses may occasionally be present throughout the SRWF.	Preferred depth range is deeper than the SRWEC–OCS, but may occasionally be present within this area. Neutrally buoyant egg masses may occasionally be present throughout both the SRWEC–OCS.	Black et al. 1987; Grinkov and Rikhter 1981; O'Dor and Balch 1985
Ocean quahog clam (*Artica islandica*)	Juveniles and Adults	Prefers depths ranging from 82 and 200 ft (25 and 61 m) in medium to fine grain sand. This species also has designated EFH within the SRWF and along the SRWEC–OCS (see Appendix N1).	Year-round	Potential presence throughout	Potential presence at deeper portions of the SRWEC–OCS.	Cargnelli et al. 1999b
Sand shrimp (*Crangon septemspinosa*)	Juveniles and Adults	Migrates to deeper waters out of estuaries in the fall as water temperatures decrease, returning in the spring when temperatures increase.	Spring through fall	Potential presence throughout.	Potential presence along the SRWEC–OCS.	Taylor and Collie 2003; Sagarese et al. 2011
Spider crab (*Libinia emarginata*)	Juveniles and Adults	Occurs in shallow subtidal nearshore habitats and on the continental shelf to depths approaching 164 ft (50 m).	Year-round	Potential presence throughout.	Potential presence along the SRWEC–OCS.	URI GSO 2017

Note: The potential for each species to occur at the SRWF and along the SRWEC–OCS is related to the distribution of benthic habitat types within each area.

5.3 REGIONAL EFFECTS OF CLIMATE CHANGE ON BENTHIC RESOURCES

In the vicinity of SRWF and, in general, along the US Northeast OCS and continental slope, benthic communities have experienced increased water temperatures over the past several decades (Kavanaugh et al. 2017). Numerous benthic and pelagic species are predicted to shift their ranges northward and into deeper waters in response to increasing water temperatures (Kleisner et al. 2017; Selden et al. 2018; Kisei et al. 2020). Modeling predicts that bottom temperatures in southern New England will become too warm to support larval development of the commercially valuable American lobster, causing this species to move offshore and northward (Rheuban et al. 2017). In southern New England, lobster catches have declined in recent decades, which may be attributable to increased water temperatures and associated increases in shell disease prevalence (Collie and King 2016; Groner et al. 2018; Jaini et al. 2018; Wahle et al. 2015). Cascading socioeconomic effects on the industries that harvest these species are anticipated although it can be difficult to accurately predict which fisheries may be affected; some fishermen may benefit from the presence of new target species. For example, black seabass and spiny dogfish are predicted to increase in the vicinity of the SRWF as sea temperatures continue to increase (Selden et al. 2018). Additionally, the lobster fishery in southern New England has transitioned to harvesting Jonah crabs as a way to supplement income (Truesdale et al. 2019).

As temperatures increase over time, the average pH is expected to continue to decline as seawater becomes more saturated with carbon dioxide (Saba et al. 2016). Acidification of seawater is associated with decreased survival and health of organisms with calcareous shells (such as the Atlantic scallop, blue crab, and hard clam). Larvae that survive to the recruitment stage may have thinner or deformed shells and be more susceptible to predators (Stevens and Gobler 2018). Modeled scenarios of decreasing seawater pH predict a substantial decline in the harvestable stock of the Atlantic scallop, with collateral loss of economic value (Rheuban et al. 2018).

6.0 REFERENCES

Aronson, R., A. Bruckner, J. Moore, B. Precht, and E. Weil. 2008. Astrangia poculata. The IUCN Red List of Threatened Species 2008: e.T133446A3749524. http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T133446A3749524.en. Downloaded on 21 March 2019.

Atlantic States Marine Fisheries Commission (ASMFC). 2020a. Horseshoe Crab. Accessed June 2020. http://www.asmfc.org/species/horseshoe-crab

Atlantic States Marine Fisheries Commission (ASMFC). 2020b. American Lobster. Accessed June 2020. http://www.asmfc.org/species/american-lobster

Auker, L.A. 2019. A decade of invasion: changes in the distribution of *Didenmum vexillum Kott*, 2002 in Narragansett Bay, Rhode Island, USA, between 2005 and 2015. BioInvasions Records 8: in press.

Bay State Wind LLC. 2019. Construction and Operations Plan, Bay State Offshore Wind Farm. Submitted to Bureau of Ocean Energy Management. Submitted by Bay State Wind LLC. Submitted March 2019, Revised July 2019.

Black, G.A.P., T.W. Rowell, and E.G. Dawe. 1987. Atlas of the biology and distribution of the squids *Illex illecebrosus* and *Loligo pealei* in the northwest Atlantic. Canadian Special Publication of Fisheries and Aquatic Sciences. Volume 100. 62 p.

Bull, D.C. and R.B. Williamson. 2001. Prediction of principal metal-binding solid phases in estuarine sediments from color image analysis. Environ. Sci. Tech. 35: 1658-1662.

Bureau of Ocean Energy Management (BOEM) Office of Renewable Energy Programs. 2019. Guidelines for Providing Benthic Habitat Survey Information for Renewable Energy Development on the Atlantic Outer Continental Shelf Pursuant to 30 CFR Part 585. June 2019.

Bureau of Ocean Energy Management (BOEM) Office of Renewable Energy Programs. 2020a. Guidelines for Information Requirements for a Renewable Energy Construction and Operations Plan (COP). Version 4.0: May 27, 2020.

Bureau of Ocean Energy Management (BOEM) Office of Renewable Energy Programs. 2020b. Guidelines for Providing Geophysical, Geotechnical, and Geohazard Information Pursuant to 30 CFR Part 585. May 27, 2020.

Bureau of Ocean Energy Management (BOEM) Office of Renewable Energy Programs. 2020c. Guidelines for Providing Archaeological and Historic Property Information Pursuant to 30 CFR Part 585. May 27, 2020.

Calabretta, C.J., and C.A. Oviatt. 2008. The response of benthic macrofauna to anthropogenic stress in Narragansett Bay, Rhode Island: A review of human stressors and assessment of community conditions. Marine Pollution Bulletin 56(10): 1680-1695.

Cargnelli, L.M., D.B. Griesback, and E. Weissberger. 1999a. Essential Fish Habitat Source Document: Atlantic surfclam, Spisula solidissima, Life History and Habitat Characteristics. NOAA Technical Memorandum NMFS-NE-142. National Marine Fisheries Service Northeast Fisheries Science Center Woods Hole, Massachusetts.

Cargnelli, L.M., S.J. Greibach, D.B. Packer, and E. Weissberger. 1999b. Essential Fish Habitat Source Document: Ocean quahog, Artica islándica, Life History and Habitat Characteristics. NOAA Technical Memorandum NMFS-NE-148. National Marine Fisheries Service Northeast Fisheries Science Center Woods Hole, Massachusetts.

CoastalVision and Germano & Associates. 2010. Sediment Profile & Plan View Imaging Report: Evaluation of Sediment and Benthos Characteristics along Potential Cable Routes and Turbine Locations for the Proposed Block Island Wind Farm. Report prepared for Deepwater Wind, Providence, RI.

Cobb, J.S. and R.A. Wahle. 1994. Early Life History and Recruitment Processes of Clawed Lobsters. Crustaceana, Volume 67, No. 1, pp. 1-25.

Collie, J.S., G.A. Escarnero, and P.C. Valentine. 1997. Effects of bottom fishing on the benthic megafauna of Georges Bank. Marine Ecology Progress Series 155: 159-172.

Collie, J.S., A.D. Wood, and H.P. Jeffries. 2008. Long-term shifts in the species composition of a coastal fish community. Canadian Journal of Fisheries and Aquatic Sciences 65(7), 1352−1365.

Collie, J.S. and J.W. King. 2016. Spatial and Temporal Distributions of Lobsters and Crabs in the Rhode Island Massachusetts Wind Energy Area. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Atlantic OCS Region, Sterling, Virginia. OCS Study BOEM 2016-073.

Deepwater Wind (DWW). 2012. Block Island Wind Farm and Block Island Transmission System Environmental Report/Construction and Operations Plan, September 2012. Prepared by Tetra Tech EC, Inc. Boston, MA.

DWW Rev I, LLC. 2020. Construction and Operations Plan, Revolution Wind Farm. Prepared by VHB, Providence, RI. Submitted to the Bureau of Ocean Energy Management, Sterling, VA. March 2020.

Deepwater Wind South Fork, LLC. 2019. Construction and Operations Plan, 30 CFR Part 585. Submitted to Bureau of Ocean Energy Management. Submitted by Deepwater Wind South Fork, LLC. Submitted June 2018, Revised September 2018, Revision 2 Submitted May 2019.

Dickinson, J.J., R.L. Wigley, R.D. Brodeur, and S. Brown-Leger. 1980. Distribution of Gammaridean Amphipoda (Crustacea) in the Middle Atlantic Bight Region. NOAA Technical Report NMFS SSRF- 741.

Dimond J. and E. Carrington E. 2007. Temporal variation in the symbiosis and growth of the temperate scleractinian coral Astrangia poculata. Mar Ecol Prog Ser 348:161-172.

DiPreta, G.M. 2019. Successional state of benthic communities in temperate coral dominated habitats in Rhode Island. Masters Thesis, Southern Connecticut State University, New Haven, CT.

Fay, C.W., R.J. Neves, and G.B. Pardue. 1983. Species profiles: life histories and environmental requirements of coastal fishes and invertebrates (MidAtlantic): surf clam. U.S. Fish Wildl. Serv., Div. Biol. Serv., FWS/OBS-82/11.13.23 p.

Federal Geographic Data Committee (FGDC). 2012. FGDC-STD-018-2012. Coastal and Marine Ecological Classification Standard. Reston, VA.

Fenchel, T. 1969. The ecology of marine macrobenthos IV. Structure and function of the benthic ecosystem, its chemical and physical factors and the microfauna communities with special reference to the ciliated protozoa. Ophelia 6: 1-182.

Fredette, T.J., W.F. Bohlen, D.C. Rhoads, and R.W. Morton. 1988. Erosion and resuspension effects of Hurricane Gloria at Long Island Sound dredged material disposal sites. In: Willey, R.G., editor. Water Quality ’88, Seminar Proceedings; 1988 Feb 20–23; Charleston, SC. Davis (CA): U.S. Army Corps of Engineers, Hydraulic Engineering Center. p. 323-334.

Fisher, R.A. 2009. FRG Final Report for the Channeled Whelk Assessment. Project #: FRGP 2009-12.

Folk, R.L. 1954. The Distinction between Grain Size and Mineral Composition in Sedimentary-Rock Nomenclature. The Journal of Geology 62: 344-359.

Fugro USA Marine, Inc. 2020. Sunrise Wind Farm Project (SRW01) Marine Site Investigation Report (Preliminary). Prepared for Sunrise Wind June 2020.

Germano, J.D., D.C. Rhoads, R.M. Valente, D. Carey, and M. Solan. 2011. The use of Sediment Profile Imaging (SPI) for environmental impact assessments and monitoring studies: lessons learned from the past four decades. Oceanogr. Mar. Biol. 49: 247-310.

Gotceitas, V. and J.A. Brown. 1993. Substrate selection by juvenile Atlantic cod (*Gadus morhua*): effects of predation risk. Oecologia 93: 31-37.

Grace, S. 2017. Winter quiescence, growth rate, and release from competition in the temperate scleractinian coral Astrangia poculata (Ellis & Solander 1786). Northeastern Naturalist 24(24(sp7)):B119-B134.

Greene, H.G., J.J. Bizarro, V.M. O'Connell, and C.K. Brylinsky. 2007. Construction of digital potential marine benthic habitat maps using a coded classification scheme and its applications. In Todd, B.J. and H.G. Greene, eds., Mapping the Seafloor for Habitat Characterization: Geological association of Canada, Special Paper 47, p. 147-162.

Greene, J.K., Anderson, M.G., Odell, J., and Steinberg, N., eds. 2010. The Northwest Atlantic Marine Ecoregional Assessment: Species, Habitats and Ecosystems. Phase One. The Nature Conservancy, Eastern U.S. Division, Boston, MA.

Grinkov, Y.A. and V.A. Rikhter. 1981. Some data on distribution of groundfish and short-finned squid along the oceanic slopes of the Scotian Shelf in spring 1979. Northwest Atlantic Fisheries Organization Science Council. Resource Document 81 Volume 63. 13 p. as cited in NOAA. 2004. Essential Fish Habitat Source Document: Northern Shortfin Squid, Ilex illecebrosus, Life History and Habitat Characteristics

Griswold, C.A. and J. Prezioso. 1981. In-situ observations on reproductive behavior of the long- finned squid, Loligo pealei. Fishery Bulletin 78: 945–947.

Groner, M.L., J.D. Shields, D.F. Landers, J. Swenarton, and J.M. Hoenig. 2018. Rising Temperatures, Molting Phenology, and Epizootic Shell Disease in the American Lobster. American Naturalist 192(5): E163-E177.

Guida, V., A. Drohan, H. Welch, J. McHenry, D. Johnson, V. Kentner, J. Brink, D. Timmons, and E. Estela-Gomez. 2017. Habitat Mapping and Assessment of Northeast Wind Energy Areas. Sterling, VA: US Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2017-088. 312 p.

Hargis, W.J., Jr. and D.S. Haven. 1999. Chesapeake oyster reefs, their importance, destruction, and guidelines for restoring them. In: Luckenbach, M.W., R. Mann, J.A. Wesson (eds.). Oyster reef habitat restoration: a synopsis, and a synthesis of approaches. VIMS Press, Gloucester Pt, VA. pp 329-258.

Hart, D.R. and A.S. Chute. 2004. Sea scallop, Placopecten magellanicus, life history and habitat characteristics, 2nd edition. Essential fish habitat source document. NOAA technical memorandum NMFSNE-189. Woods Hole, MA: Northeast Fisheries Science Center. 32 pp.

Hatfield, E.M.C. and S.X. Cadrin. 2002. Geographic and temporal patterns in size and maturity of the longfin inshore squid (*Loligo pealeii*) off the northeastern United States. Fishery Bulletin 100:200-213.

Henry, K.M. and S.W. Nixon. 2008. A half century assessment of hard clam, Mercenaria, growth in Narragansett Bay, Rhode Island. Estuaries and Coasts 31:755-766.

Horn, H.S. 1974. The ecology of secondary succession. Annu. Rev. Ecol. Systemat. 5: 25-37.

Huettel, M., W. Ziebis, and S. Forster. 1996. Flow-induced uptake of particulate matter in permeable sediments. Limnol. Oceanogr. 41: 309-322.INSPIRE Environmental. 2019. Standard operating procedure for sediment profile and plan view imaging sample collection and image analysis. Prepared by INSPIRE Environmental, March 2019.

INSPIRE Environmental. 2020. Benthic Resources Characterization Report – New York State Waters, Sunrise Wind Farm Project. Prepared for Stantec, Quincy, MA and Sunrise Wind LLC for submittal to the Bureau of Ocean Energy Management as Appendix M2 of the Construction and Operations Plan, 30 CFR Part 585, Sunrise Wind Farm Project. Prepared by INSPIRE Environmental. December 2020.

Jaini, M., R.A. Wahle, A.C. Thomas, and R. Weatherbee. 2018. Spatial surface temperature correlates of American lobster (Homarus americanus) settlement in the Gulf of Maine and southern New England shelf. Bulletin of Marine Science 94(3): 737-751.

Jeffries, H.P. 1966. Partitioning of the Estuarine Environment by two species of Cancer. Ecology 47: 477-481.

Jenkins, J.B., A. Morrison, and C.L. MacKenzie, Jr. 1997. The molluscan fisheries of the Canadian Maritimes. In `The History, Present Condition, and Future of the Molluscan Fisheries of North and Central America and Europe, Vol. 1. Atlantic and Gulf Coasts. (ed.) MacKenzie et al. U.S. Department of Commerce, NOAA Technical Report NMFS. pp 15-44.

Karakassis, I., M. Tsapakis, C.J. Smith, and H. Rumohr. 2002. Fish farming impacts in the Mediterranean studied through sediment profiling imagery. Mar. Ecol. Progr. 227: 125-133.

Kavanaugh, M.T., J.E. Rheuban, K.M.A. Luis, and S.C. Doney. 2017. Thirty-Three Years of Ocean Benthic Warming Along the U.S. Northeast Continental Shelf and Slope: Patterns, Drivers, and Ecological Consequences. Journal of Geophysical Research: Oceans, 122, 9399–9414. https://doi.org/10.1002/2017JC012953.

Kisei R. Tanaka, Michael P. Torre, Vincent S. Saba, Charles A. Stock, Yong Chen. An ensemble high-resolution projection of changes in the future habitat of American lobster and sea scallop in the Northeast US continental shelf. Diversity and Distributions, 2020; DOI: 10.1111/ddi.13069

Kleisner, K.M., M.J. Fogarty, S. McGee, J.A. Hare, S. Moret, C.T. Perretti and V.S. Saba. 2017. Marine species distribution shifts on the US Northeast Continental Shelf under continued ocean warming. Progress in Oceanography 153: 24-36.

Kraeuter, J.N., S. Buckner, and E.N. Powell. 2005. A note on a spawner – recruit relationship for a heavily exploited bivalve: the case of northern quahogs (hard clams), *Mercenaria* in Great South Bay New York.

Krouse, J.S. 1980. Distribution and catch composition of Jonah crab, Cancer borealis, and Rock crab, Cancer irroratus, near Boothbay Harbor, Maine. Fishery Bulletin. 77(3): 685-693.

Lyle, M. 1983. The brown-green colour transition in marine sediments: a marker of the Fe (III) – Fe (II) redox boundary. Limnol. Oceanogr. 28: 1026-1033.

Macy, W.K. and J. Brodziak. 2001. Seasonal maturity and size at age of *Loligo pealeii* in waters of southern New England. ICES Journal of Marine Science, 58: 852-864.

Marine Surveys. 1984. Chesapeake Bay Disposal Sites Survey: REMOTS® Baseline Monitoring. February 1984. New Haven, Connecticut: Annual report prepared for Virginia Institute of Marine Science, Gloucester Point, VA.

Mid-Atlantic Fishery Management Council (MAFMC). 1998c. Amendment 12 to the Atlantic Surfclam and Ocean Quahog Fishery Management Plan. Mid-Atlantic Fishery Management Council in cooperation with the National Marine Fisheries Service, and the New England Fishery Management Council, October 1998.

Massachusetts Department of Marine Fisheries (MADMF). 2019. Southern New England Ventless Trap Survey 2006- 2018.

McGonigle, C., J.H. Grabowski, C.J. Brown, T.C. Webber, and R. Quinn. 2011. Detection of deep water benthic macroalgae on multibeam backscatter at Cashes Ledge, Gulf of Maine, USA. Estuarine, Coastal and Shelf Science. Volume 91, pp. 87-101.

Meyer, T.L., R.A. Cooper, and K.J. Pecci. 1981. The performance and environmental effects of a hydraulic clam dredge. Mar. Fish. Rev. 43(9): 14-22.

Mullen, D.M. and J.R. Moring. 1986. Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (North Atlantic). Sea Scallop.

National Marine Fisheries Service (NOAA Fisheries). 2020a. Ocean Quahog. Accessed June 2020. https://www.fisheries.noaa.gov/species/ocean-quahog.

National Marine Fisheries Service (NOAA Fisheries). 2020b. Atlantic Sea Scallop. Accessed June 2020. https://www.fisheries.noaa.gov/species/atlantic-sea-scallop.

National Marine Fisheries Service (NOAA Fisheries). 2020c. Atlantic Surfclam. Accessed June 2020. https://www.fisheries.noaa.gov/species/atlantic-surfclam.

New Jersey Department of Environmental Protection (NJDEP). 2016. Wildlife Populations: Horseshoe Crab. Environmental Trends Report.

Nilsson, H.C. and R. Rosenberg. 1997. Benthic habitat quality assessment of an oxygen stressed fjord by surface and sediment profile images. J. Mar. Syst. 11: 249-264.

NOAA Habitat (NOAA National Marine Fisheries Greater Atlantic Regional Fisheries Office Habitat Conservation and Ecosystem Services Division). 2020. Recommendations for Mapping Fish Habitat. May 2020.

Northeast Fisheries Science Center (NEFSC). 2004. Essential Fish Habitat Source Document: Sea Scallop, Placopecten magellanicus, Life History and Habitat Characteristics. NOAA Technical Memorandum NMFS-NE-189.

Northeast Fisheries Science Center (NEFSC). 2005. Essential Fish Habitat Source Document: Longfin Inshore Squid, *Loligo pealeii*, Life History and Habitat Characteristics. NOAA Technical Memorandum NMFS-NE-193.

Northeast Ocean Data. 2019. Northeast Ocean Data Viewer. Accessed November 2019. http://www.northeastoceandata.org/data-explorer/.

NYSERDA. 2017. 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. https://www.nyserda.ny.gov/-/media/Files/Publications/Research/Biomass-Solar-Wind/Master-Plan/17-25a-MBES-and-Benthic-Survey-Data.pdf

O'Dor, R.K. and N. Balch. 1985. Properties of Illex illecebrosus egg masses potentially influencing larval oceanographic distribution. Northwest Atlantic Fisheries Organization Science Council. Study 9, pp. 69-76.

O'Hara, C.J. and R.N. Oldale. 1980. Maps showing geology and shallow structure of eastern Rhode Island Sound and Vineyard Sound, Massachusetts: U.S. Geological Survey Miscellaneous Field Studies Map MF-1186, 41 p.

Pearson, T.H. and R. Rosenberg. 1978. Macrobenthic succession in relation to organic enrichment and pollution of the marine environment. Oceanogr. Mar. Biol. 16: 229-311.

Peemoeller, B.J. and B.G. Stevens. 2013. Age, size, and sexual maturity of channeled whelk (Busycotypus canaliculatus) in Buzzards Bay, Massachusetts. Fisheries Bulletin. Volume 111, pp. 265-278.

Poppe, L.J., K.Y. McMullen, S.D. Ackerman, D.S. Blackwood, B.J. Irwin, J.D. Schaer, and M.R. Forrest. 2011. Sea-floor geology and character of eastern Rhode Island Sound west of Gay Head, Massachusetts: U.S. Geological Survey Open-File Report 2011–1004, DVD-ROM. Accessed October 11, 2017. http://pubs.usgs.gov/of/2011/1004/.

Poppe, L.J., K.Y. McMullen, W.W. Danforth, M.A. Blankenship, A.R. Clos, K.A. Glomb, P.G. Lewit, M.A. Nadeau, D.A. Wood, and C.E. Parker. 2014. Combined multibeam and bathymetry data from Rhode Island Sound and Block Island Sound – A regional perspective: U.S. Geological Survey Open-File Report 2014–1012, 9 p.

Redmond, M.S. and K.J. Scott. 1989. Amphipod Predation by the Infaunal Polychaete, *Nephthys incisa*. Estuaries, Volume 12, No. 3, pp. 205-207.

Rheuban, J.E., M.T. Kavanaugh, and S.C. Doney. 2017. Implications of Future Northwest Atlantic Bottom Temperatures on the American Lobster (Homarus americanus) Fishery. Journal of Geophysical Research-Oceans 122(12): 9387-9398.

Rheuban, J.E., S.C. Doney, S.R. Cooley and D.R. Hart. 2018. Projected impacts of future climate change, ocean acidification, and management on the US Atlantic sea scallop (Placopecten magellanicus) fishery. PLoS ONE 13(9): e0203536 13(9).

Rhoads, D.C. 1974. Organism-sediment relations on the muddy seafloor. Oceanogr. Mar. Biol. 12: 263-300.

Rhoads, D.C. and L.F. Boyer. 1982. The effects of marine benthos on physical properties of sediments. In: McCall, P.L. and M.J.S. Tevesz, editors. Animal-sediment relations. New York (NY): Plenum Press. p. 3-52.

Rhoads, D.C. and J.D. Germano. 1982. Characterization of organism-sediment relations using sediment profile imaging: an efficient method of remote ecological monitoring of the seafloor (REMOTS System). Mar. Ecol. Progr. 8: 115-128.

Rhode Island Department of Environmental Management (RIDEM). 2019. Ventless Trap Survey 2013-2018.

Robichaud, D.A., C. Frail, P. Lawton, D.S. Pezzack, M.B. Strong, and D. Duggan. 2000. Exploratory Fisheries for Rock Crab, Cancer irroratus, and Jonah Crab, Cancer borealis, in Canadian Lobster Fishing Areas 34, 35, 36, 38. Canadian Stock Assessment Secretariat. DFO Research Document 2000/051.

Robichaud, D.A., and C. Frail. 2006. Development of the Jonah Crab, Cancer borealis, and Rock Crab, Cancer irroratus, Fisheries in the Bay of Fundy (LFAs 35-38) and off Southwest Nova Scotia (LFA 34): Exploratory to Commercial Status (1995-2004). Canadian Manuscript Report of Fisheries and Aquatic Sciences 2775.

Roper, C.F.E., M.J. Sweeney, and C.E. Nauen. 1984. FAO Species Catalogue, Vol. 3 Cephalopods of the world. An annotated and illustrated catalogue of species of interest to fisheries. FAO Fisheries Synopsis 125 (3):1–277.

Rosenberg, R., H.C. Nilsson, and R.J. Diaz. 2001. Response of benthic fauna and changing sediment redox profiles over a hypoxic gradient. Estuar. Coast. Shelf Sci. 53: 343-350.

Saba, V.S., S.M. Griffies, W.G. Anderson, M. Winton, M.A. Alexander, T.L. Delworth, and R. Zhang. 2016. Enhanced warming of the Northwest Atlantic Ocean under climate change. Journal of Geophysical Research-Oceans, 121(1), 118-132.

Sagarese, S.R., R.M. Cerrato, and M.G. Frisk. 2011. Diet composition and feeding habits of common fishes in Long Island Bays, New York. Northeastern Naturalist 18: 291-314.

Scott, J.S. 1982. Selection of bottom type by groundfishes of the Scotian Shelf. Can. J. Fish. Aquat. Sci. 39: 943-947.

Selden, R.L., R.D. Batt, V.S. Saba, and M.L. Pinsky. 2018. Diversity in thermal affinity among key piscivores buffers impacts of ocean warming on predator-prey interactions. Global Change Biology, 24(1), 117-131.

Shimada S., M. Hiraoka, S. Nabata, M. Iima, and M. Masuda. 2003. Molecular phylogenetic analyses of the Japanese Ulva and Enteromorpha (Ulvales, Ulvophyceae), with special reference to the free-floating Ulva. Phycological Research. Volume 51. Issues 2, pp. 99-108.

Shumchenia, E.J., M.L. Guarinello, and J.W. King. 2016. A re-assessment of Narragansett Bay benthic habitat quality between 1988 and 2008. Estuaries and Coasts 39: 1463-1477

Simone, M. and J. Grant. 2017. Visual assessment of redoxcline compared to electron potential in coastal marine sediments. Estuar. Coast. Shelf Sci. 188: 156-162.

Smith, D.R., H.J. Brockmann, M.A. Beekey, T.L. King, M.J. Millard and J. Zaldivar-Rae. 2017. Conservation status of the American horseshoe crab, (Limulus Polyphemus): a regional assessment. Reviews in Fish Biology and Fisheries 27: 135-175.

Steimle, F.W. 1982. The benthic macroinvertebrates of the Block Island Sound. Estuarine, Coastal and Shelf Science 15(1): 1-16.

Stevens, A.M., and C.J. Gobler. 2018. Interactive effects of acidification, hypoxia, and thermal stress on growth, respiration, and survival of four North Atlantic bivalves. Marine Ecology Progress Series 604: 143-161.

Stokesbury, K.D.E. 2012. Report: SMAST video survey of Western portion of the offshore Windfarm area, School for Marine Science and Technology, Dartmouth.

Stokesbury, K.D.E. 2014. Final Report: SMAST video survey of Western portion of the offshore Windfarm area, School for Marine Science and Technology, Dartmouth.

Sturdivant, S.K. and M.S. Shimizu. 2017. In situ organism-sediment interactions: bioturbation and biogeochemistry in a highly depositional estuary. PLoS ONE 12(11): e0187800.

Tanaka, K. and Y. Chen. 2015. Spatiotemporal variability of suitable habitat for American lobster (Homarus americanus) in Long Island Sound. Journal of Shellfish Research 34: 531-543.

Tanaka, K.R., M.P. Torre, V.S. Saba, C.A. Stock, and Y. Chen. 2020. An ensemble high-resolution projection of changes in the future habitat of American lobster and sea scallop in the Northeast US continental shelf. Diversity and Distributions 2020; 00:1-15.

Taylor, D.L. and J.S. Collie. 2003. Effect of temperature on the functional response and foraging behavior of the sand shrimp Crangon septemspinosa preying on juvenile winter flounder Pseudopleuronectes americanus. Marine Ecology Progress Series 263:217–234.

Truesdale, C.L., Dalton, T.M., and McManus, C.M. 2019. Fishers' knowledge and perceptions of the emerging southern New England Jonah crab fishery. North American Journal of Fisheries Management, 39(5): 951-963.

University of Rhode Island Graduate School of Oceanography (URI GSO). 2017. Annual Fish Trawl Survey Report and Data. Data from 2013-2018.

University of Rhode Island Graduate School of Oceanography (URI GSO). 2019. Narragansett: Baywide Survey, August 2018.

USGS. 2020. usSEABED: Coastal and Marine Geology Program. https://walrus.wr.usgs.gov/usseabed/ Accessed: 6/30/2020

Vadas, R.L. and R.S. Steneck. 1988. Zonation of deep water benthic algae in the Gulf of Maine. Journal of Phycology, 24, 338-346.

Van Patten, M.S. and C. Yarish. 2009. Bulletin No. 39: Seaweeds of Long Island Sound. Bulletins pp. 1-101.

Wahle, R.A., L. Dellinger, S. Olszewski, and P. Jekielek. 2015. American lobster nurseries of southern New England receding in the face of climate change. ICES Journal of Marine Science 72: 69-78.

Wentworth, C. K. 1922. A Scale of Grade and Class Terms for Clastic Sediments. The Journal of Geology 30: 377–392.

Wigley, R. 1968. Benthic invertebrates of the New England Fishing Banks. Underwater Naturalist Bulletin of the American Littoral Society 5(1): 8-13.

Williams. A.B. and R.L. Wigley. 1977. Distribution of decapod crustacea off Northeastern United States based on specimens at the Northeast Fisheries Center, Woods Hole, MA. NOAA Tech. Rep. NMFS Cire. 407, 44 p.

Zajac, R.N., R.B. Whitlatch, and S.F. Thrush. 1998. Recolonization and succession in soft-sediment infaunal communities: the spatial scale of controlling factors. Hydrobiologia 375: 227-240.

Benthic Resources Characterization Report – Federal Waters

FIGURES

Sunrise Wind Farm Project

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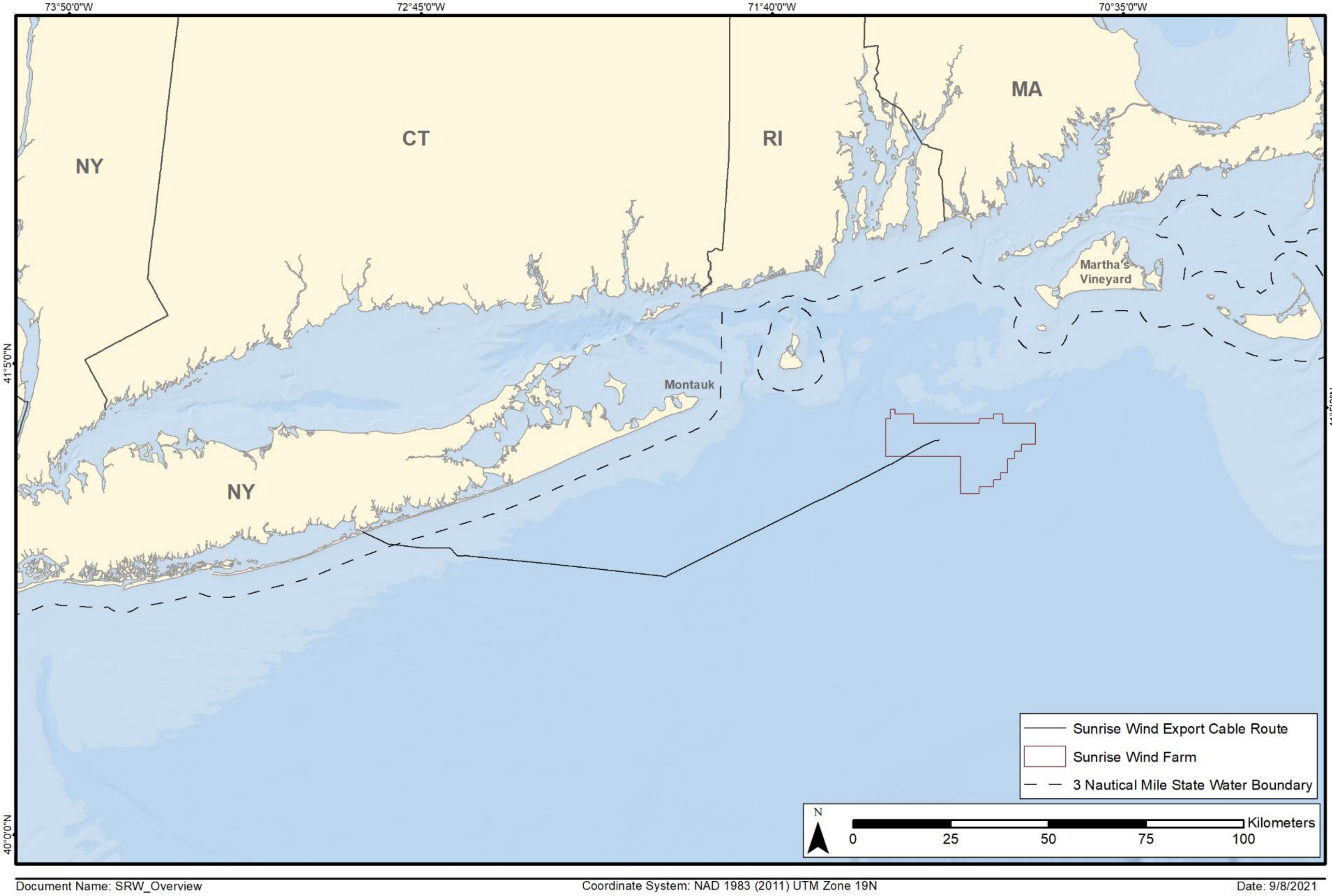

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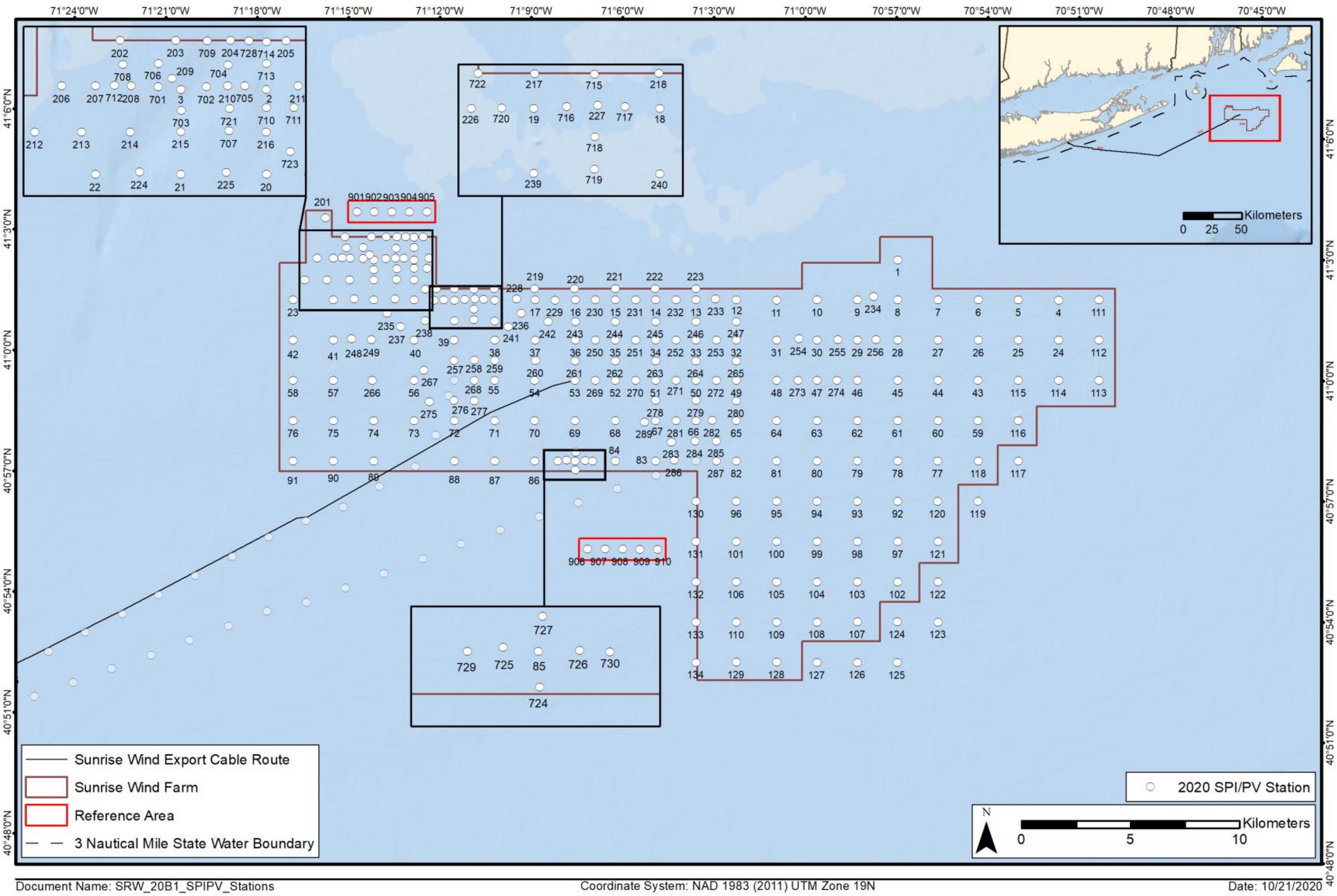

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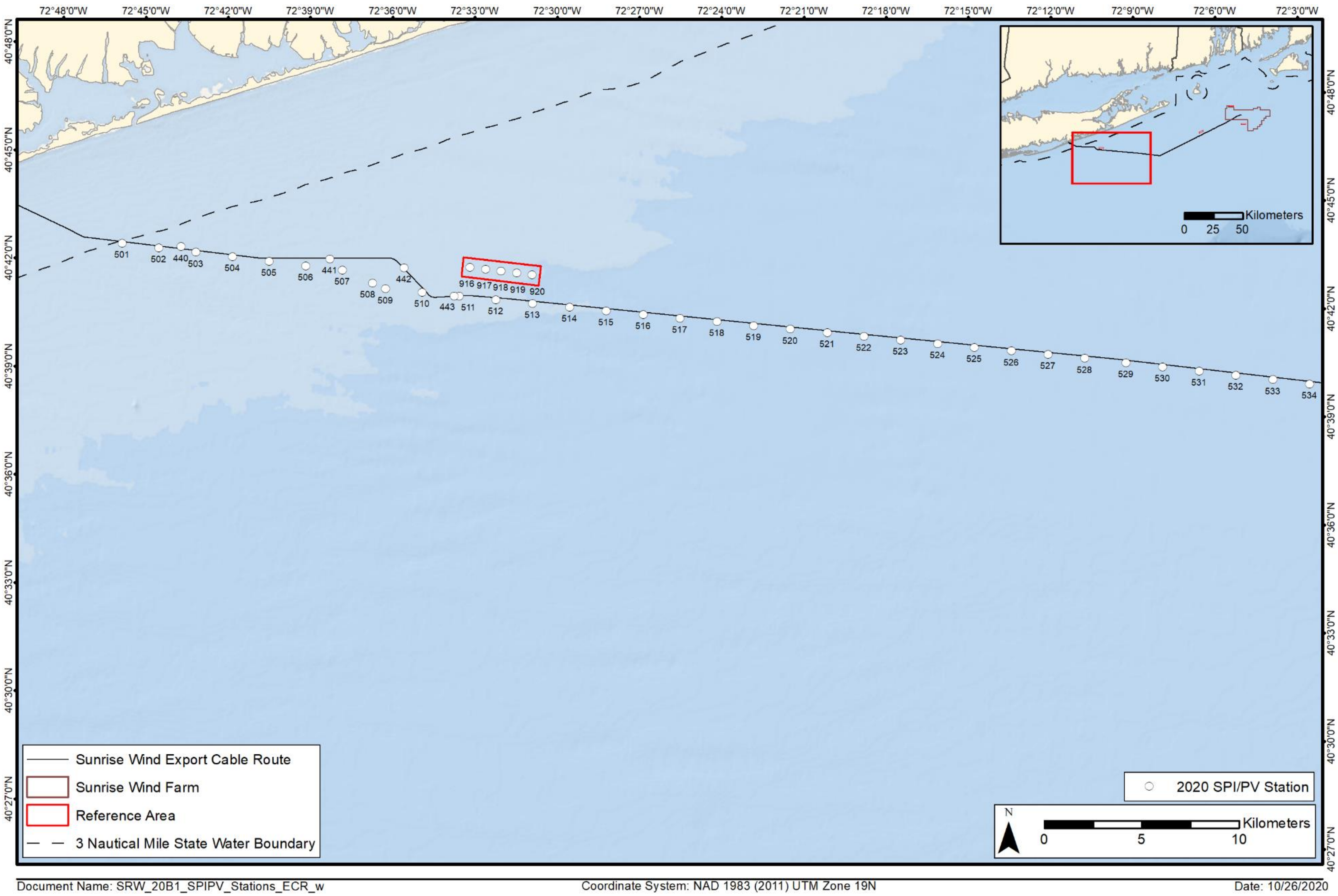

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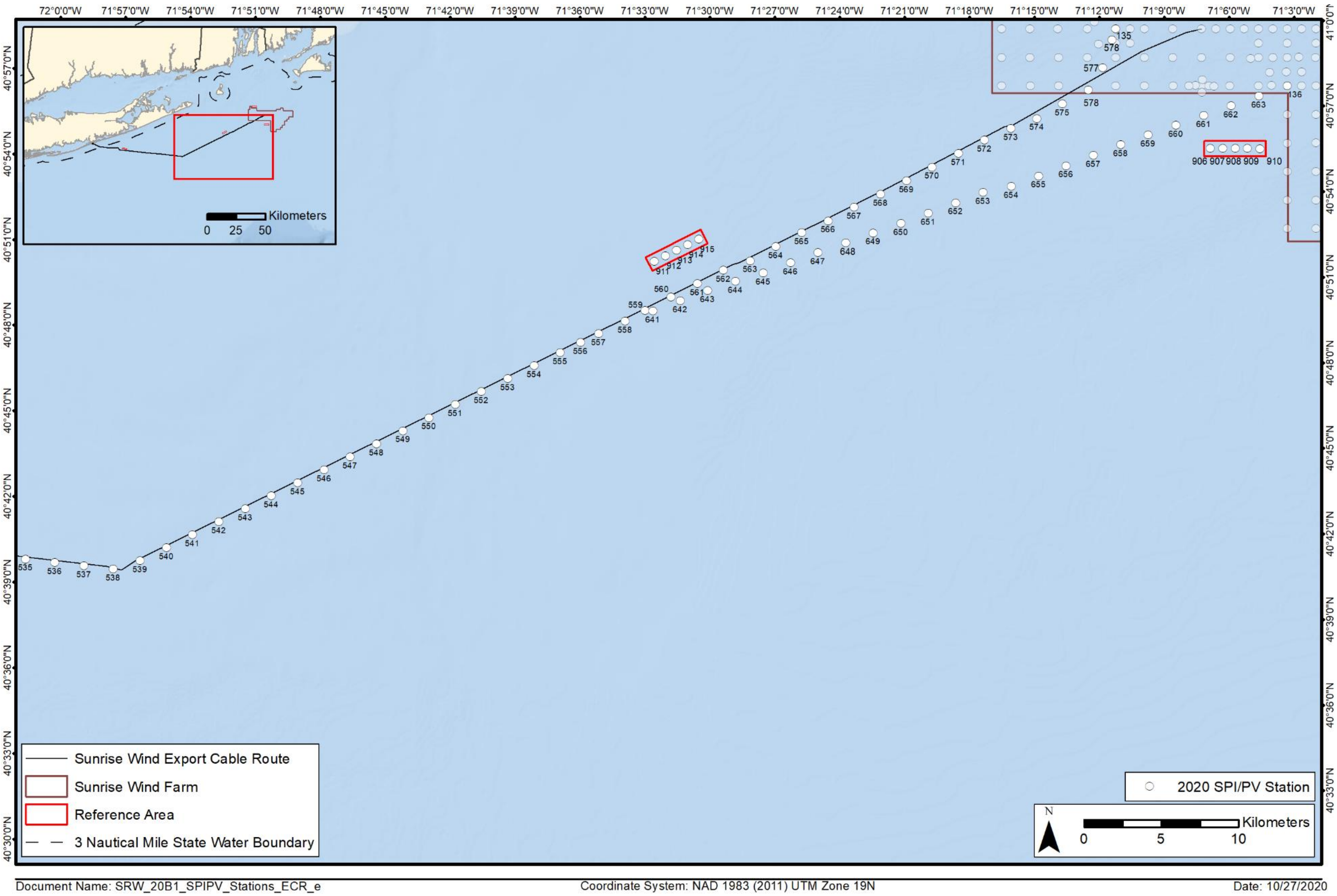

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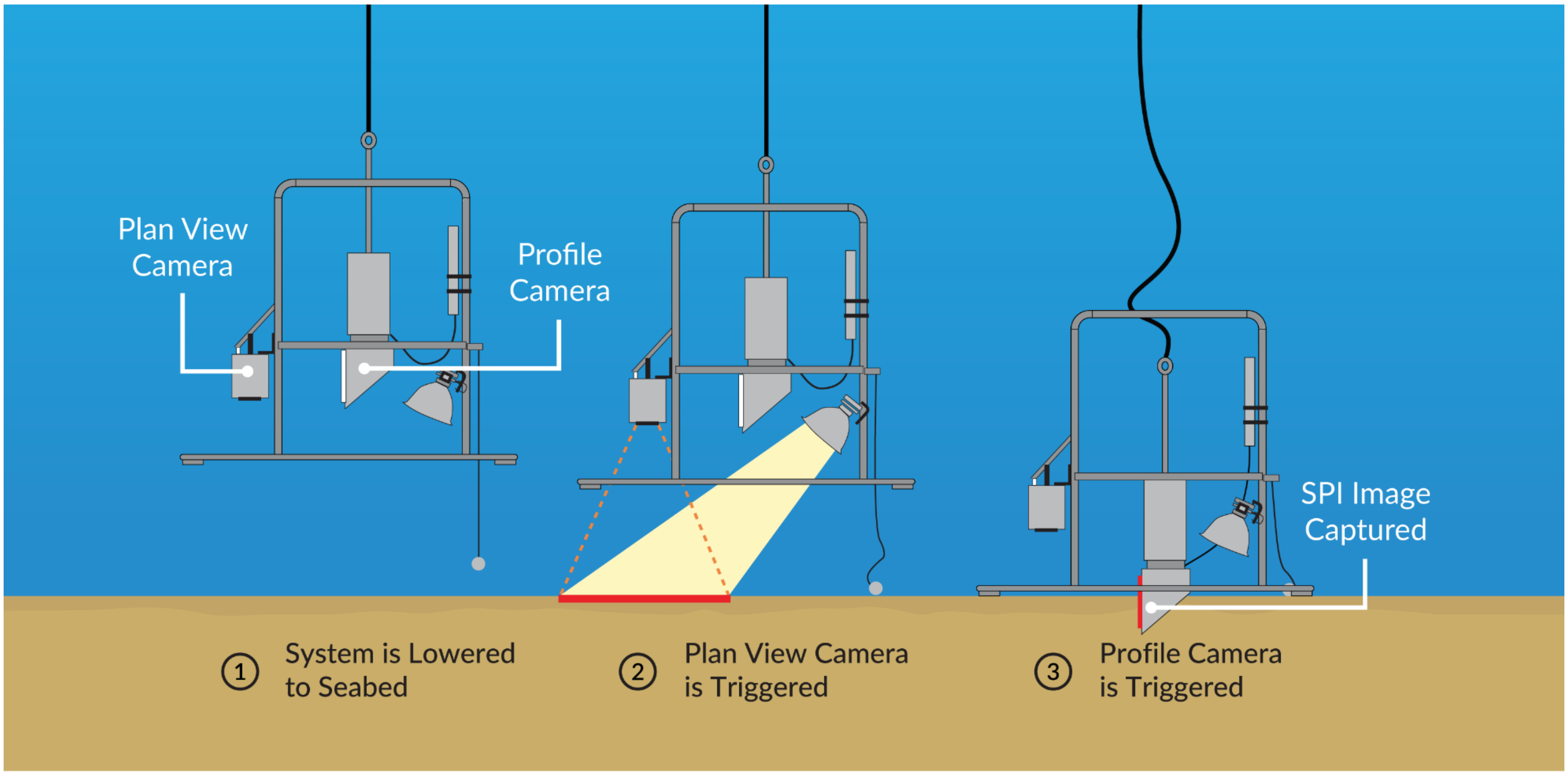

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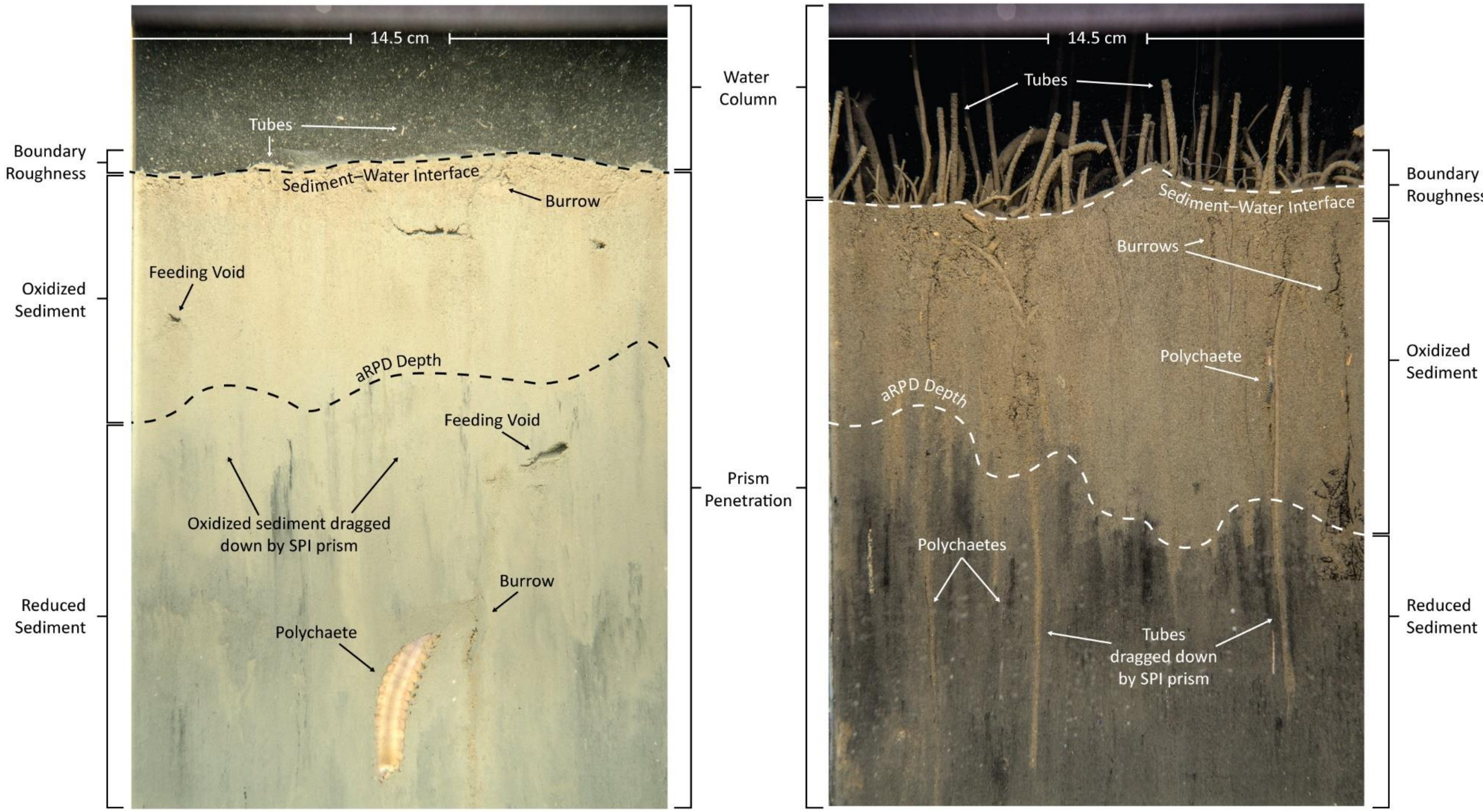

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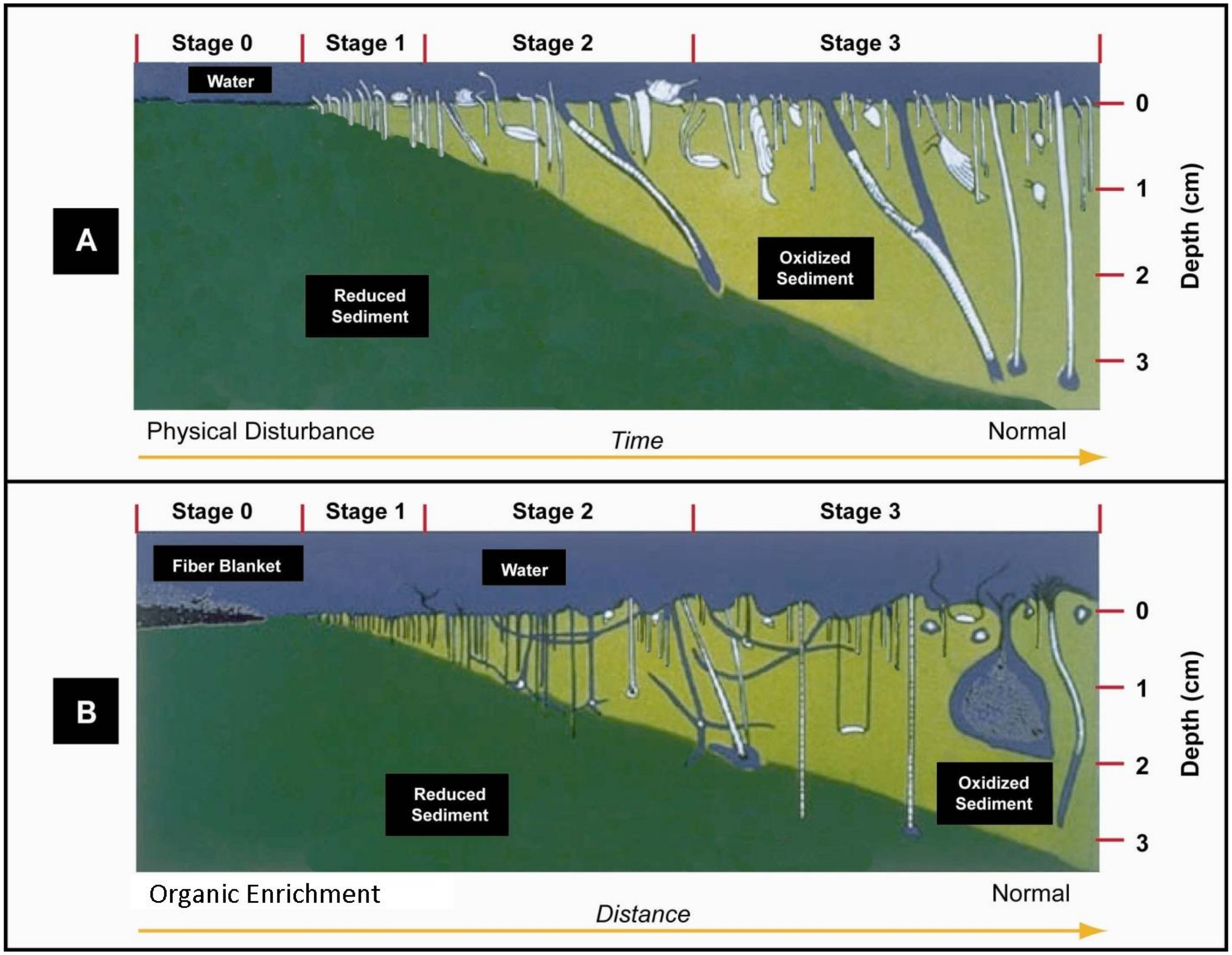

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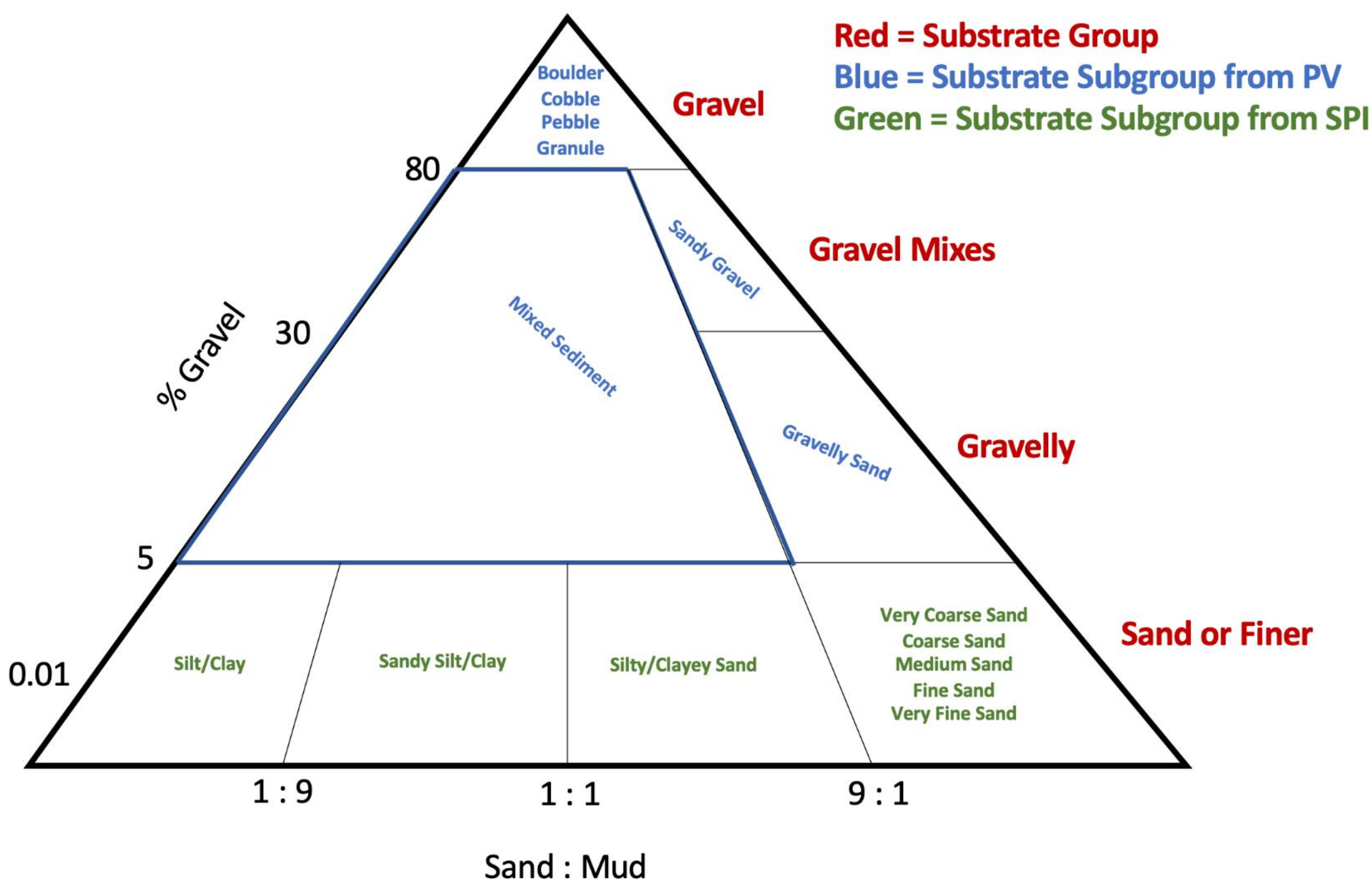

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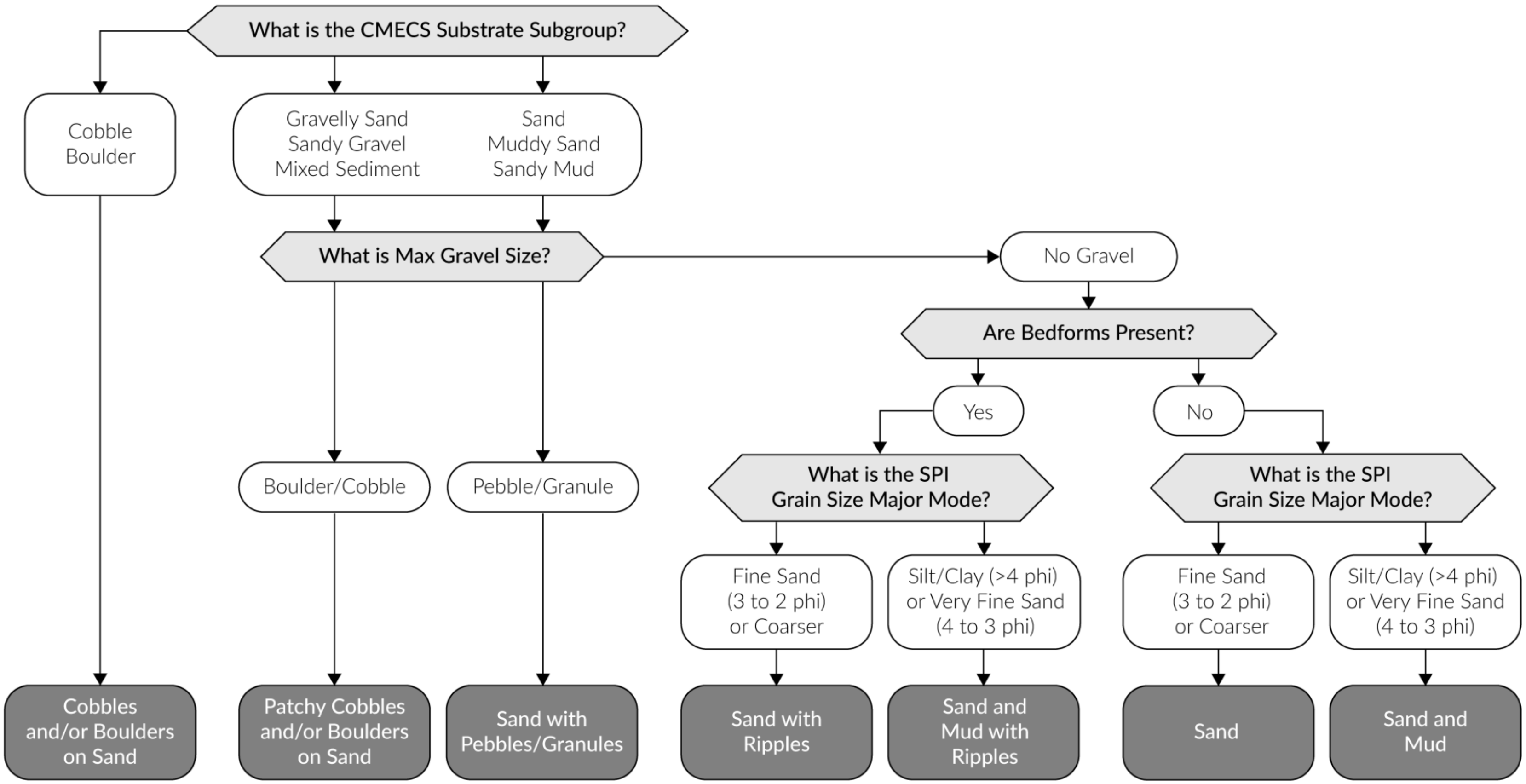

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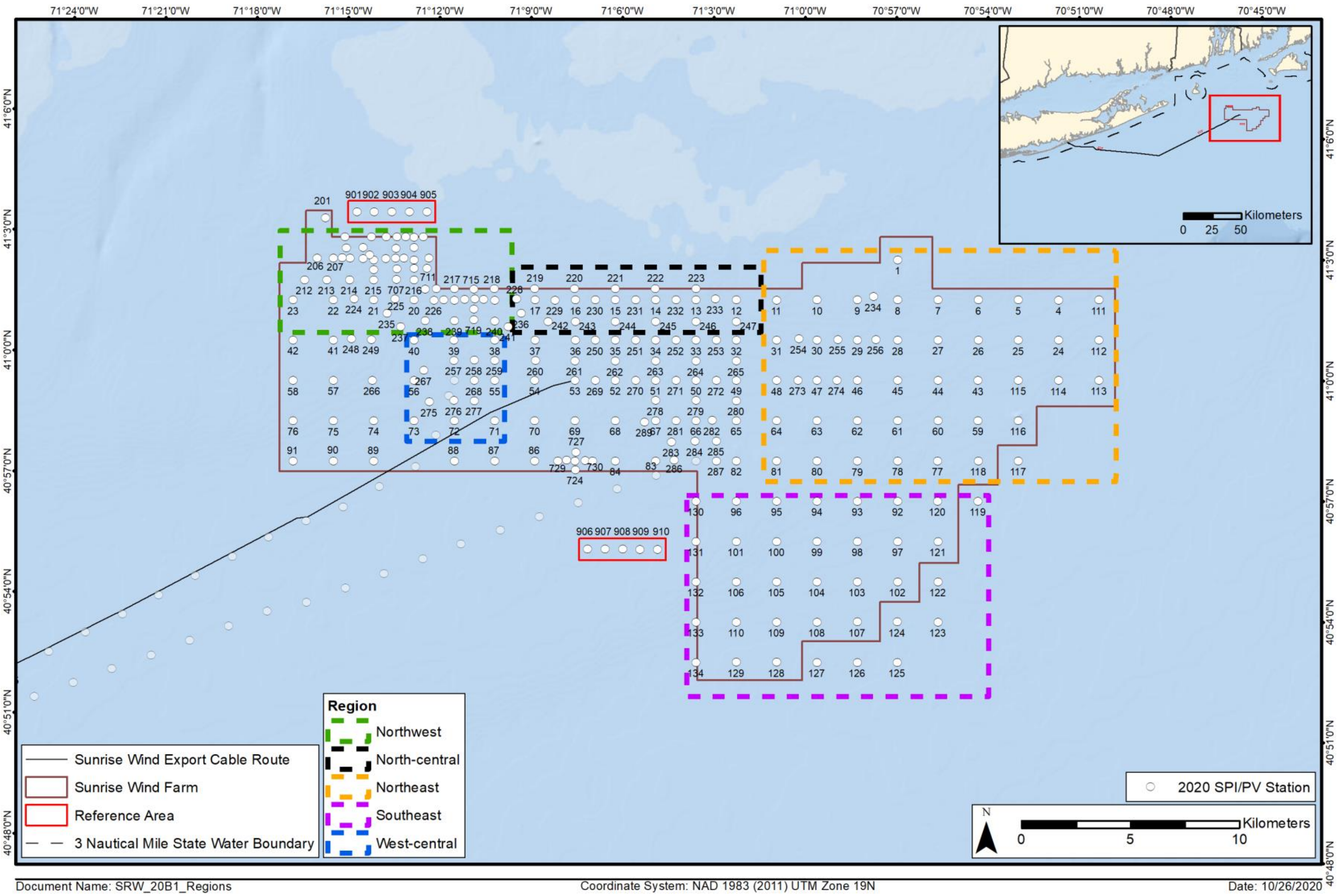

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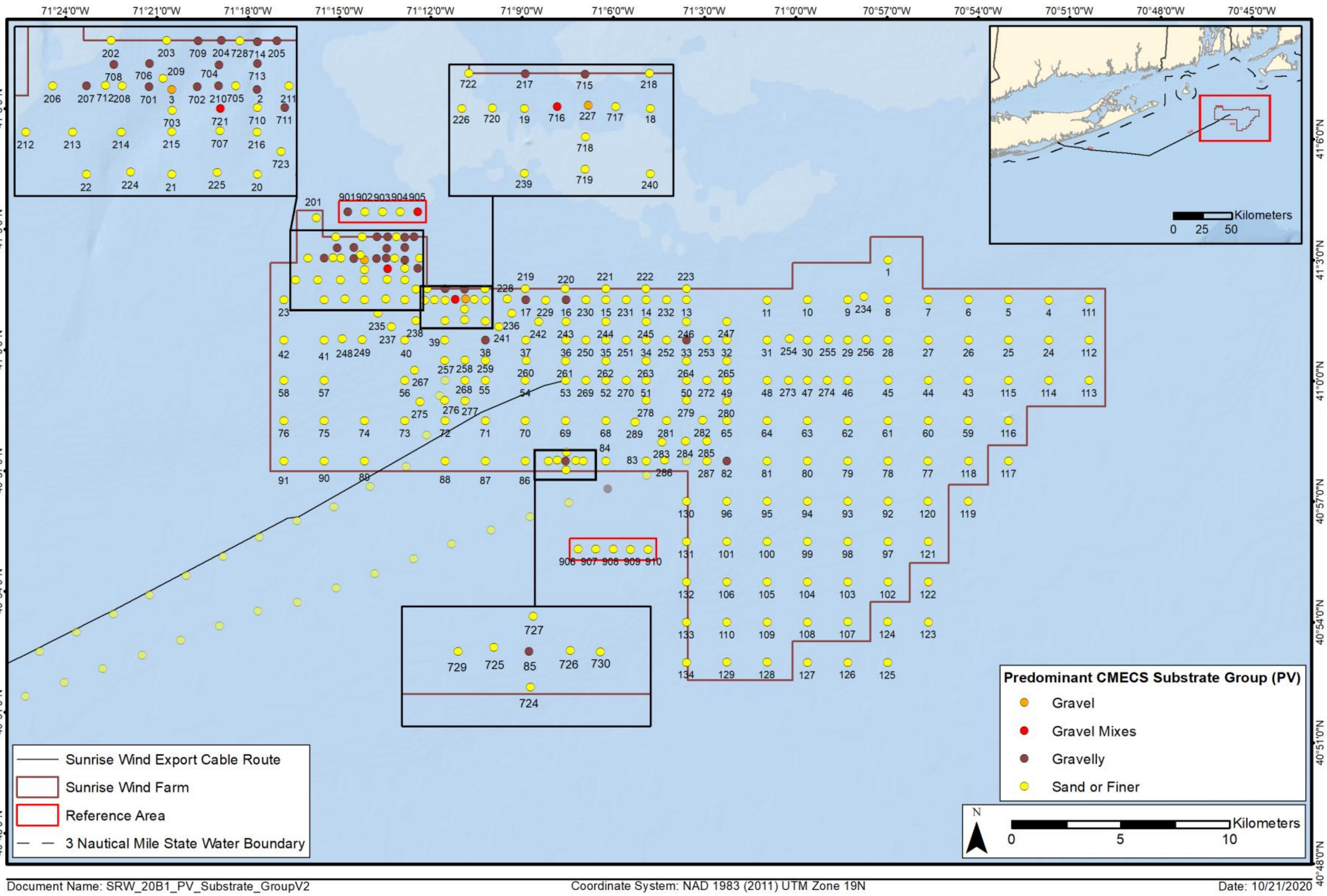

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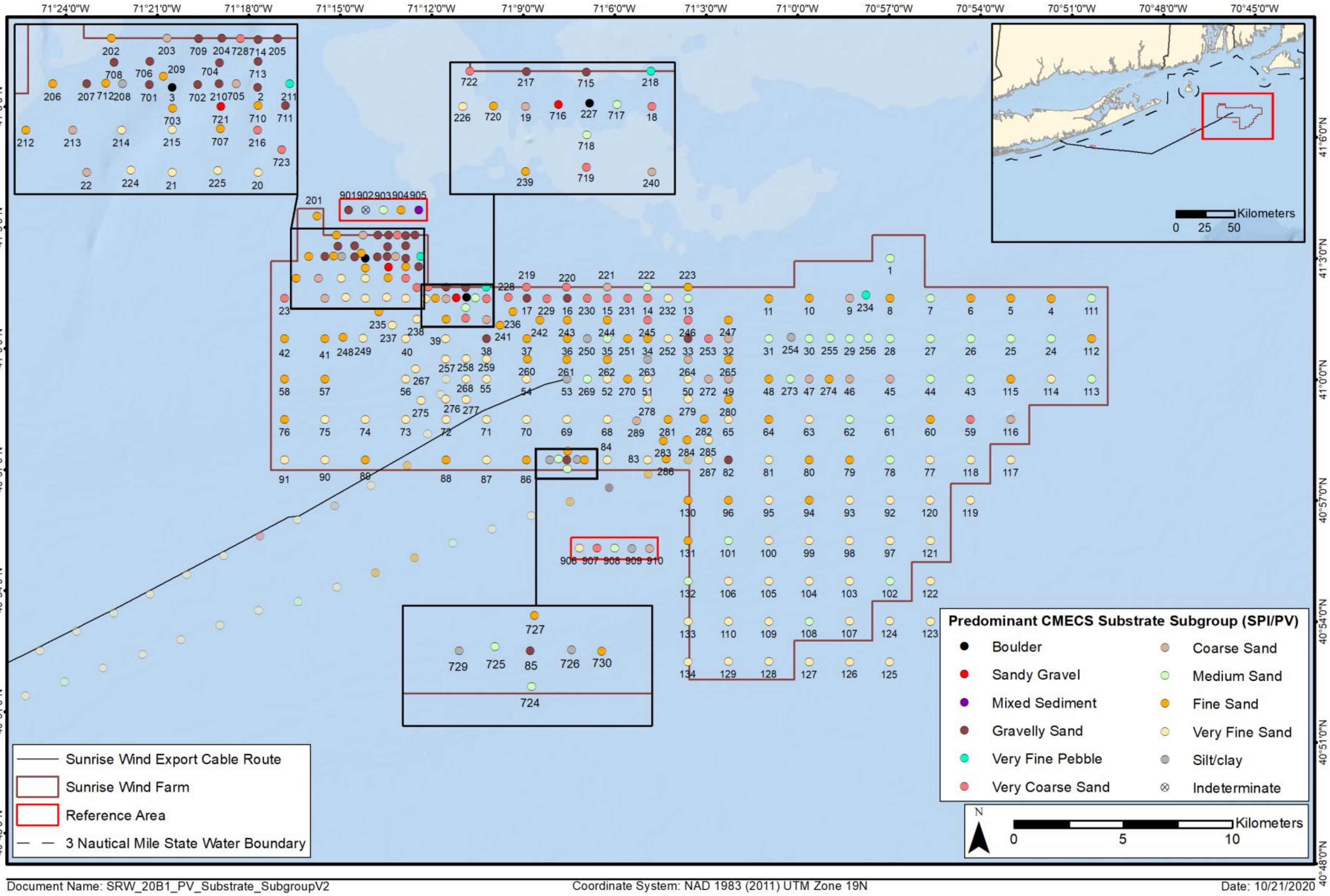


Figure 3.1-3 Predominant CMECS Substrate Subgroup determined from SPI and PV images at SRWF and two nearby reference areas

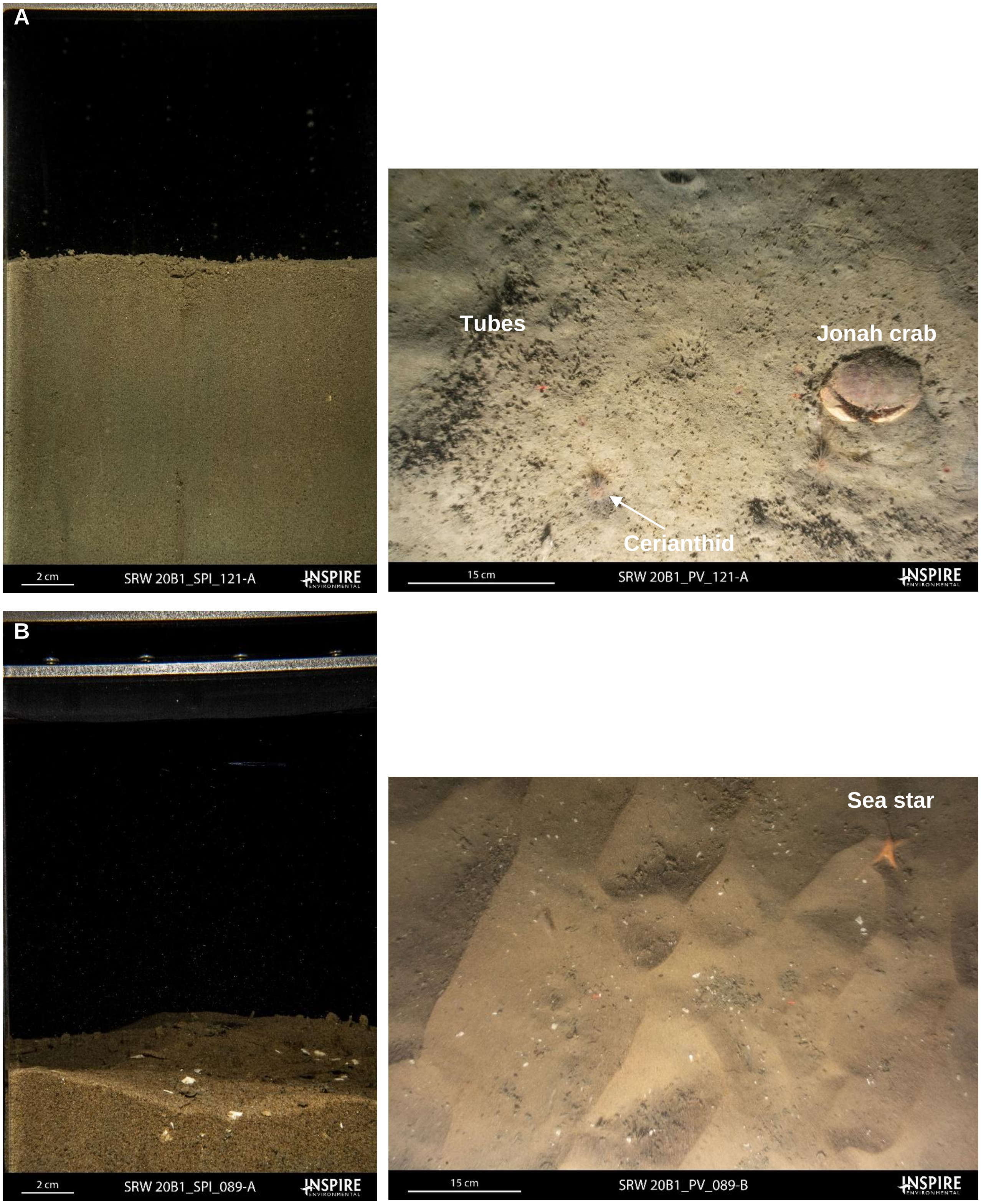
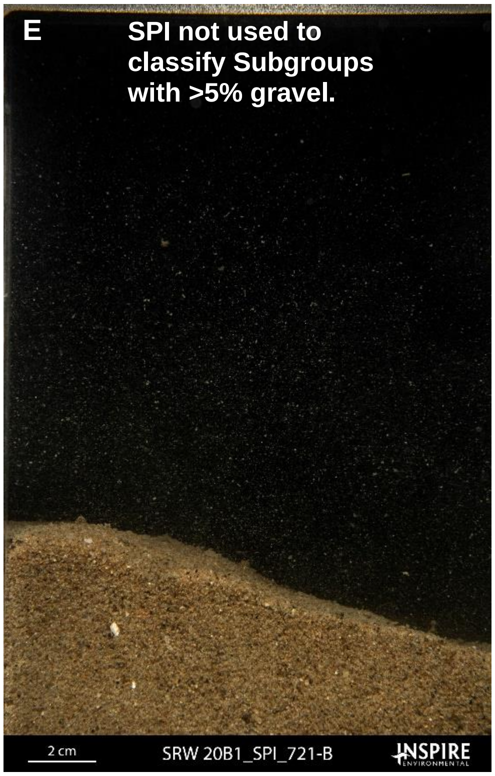
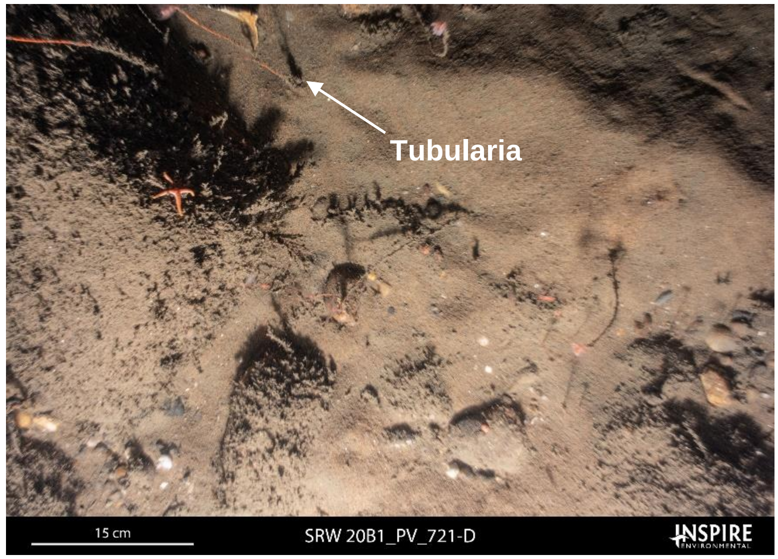
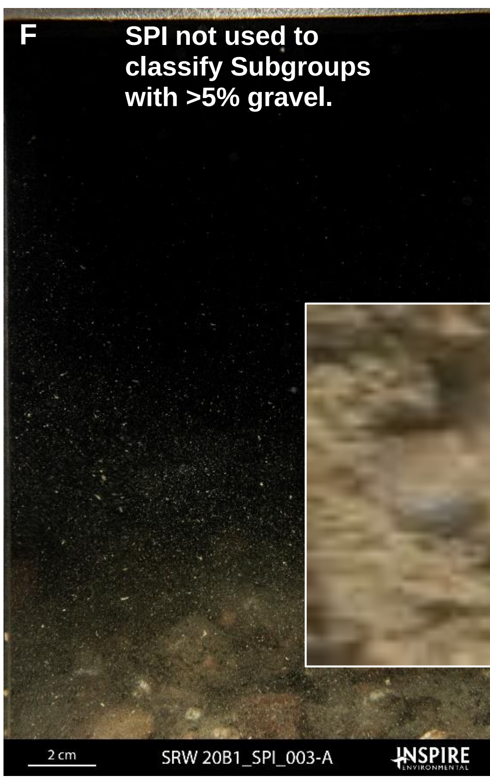


Figure 3.1-4 Representative SPI and plan view images depicting the range of CMECS Substrate Subgroups at the SRWF; (A) Very Fine Sand; (B) Fine Sand; (C) Medium Sand; (D) Gravelly Sand; (E) Sandy Gravel; and (F) Boulder

Figure 3.1-4 continued Representative SPI and plan view images depicting the range of CMECS Substrate Subgroups at the SRWF; (A) Very Fine Sand; (B) Fine Sand; (C) Medium Sand; (D) Gravelly Sand; (E) Sandy Gravel; and (F) Boulder







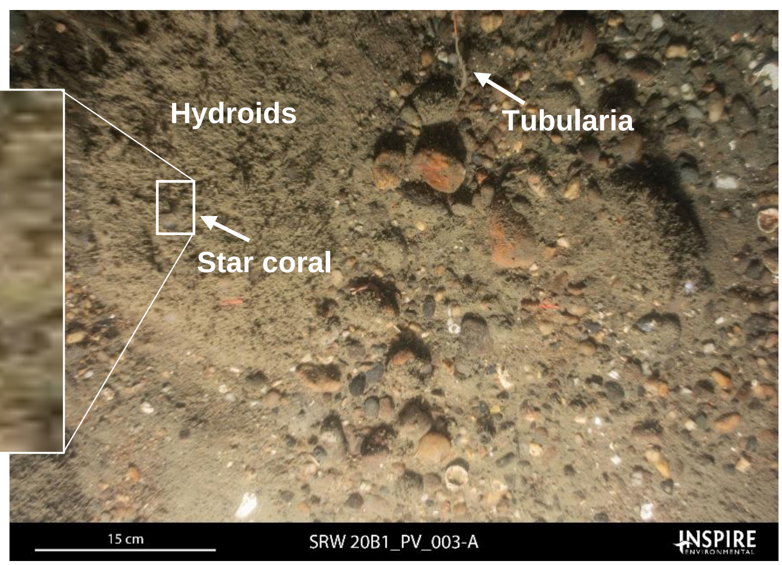
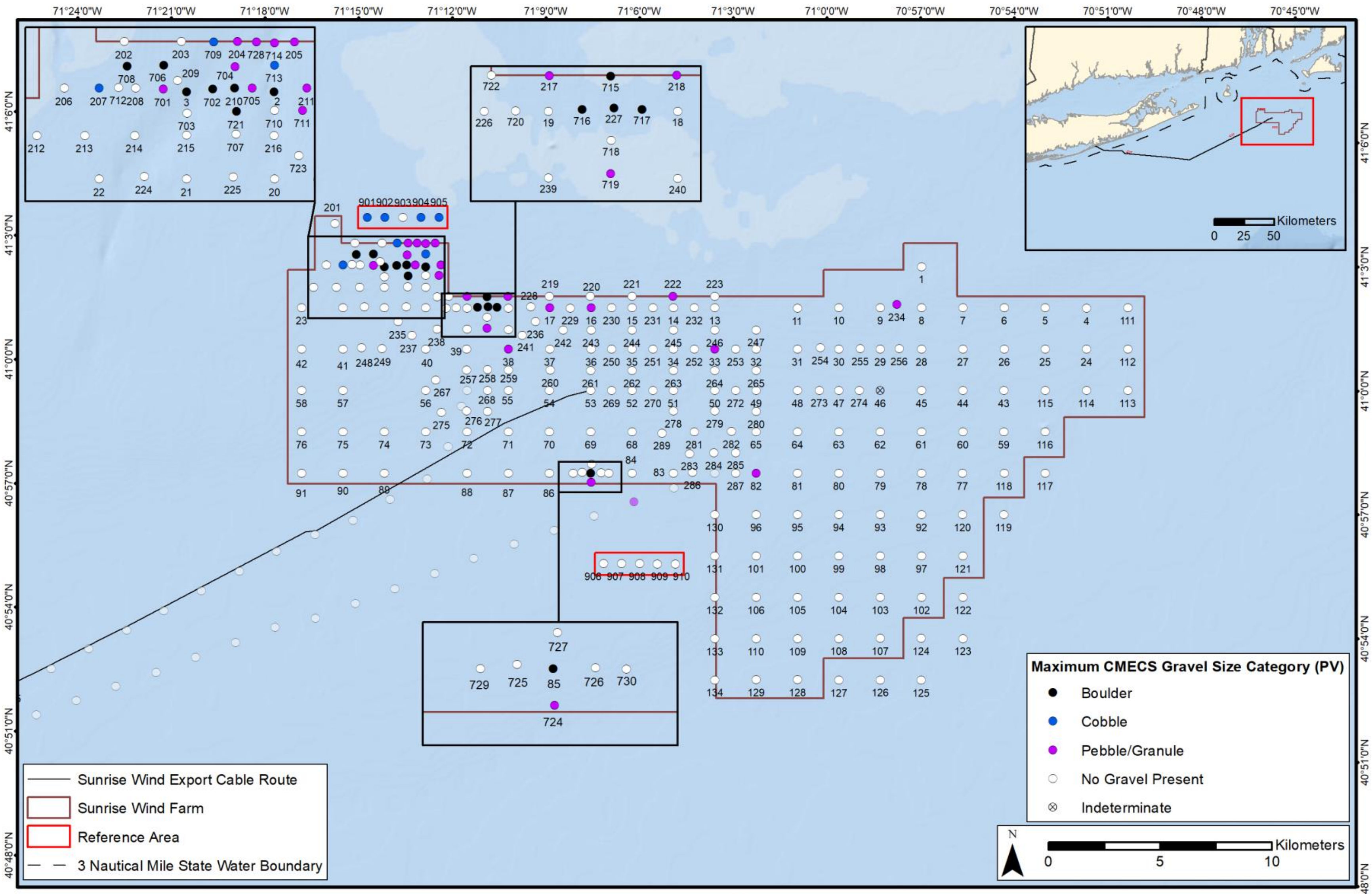


Figure 3.1-4 continued Representative SPI and plan view images depicting the range of CMECS Substrate Subgroups at the SRWF; (A) Very Fine Sand; (B) Fine Sand; (C) Medium Sand; (D) Gravelly Sand; (E) Sandy Gravel; and (F) Boulder



Document Name: SRW_20B1_PV_Max_GravelV2 Coordinate System: NAD 1983 (2011) UTM Zone 19N Date: 9/8/2021

Figure 3.1-5 Maximum gravel size observed at each station across the SRWF and two nearby reference areas. Measurements were only conducted when CMECS Substrate Group was Gravelly or larger. Figure illustrates the spatial distribution of all boulders observed.

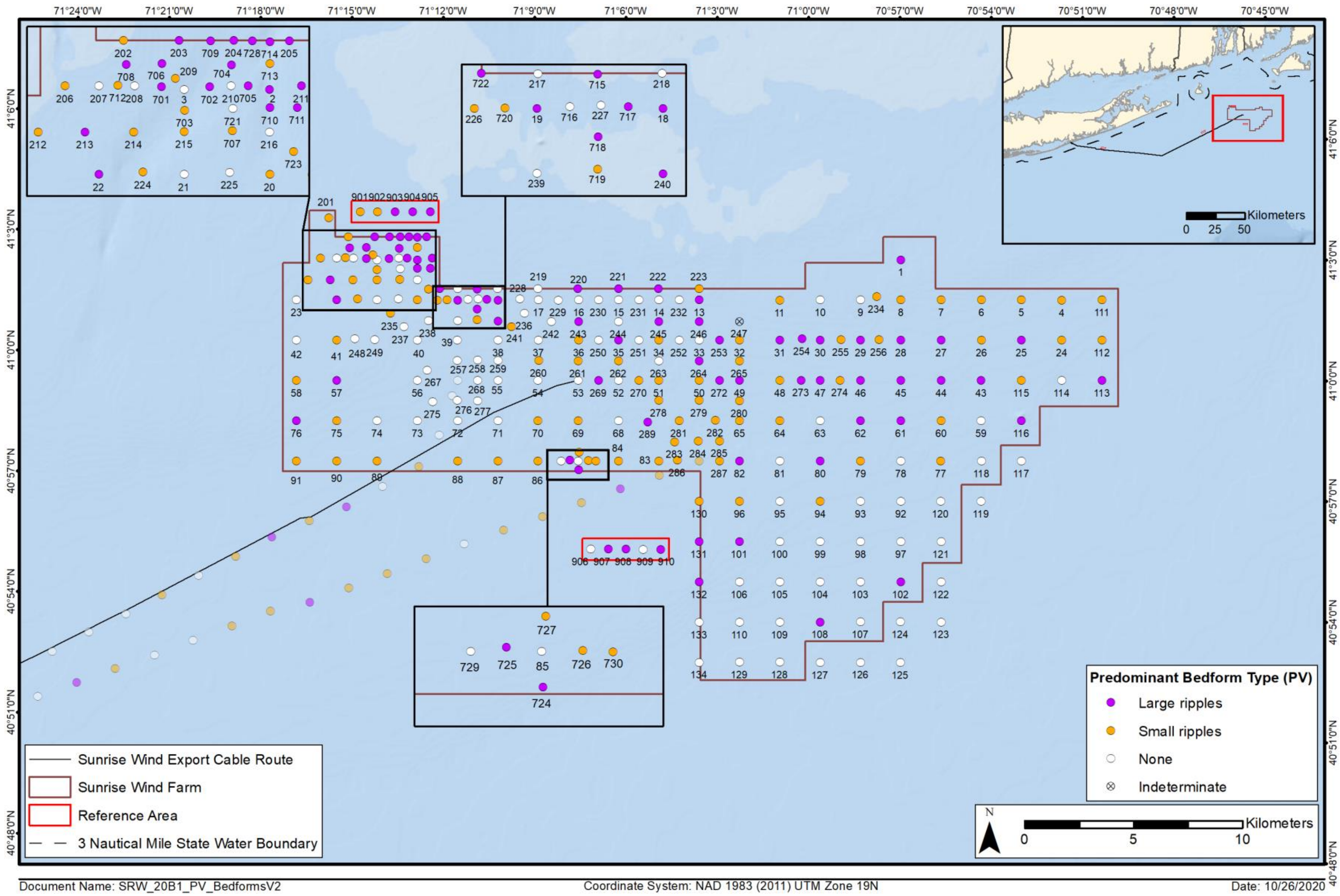


Figure 3.1-6 Small-scale bedforms observed in PV images collected at the SRWF and two nearby reference areas

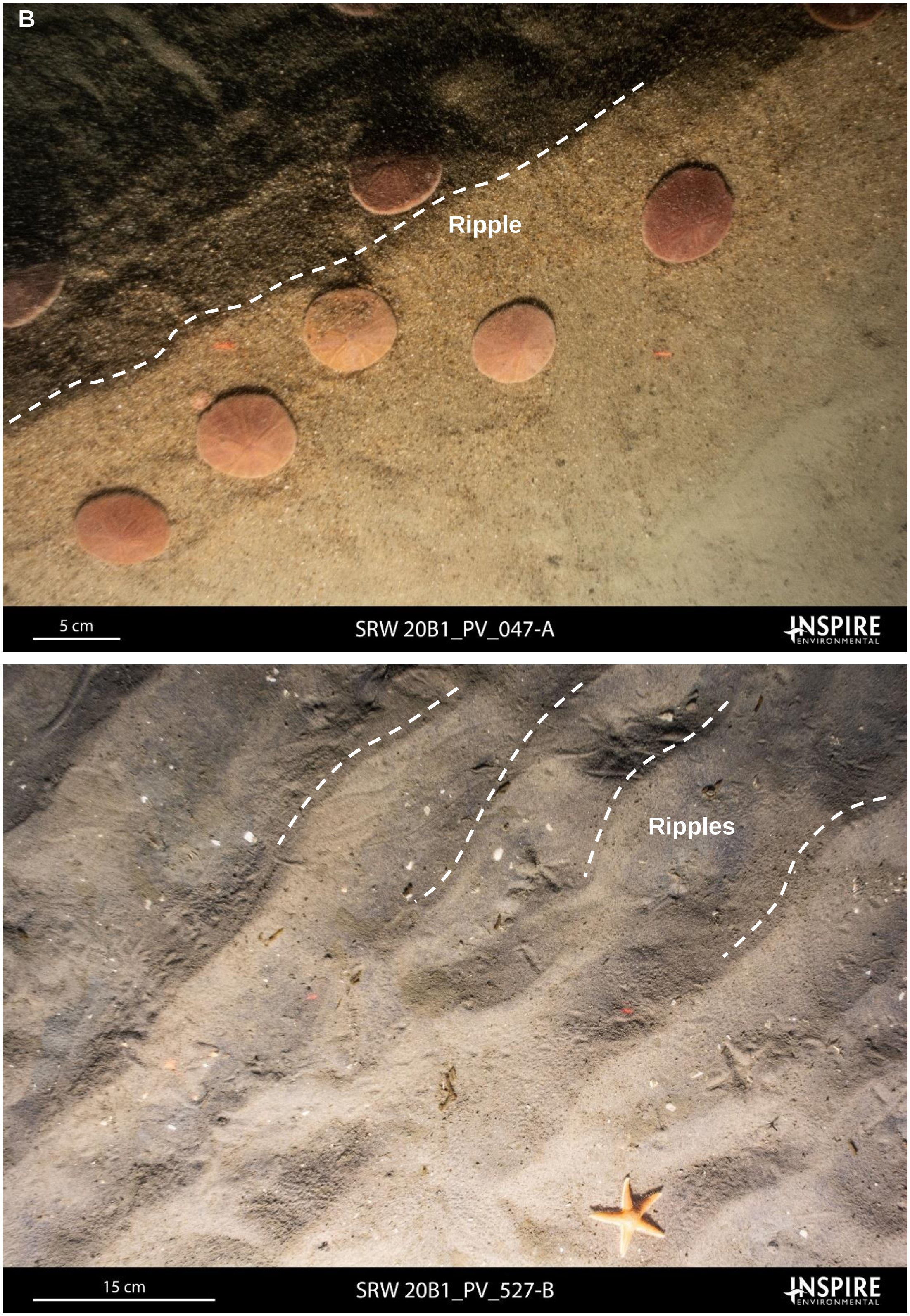


Figure 3.1-7 Representative plan view images depicting (A) large sand ripples (1-3 within the field of view) and; (B) small sand ripples (≥4 within the field of view)

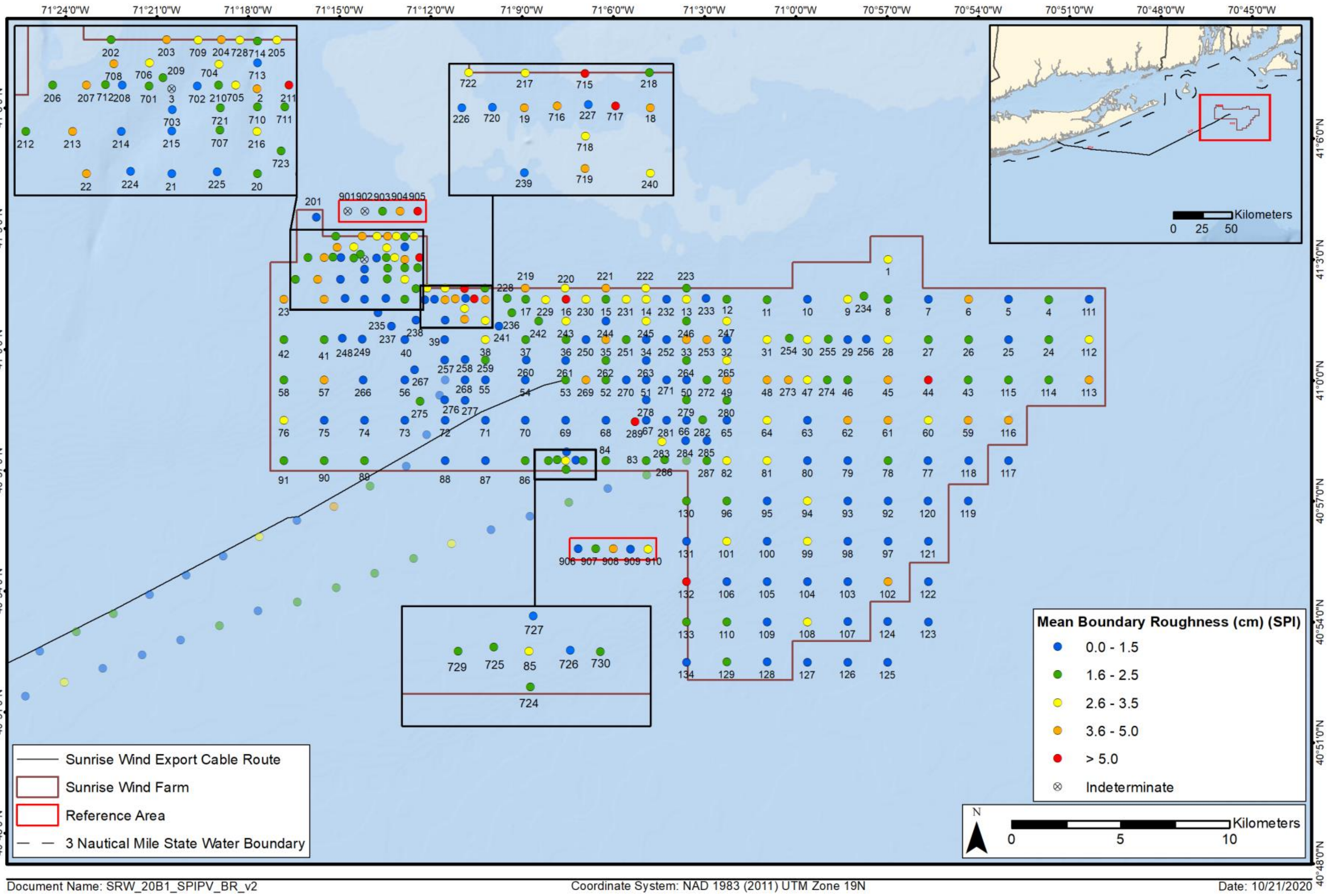


Figure 3.1-8 Mean station small-scale boundary roughness (cm) at the SRWF and two nearby reference areas

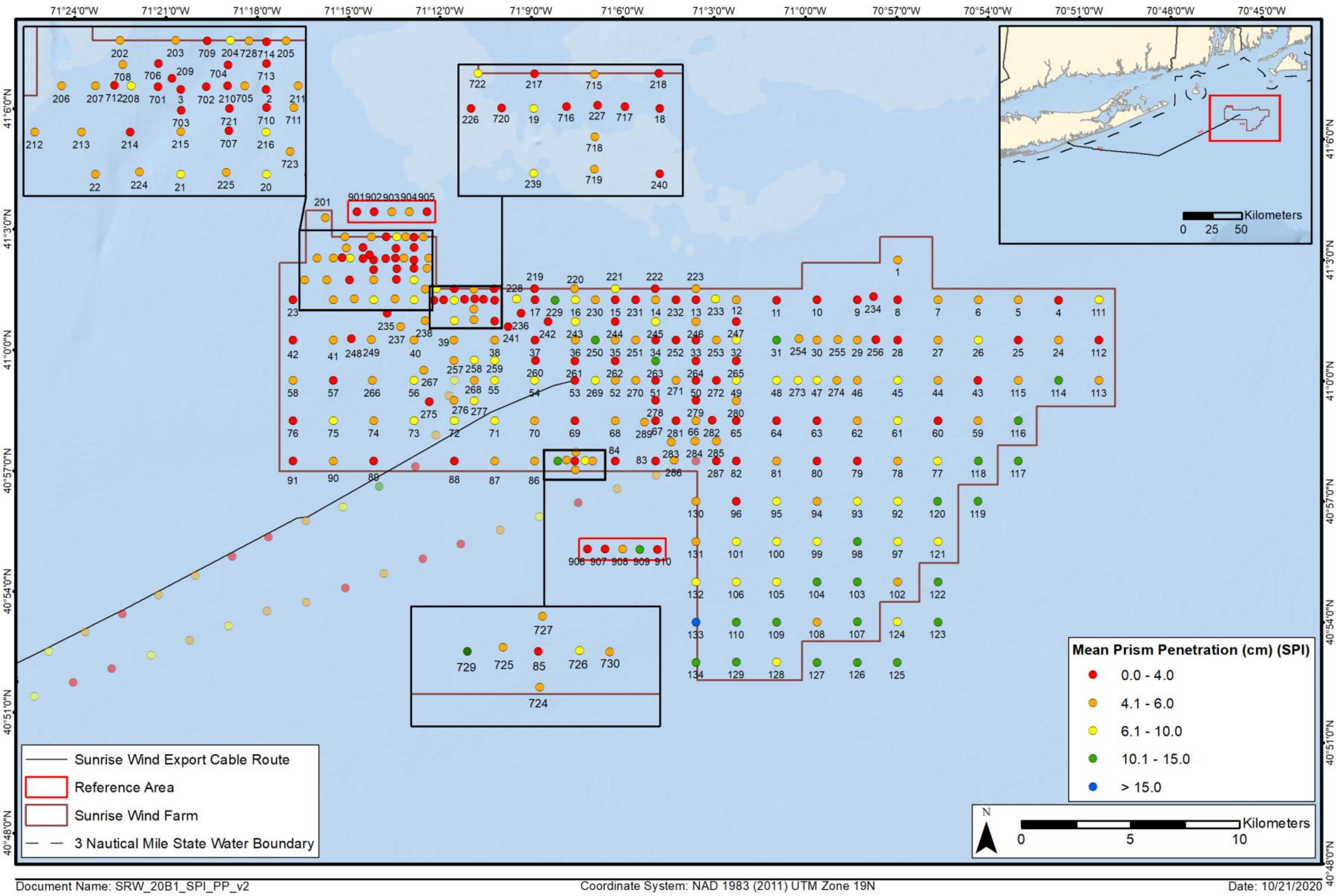


Figure 3.1-9 Mean station camera prism penetration depths (cm) at the SRWF and two nearby reference areas

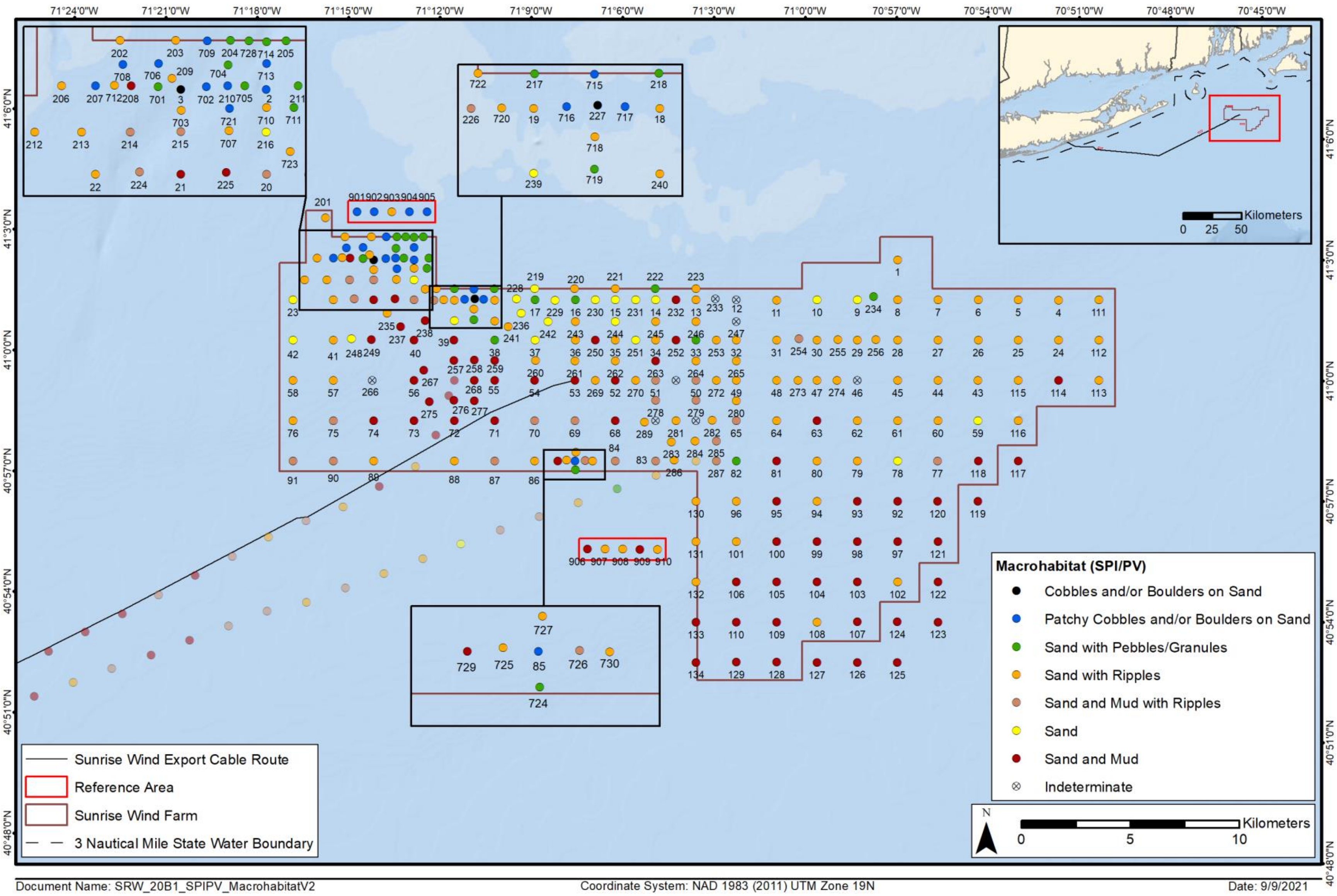


Figure 3.1-10 Macrohabitat type at the SRWF and two nearby reference areas, which was derived from a subset of both SPI and PV parameters including CMECS Substrate Group, maximum gravel size (when present), grain size major mode, and bedform presence

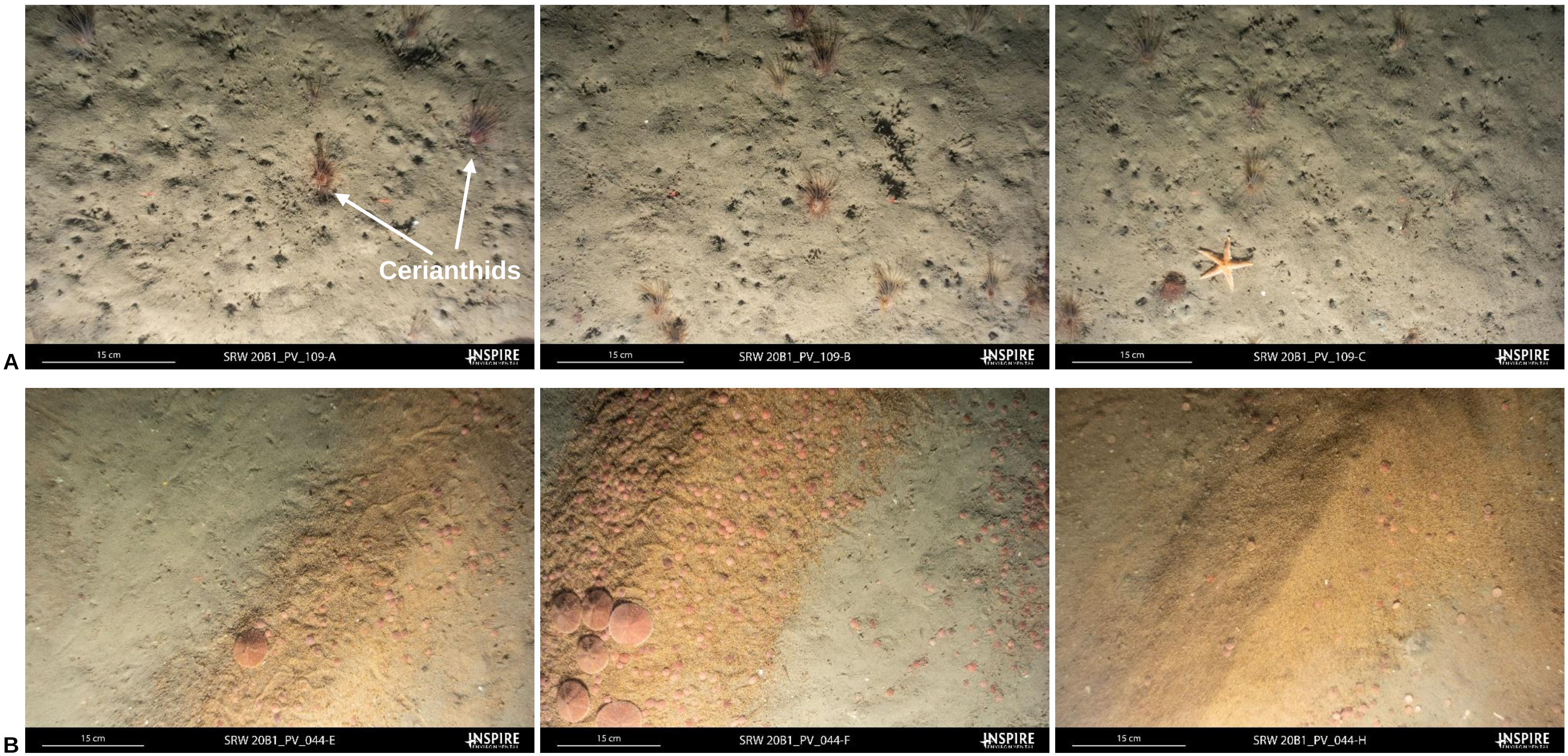


Figure 3.1-11 Representative PV images showing the range of macrohabitat types classified at the SRWF including (A) *sand and mud*, inhabited by burrowing anemones (cerianthids); (B) *sand with ripples*, inhabited by high densities of sand dollars; (C) *sand with pebbles/granules*, inhabited by Tubularia hydroids; (D) *patchy cobbles and/or boulders on sand*, inhabited by attached epifauna, including Tubularia hydroids, bryozoa, and sea stars; and (E) *cobbles and/or boulders on sand*, inhabited by a fish and attached epifauna, including bryozoa, hydroids, burrowing anemones (cerianthids), and sea stars

C
D

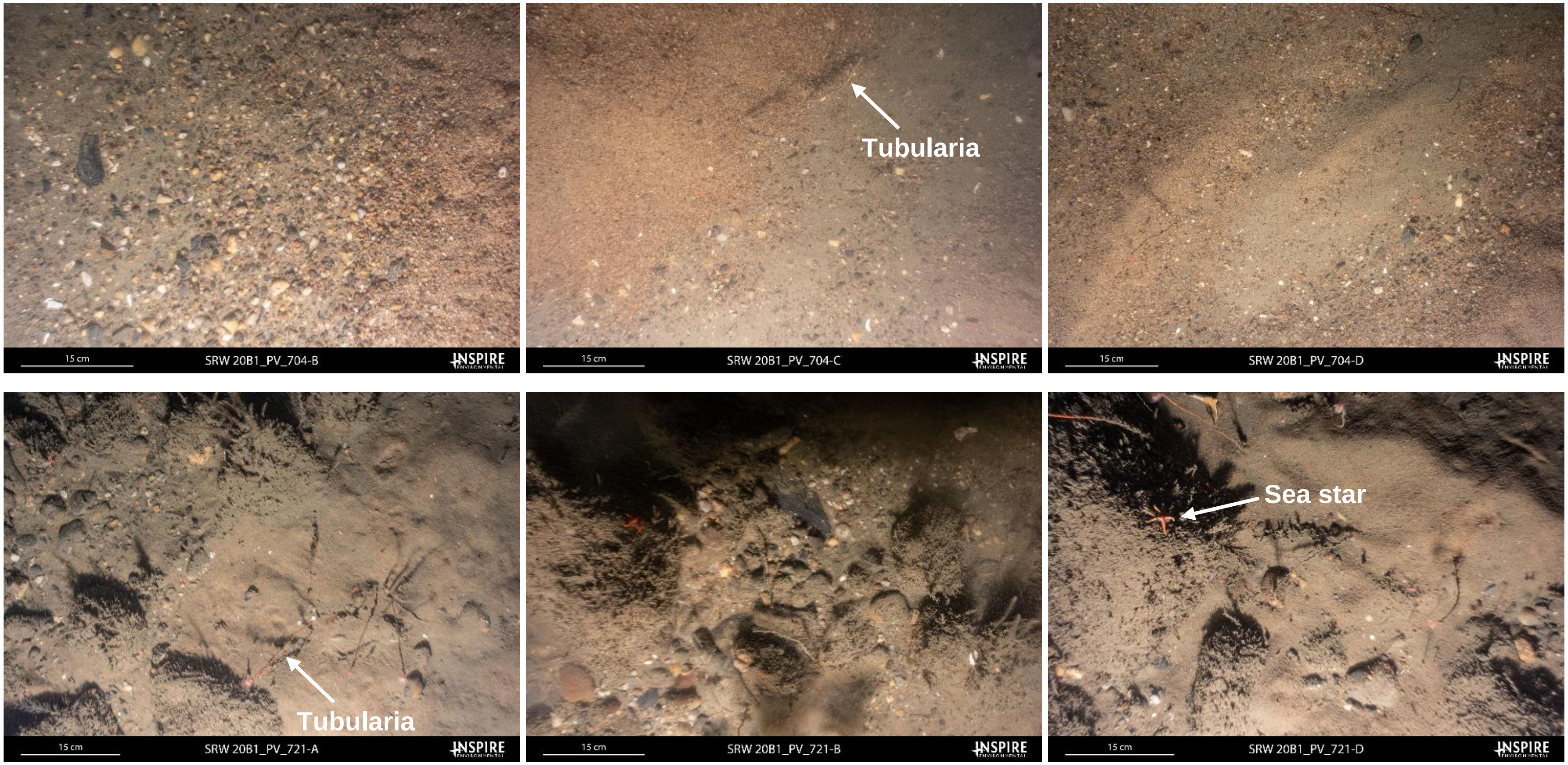


Figure 3.1-11 continued Representative PV images showing the range of macrohabitat types classified at the SRWF including (A) *sand and mud*, inhabited by burrowing anemones (cerianthids); (B) *sand with ripples*, inhabited by high densities of sand dollars; (C) *sand with pebbles/granules*, inhabited by Tubularia hydroids; (D) *patchy cobbles and/or boulders on sand*, inhabited by attached epifauna, including Tubularia hydroids, bryozoa, and sea stars; and (E) *cobbles and/or boulders on sand*, inhabited by a fish and attached epifauna, including bryozoa, hydroids, burrowing anemones (cerianthids), and sea stars

E

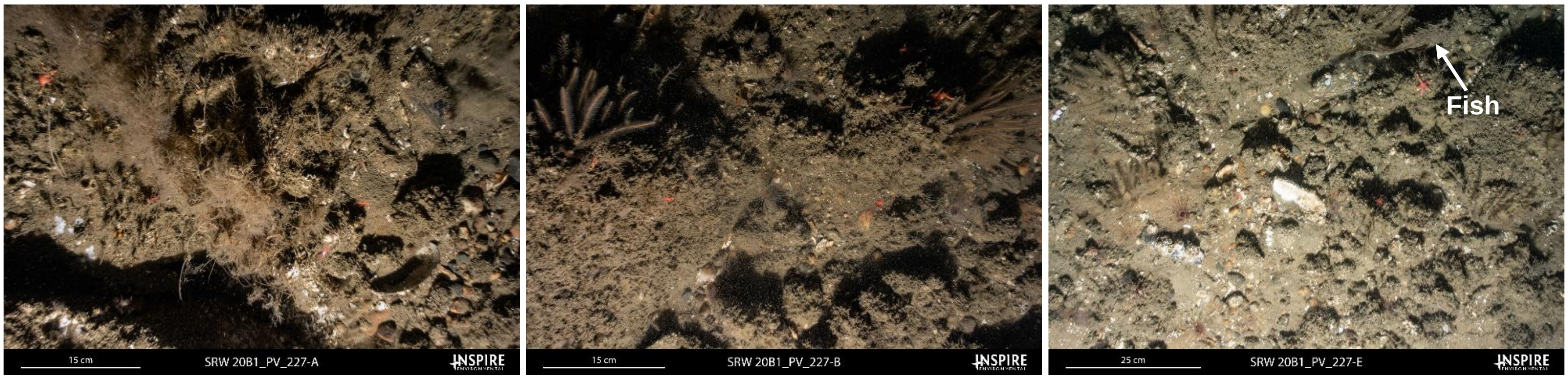


Figure 3.1-11 continued Representative PV images showing the range of macrohabitat types classified at the SRWF including (A) *sand and mud*, inhabited by burrowing anemones (cerianthids); (B) *sand with ripples*, inhabited by high densities of sand dollars; (C) *sand with pebbles/granules*, inhabited by Tubularia hydroids; (D) *patchy cobbles and/or boulders on sand*, inhabited by attached epifauna, including Tubularia hydroids, bryozoa, and sea stars; and (E) *cobbles and/or boulders on sand*, inhabited by a fish and attached epifauna, including bryozoa, hydroids, burrowing anemones (cerianthids), and sea stars

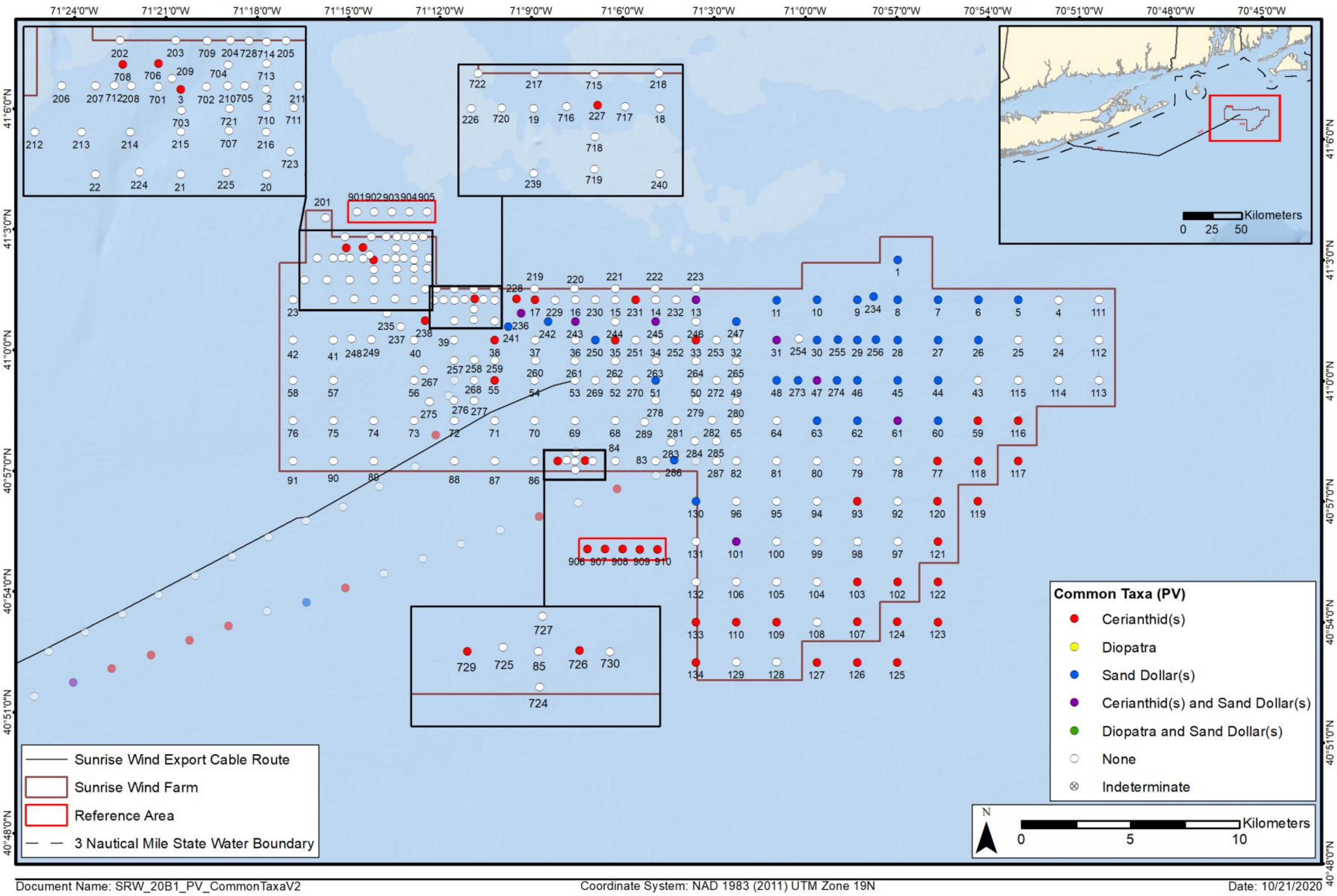


Figure 3.1-12 Distribution of burrowing anemones (ceranthids), sand dollars, and sabellid worms, three commonly observed taxa at the SRWF and two nearby reference areas

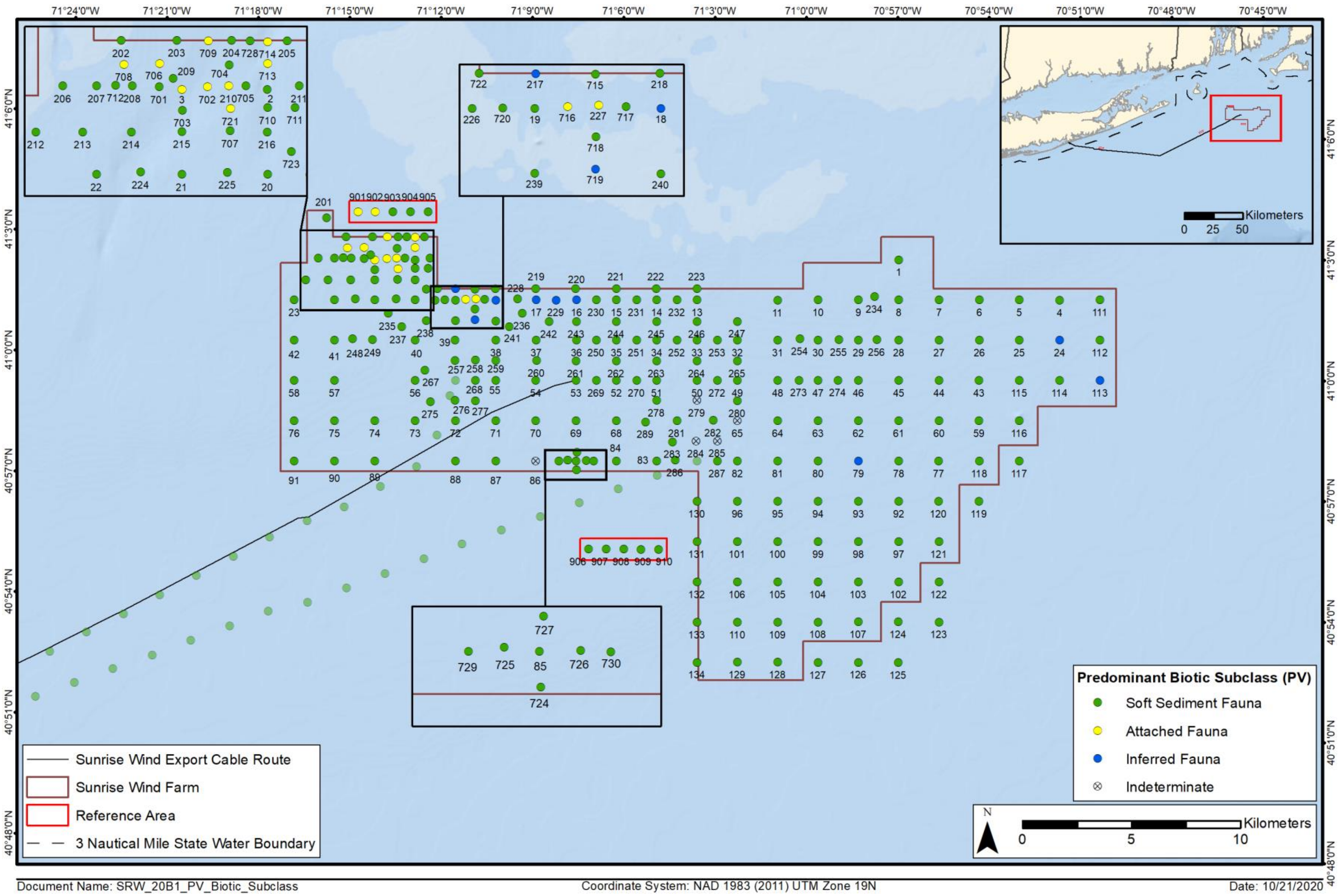


Figure 3.1-13 Predominant CMECS Biotic Subclass at the SRWF and two nearby reference areas

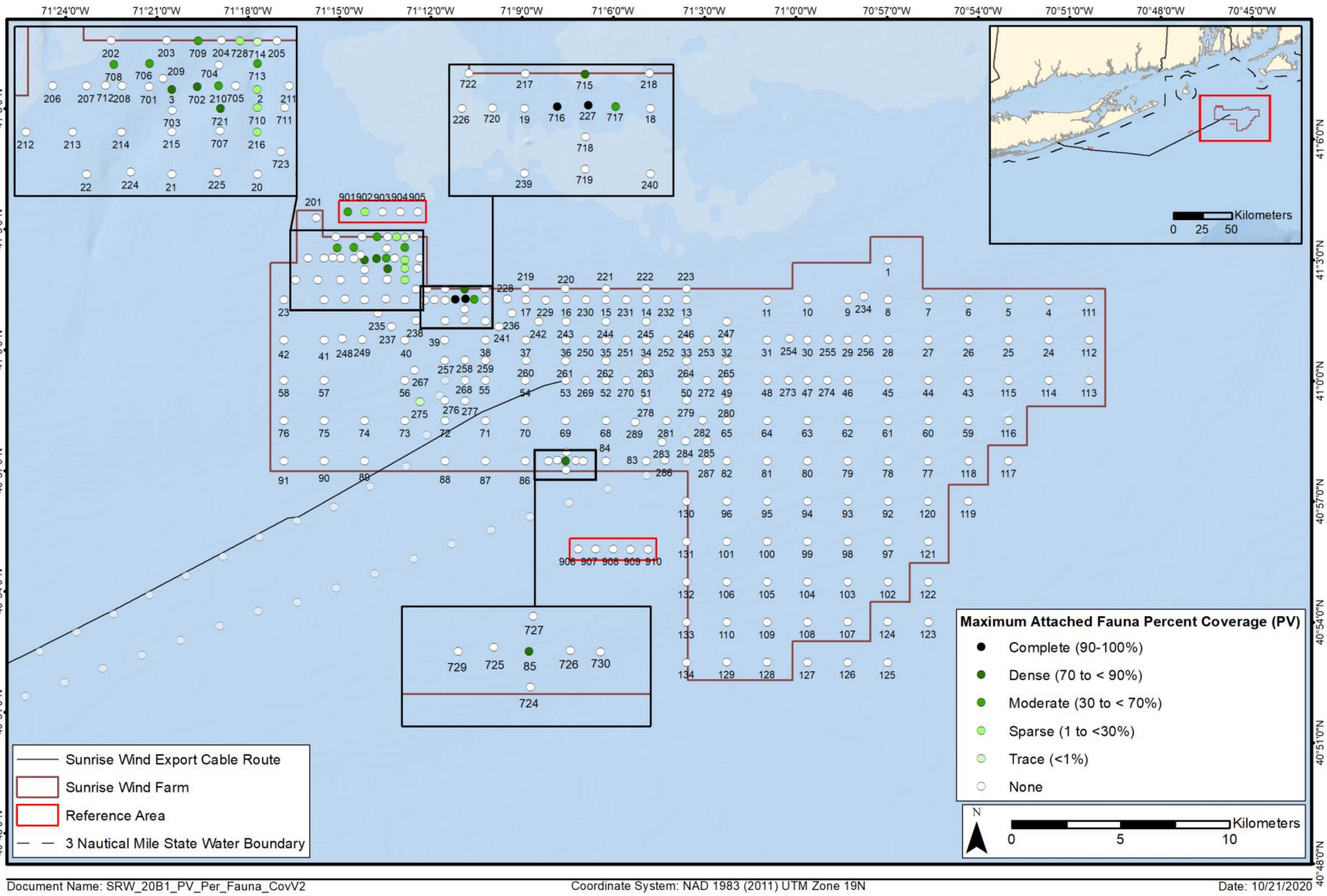


Figure 3.1-14 Maximum Attached Fauna Percent Cover (CMECS Percent Cover Modifier) at the SRWF and two nearby reference areas

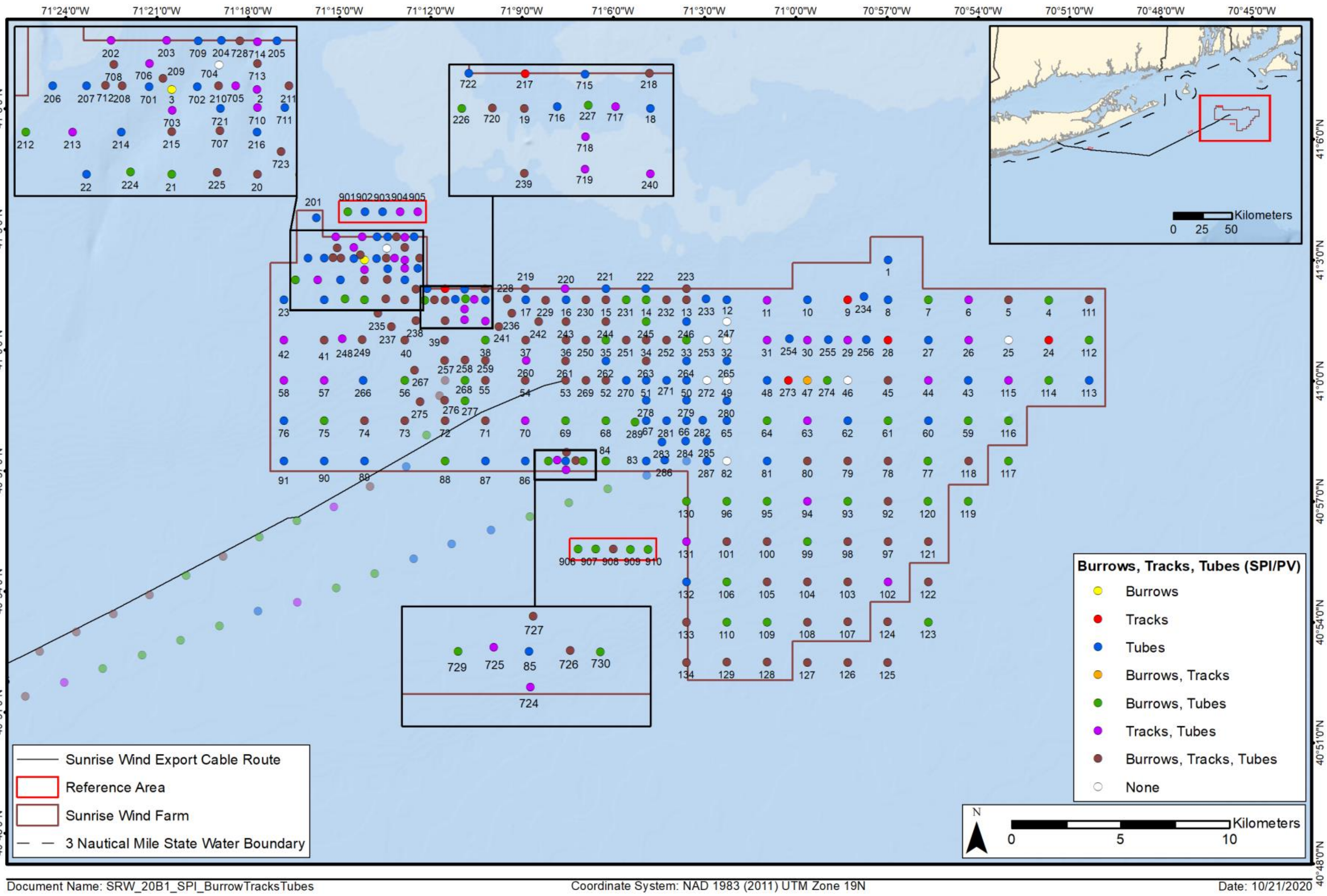


Figure 3.1-15 Occurrences of burrows, tracks, and tubes at the SRWF and two nearby reference areas

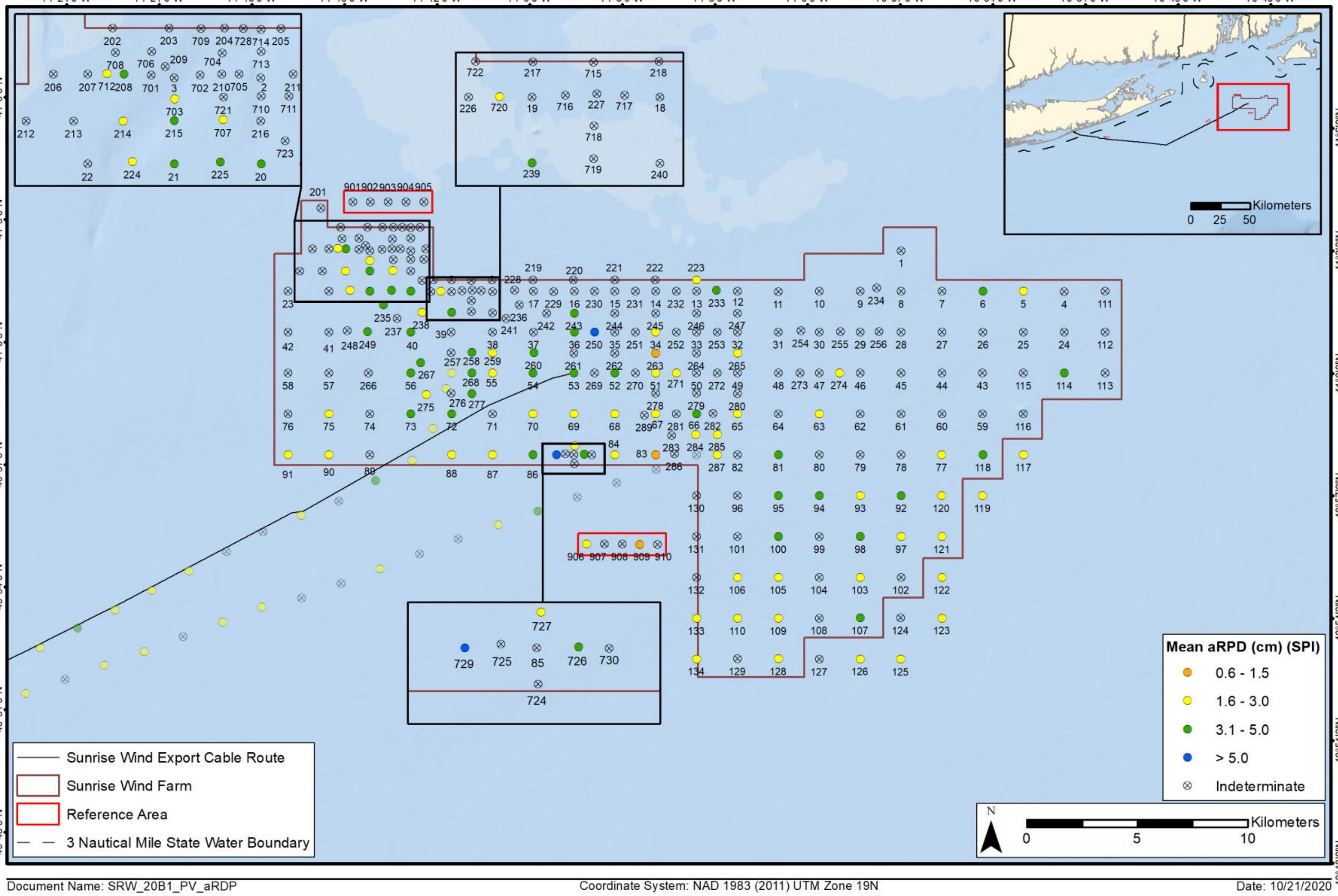


Figure 3.1-16 Mean station aRPD depth (cm) observed in SPI at the SRWF and two nearby reference areas

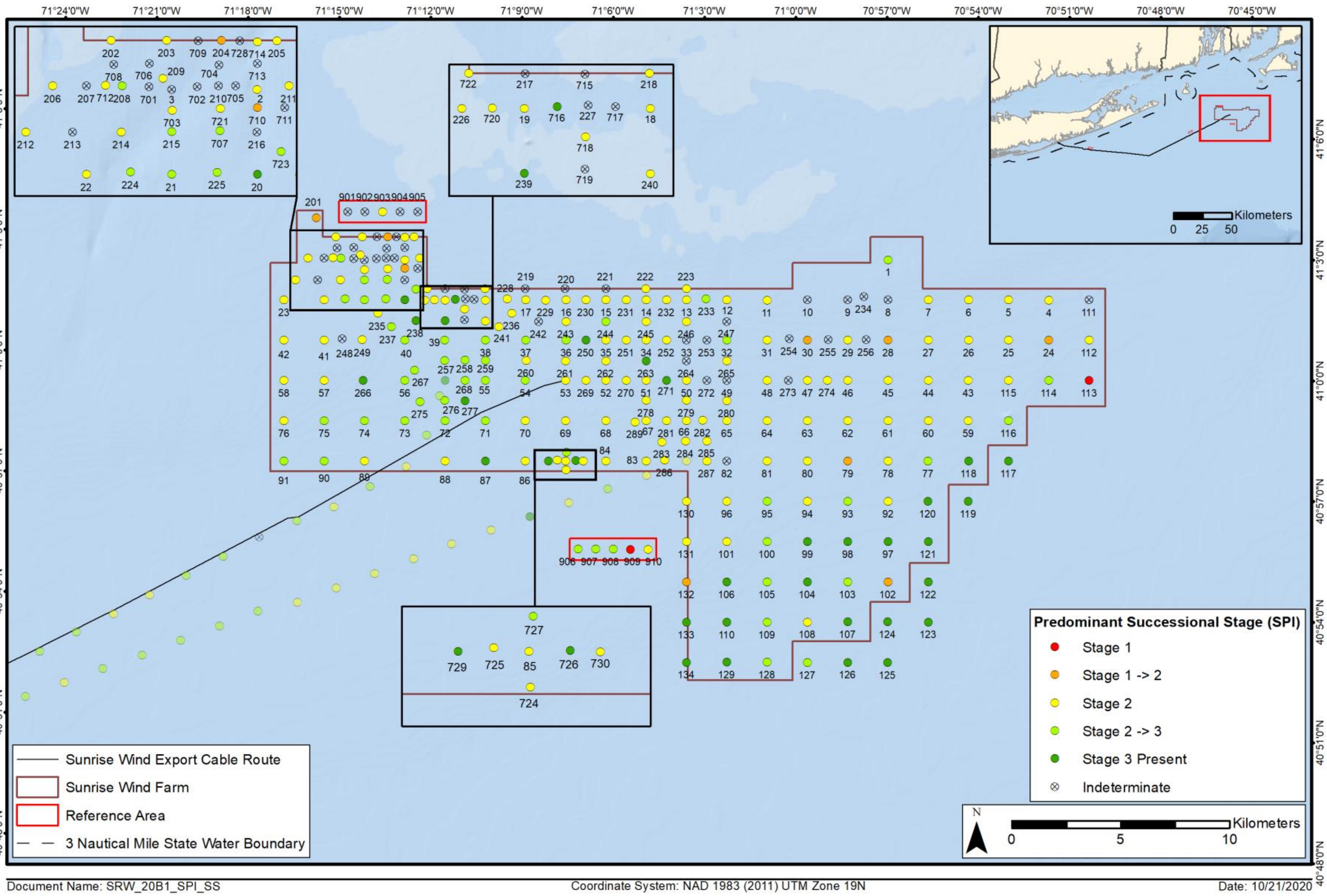


Figure 3.1-17 Successional Stage observed at the SRWF and two nearby reference areas, the most advanced Successional Stage across replicates is shown for each station

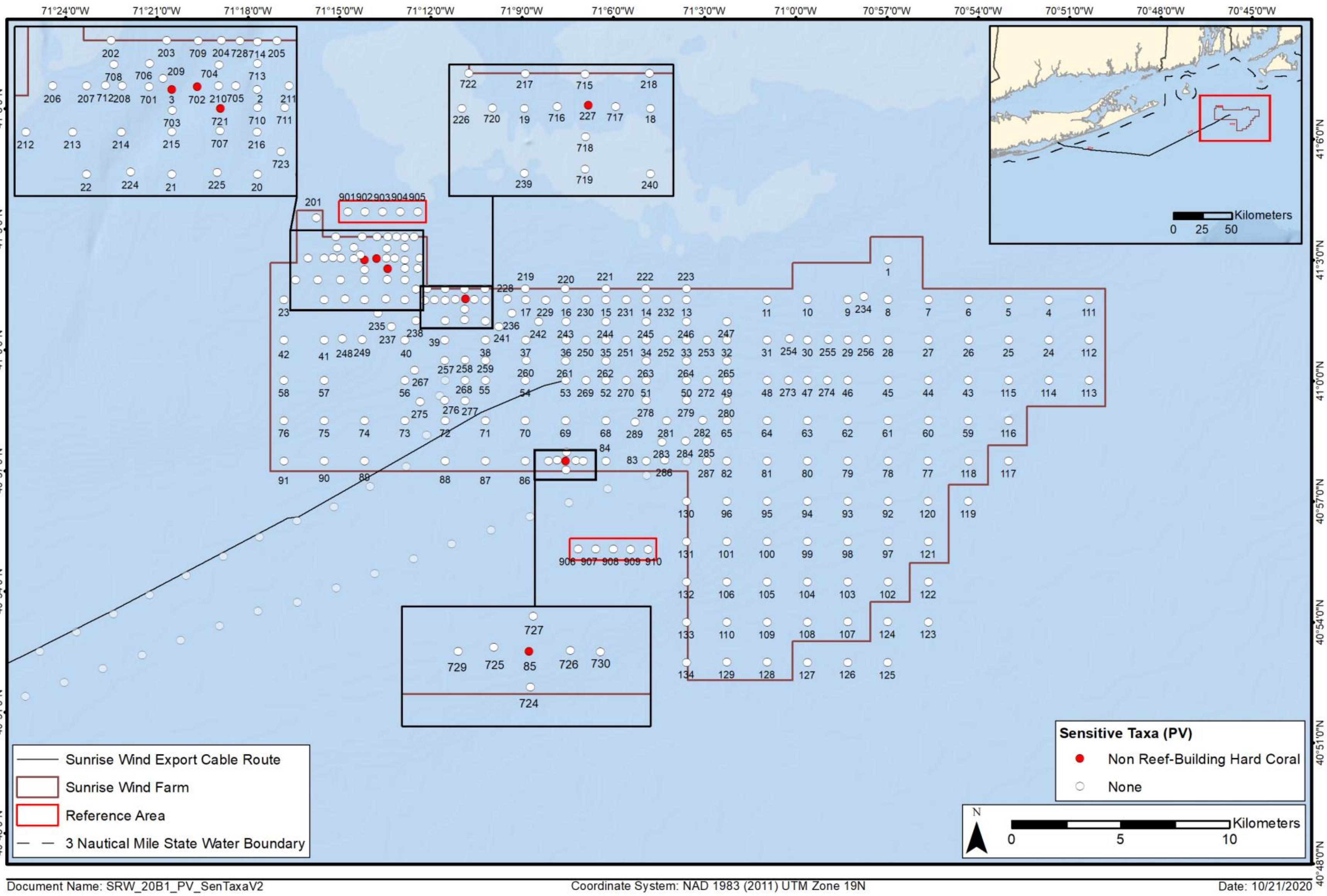


Figure 3.1-18 Sensitive taxa, the northern star coral (*Astrangia* sp.), present at five stations within the SRWF

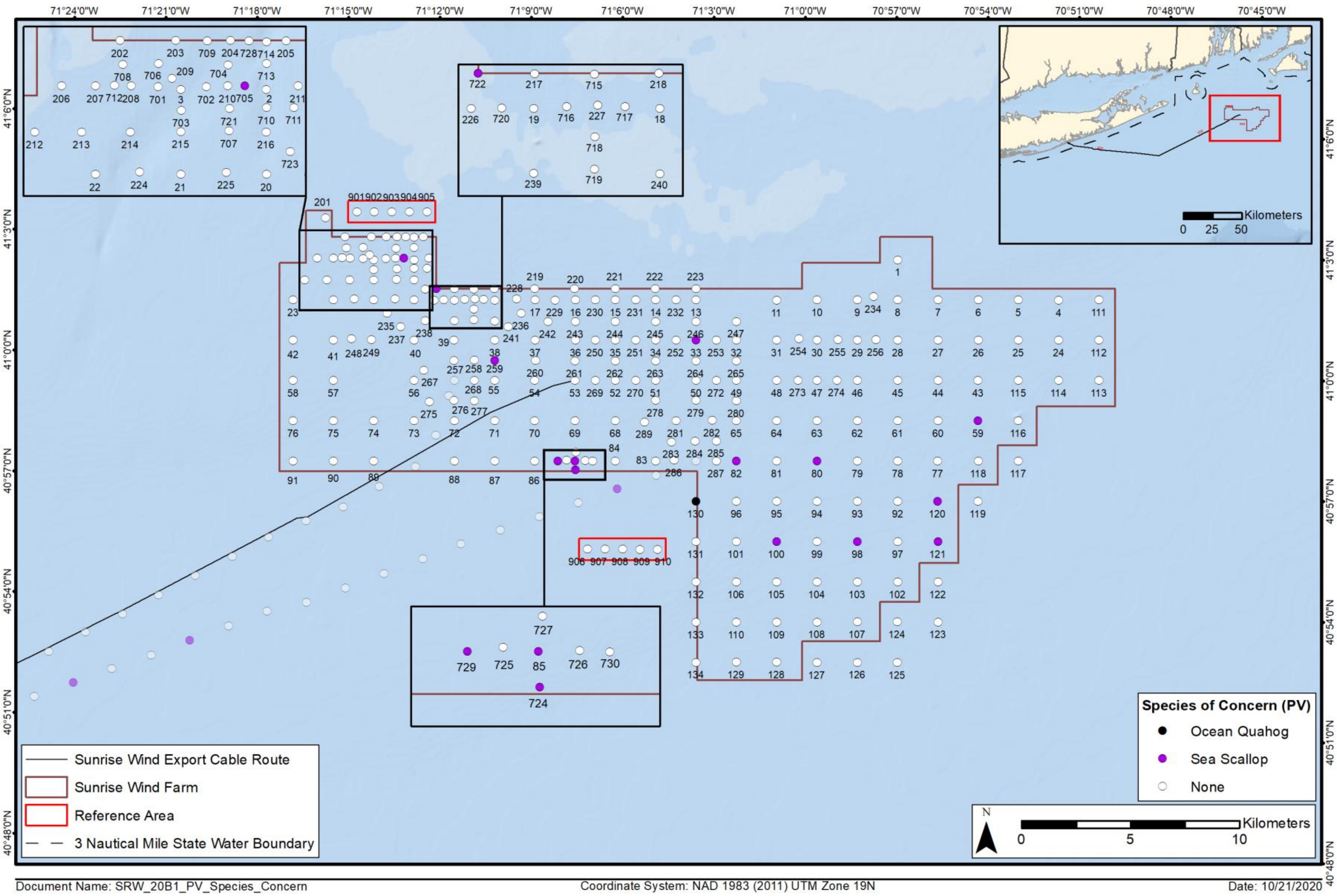


Figure 3.1-19 Species of concern, including the sea scallop (*Placopecten magellanicus*) and ocean quahog (*Arctica islandica*), at the SRWF. No species of concern were observed at any of the reference areas.

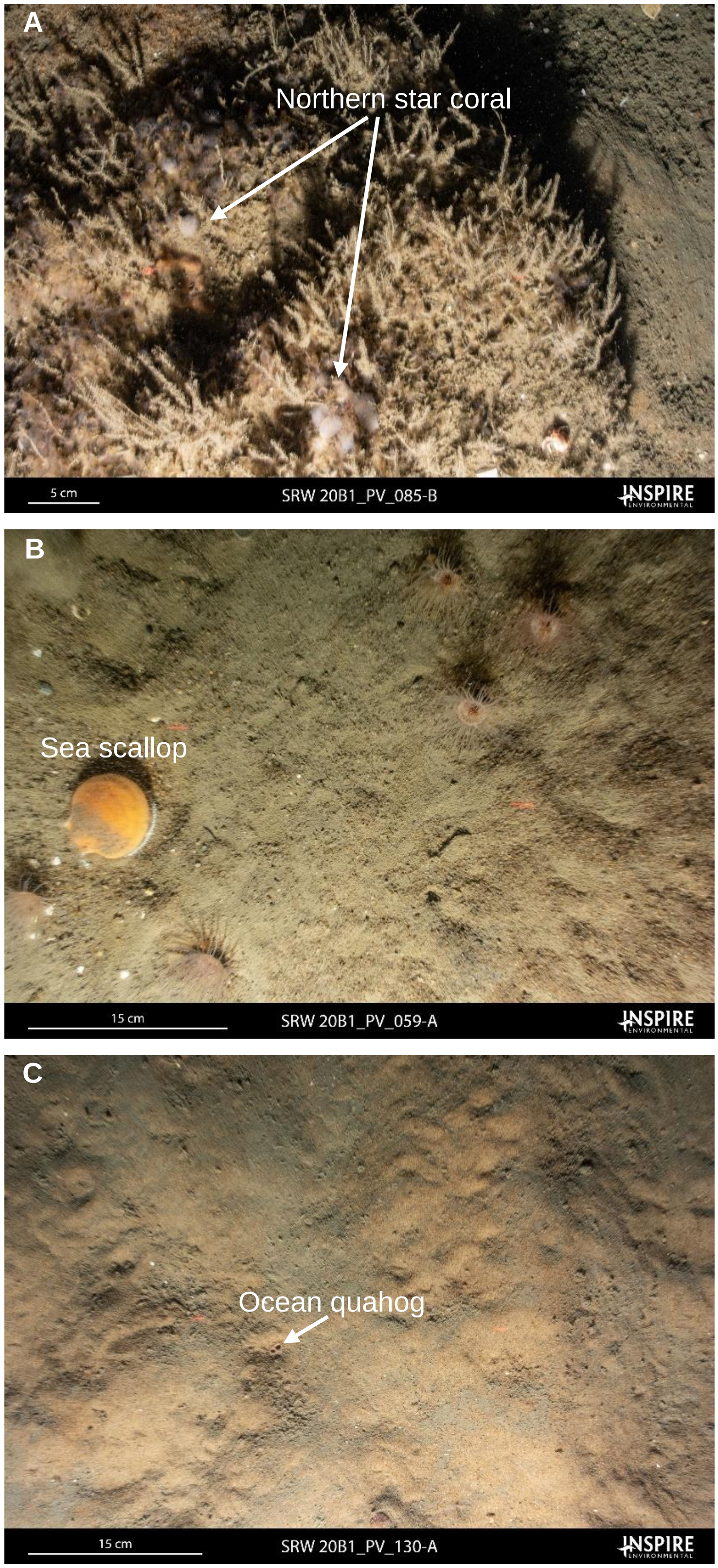


Figure 3.1-20 Representative PV images depicting (A) the northern star coral, *Astrangia* sp., a non reef-building hard coral and a sensitive species in the area; (B) the sea scallop (*Placopecten magellanicus*), a species of concern; and (C) the siphon of an Ocean quahog (*Arctica islandica*), a species of concern

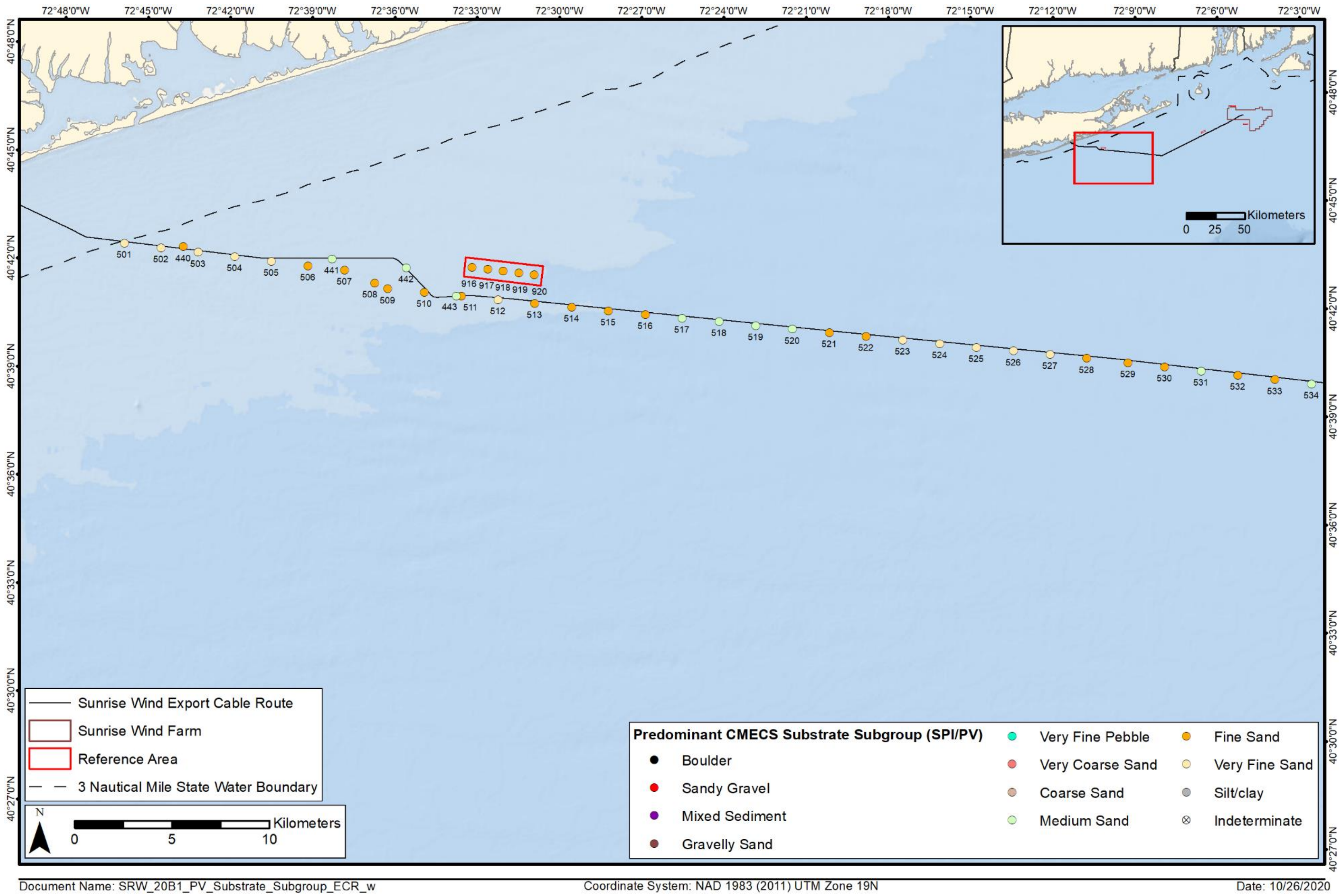


Figure 3.2-1 Predominant CMECS Substrate Subgroup determined from SPI and PV images along the western portion of the SRWEC–OCS and a nearby reference area

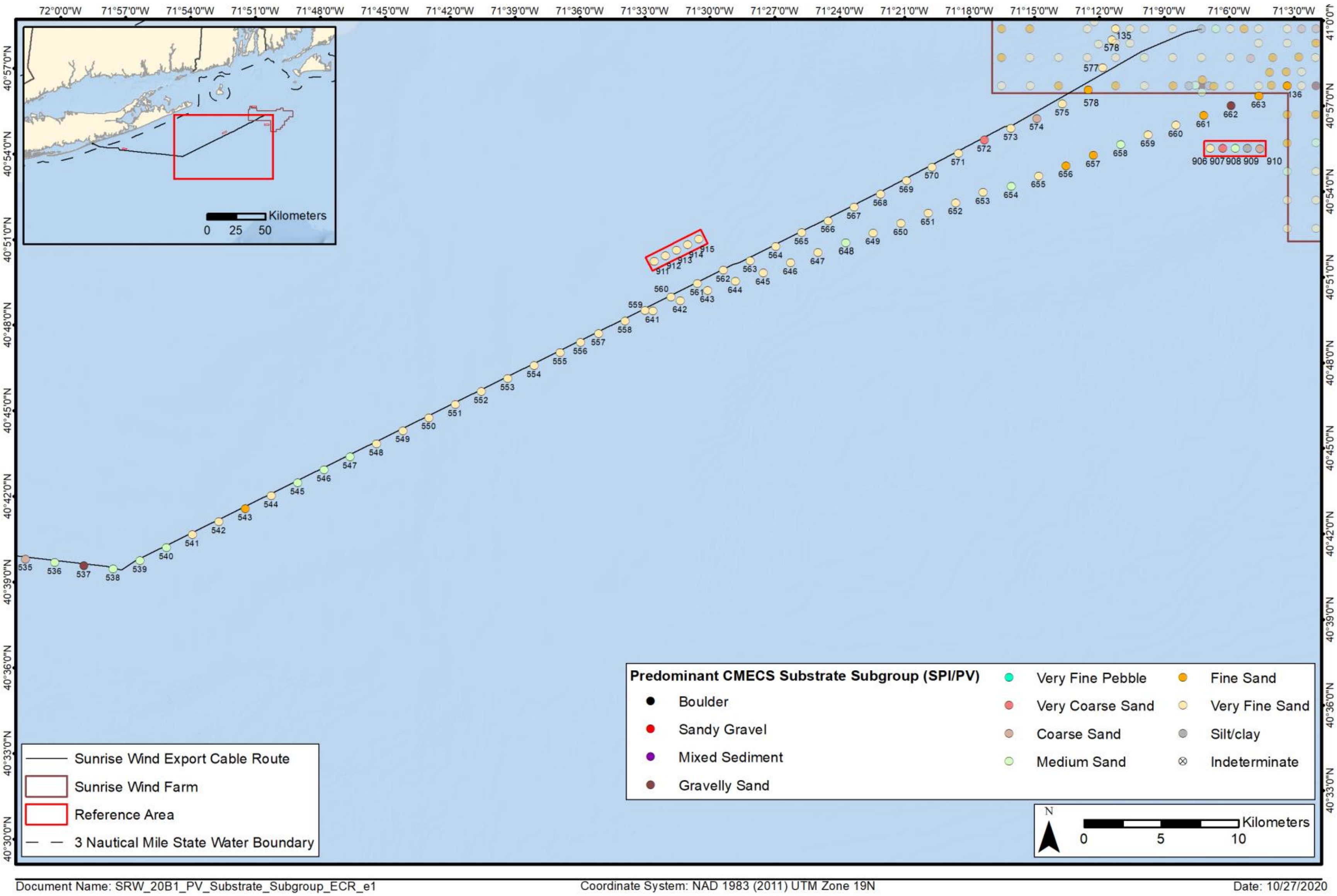


Figure 3.2-2 Predominant CMECS Substrate Subgroup determined from SPI and PV images along the eastern portion of the SRWEC–OCS and a nearby reference area

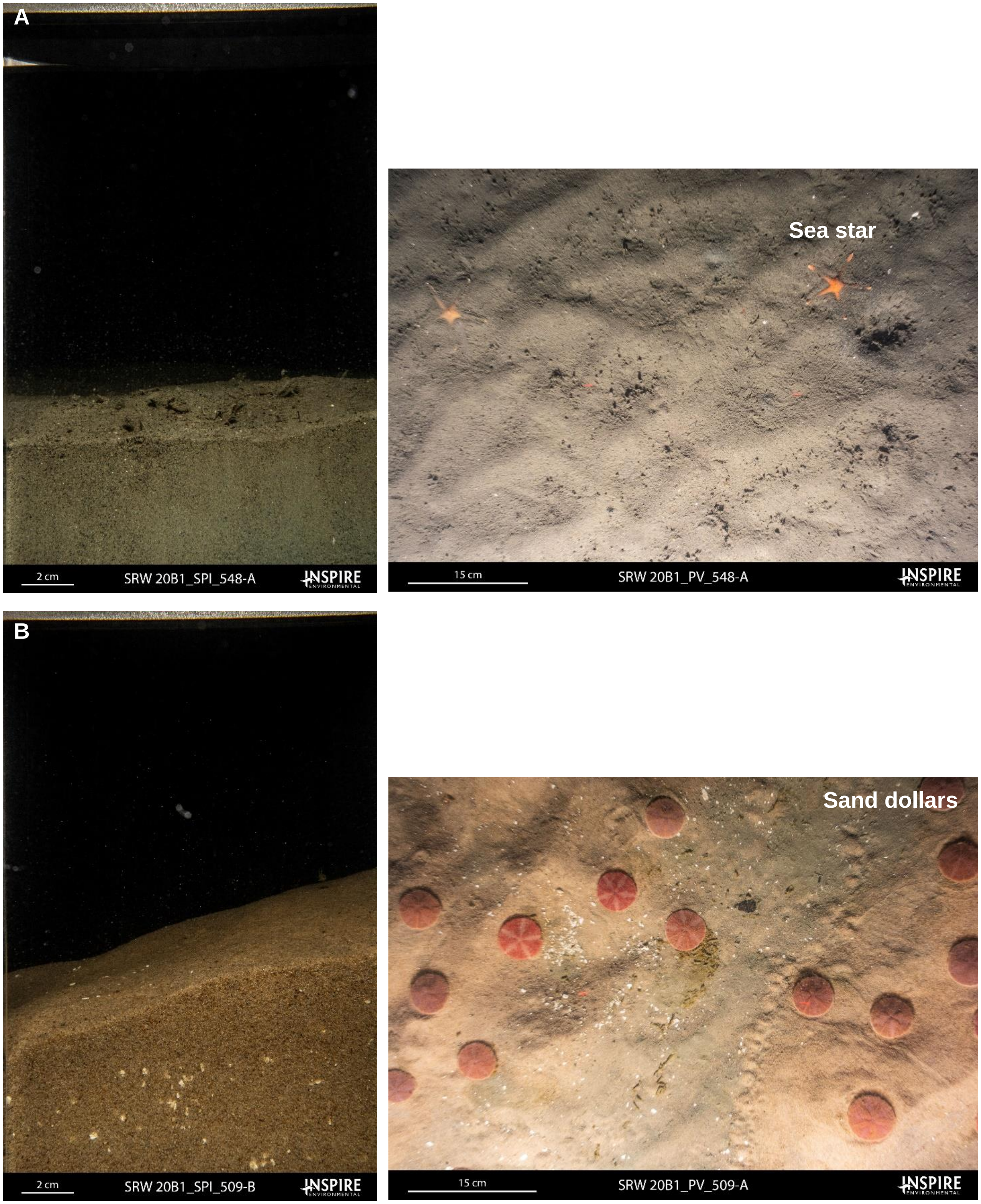


Figure 3.2-3 Representative SPI and plan view images depicting the range of CMECS Substrate Subgroups along the SRWEC–OCS; (A) Very Fine Sand; (B) Fine Sand; (C) Medium Sand; (D) Gravelly Sand

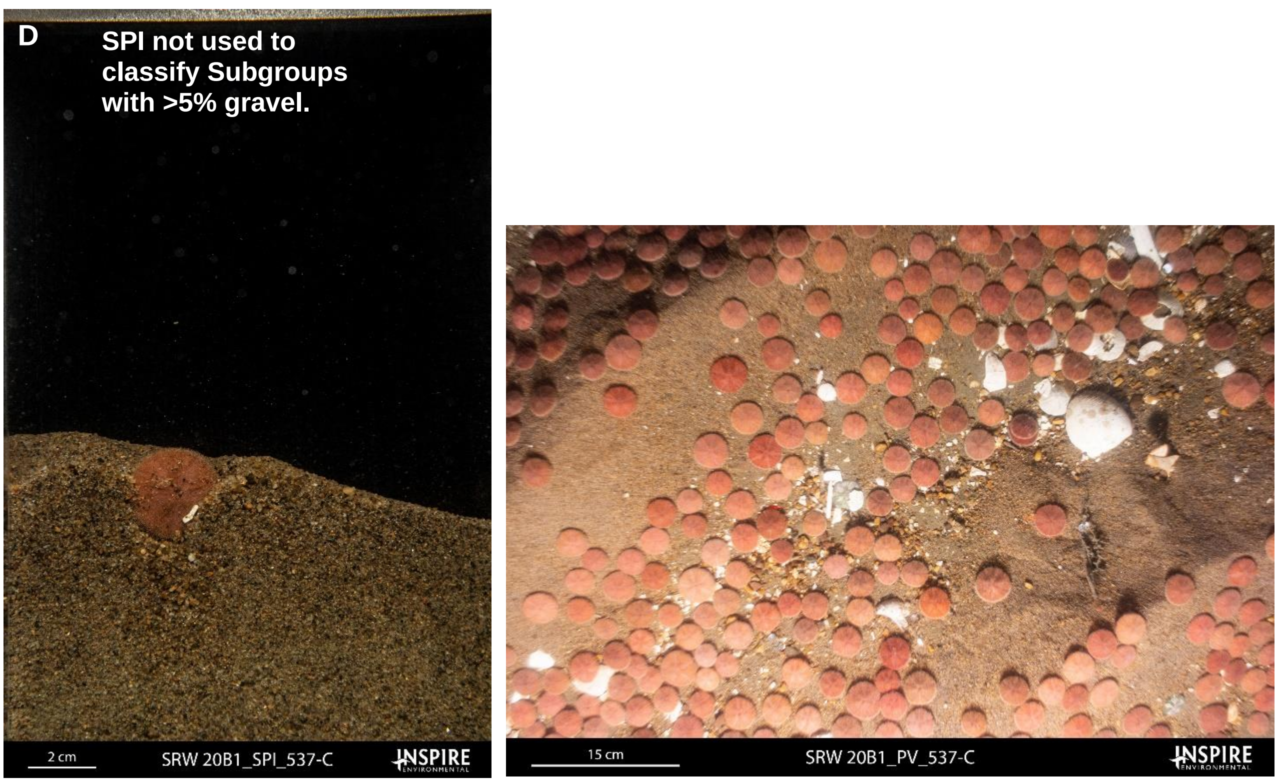


Figure 3.2-3 continued Representative SPI and plan view images depicting the range of CMECS Substrate Subgroups along the SRWEC–OCS; (A) Very Fine Sand; (B) Fine Sand; (C) Medium Sand; (D) Gravelly Sand

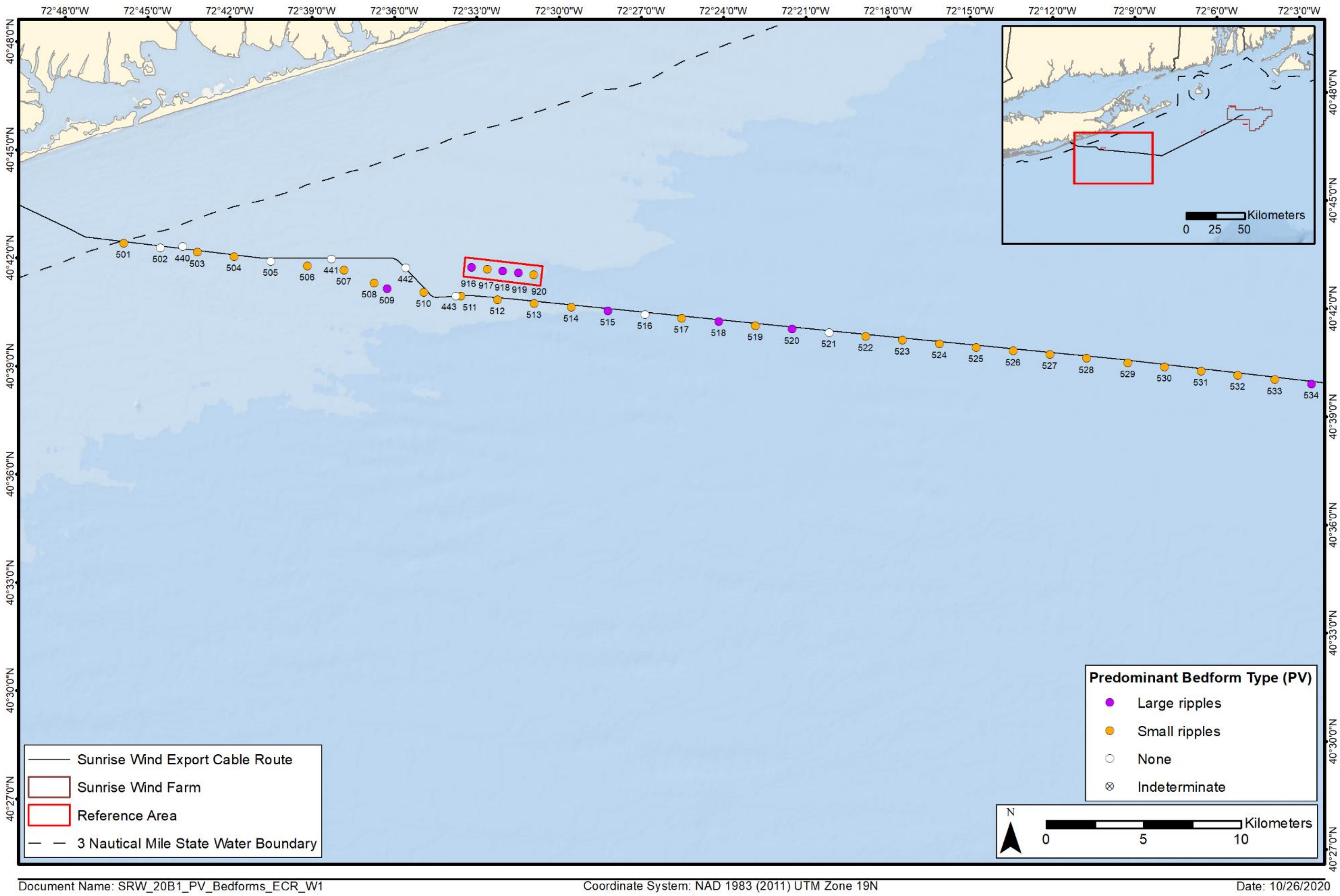


Figure 3.2-4 Small-scale bedforms observed in PV images collected along the western portion of the SRWEC–OCS and a nearby reference area

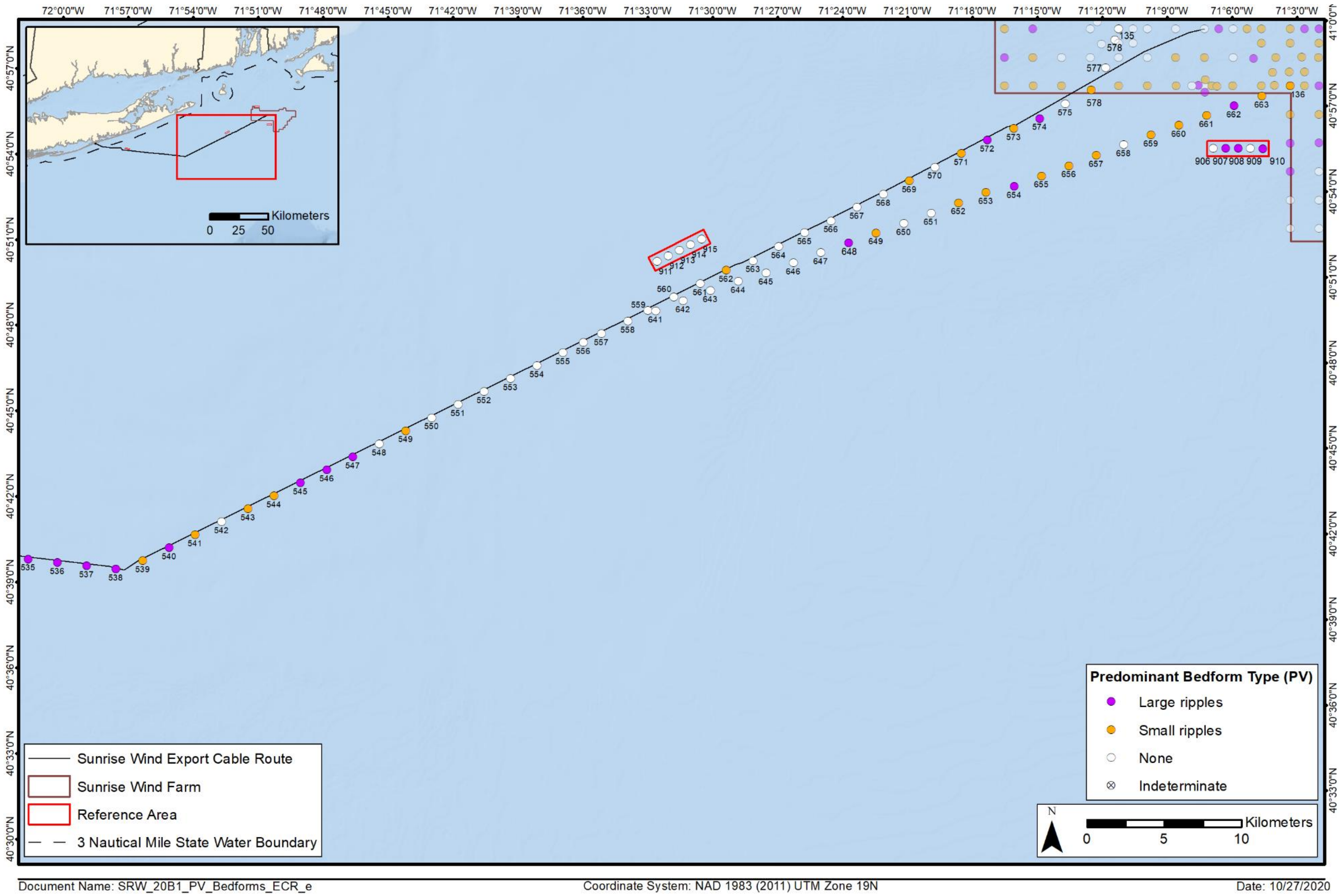


Figure 3.2-5 Small-scale bedforms observed in PV images collected along the eastern portion of the SRWEC–OCS and a nearby reference area

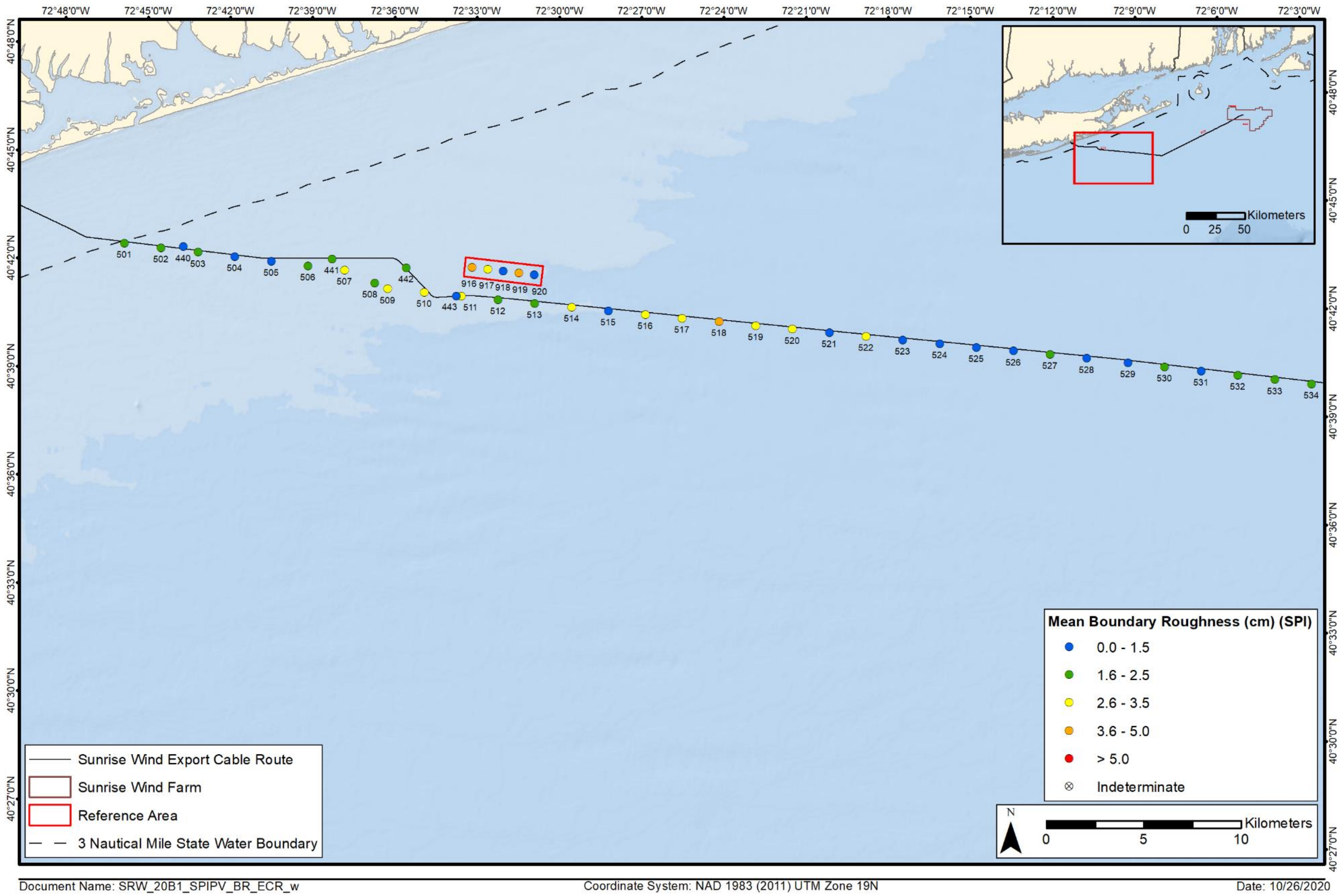


Figure 3.2-6 **Mean station small-scale boundary roughness (cm) along the western portion of the SRWEC–OCS and a nearby reference area**

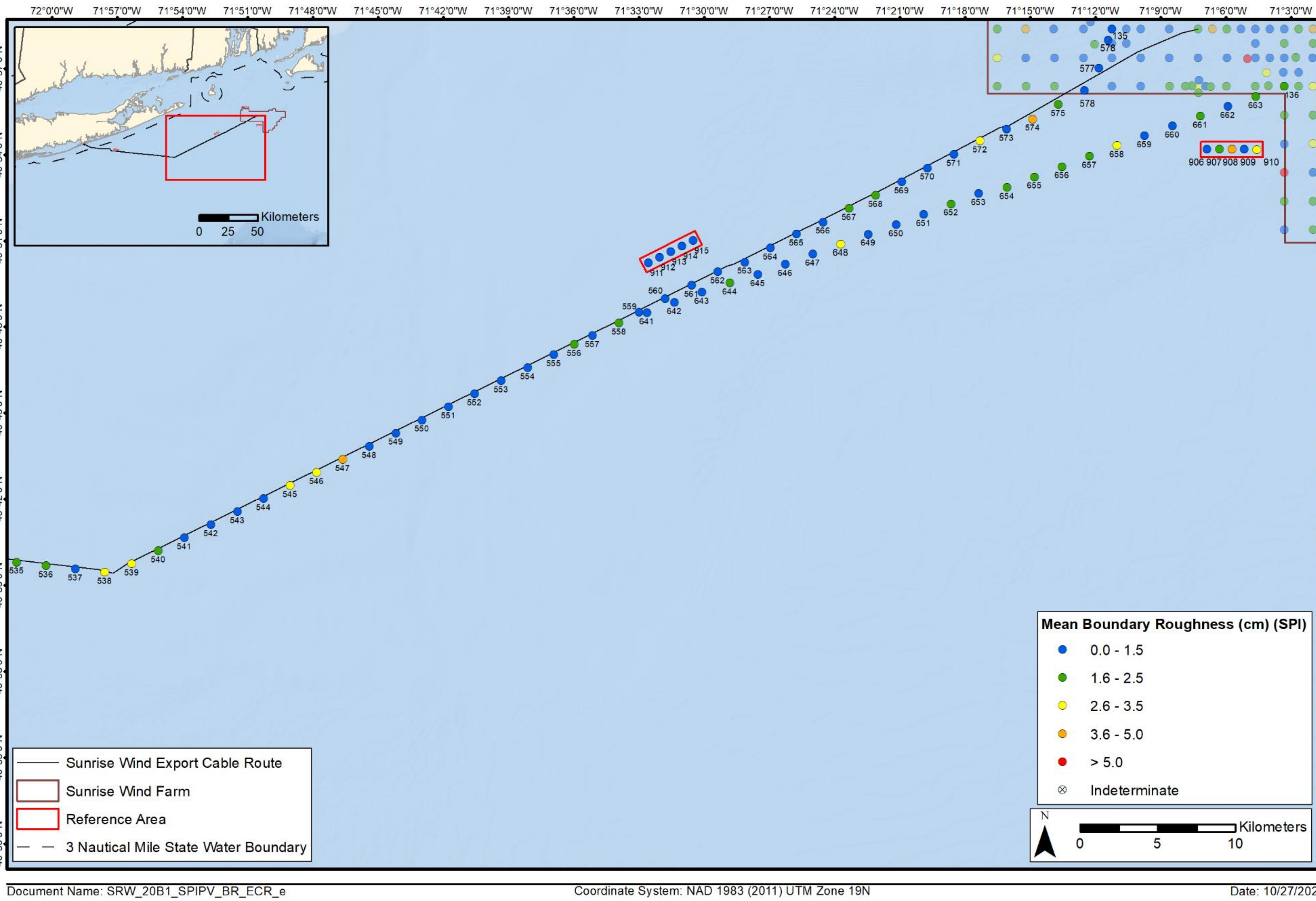


Figure 3.2-7 Mean station small-scale boundary roughness (cm) along the eastern portion of the SRWEC–OCS and a nearby reference area

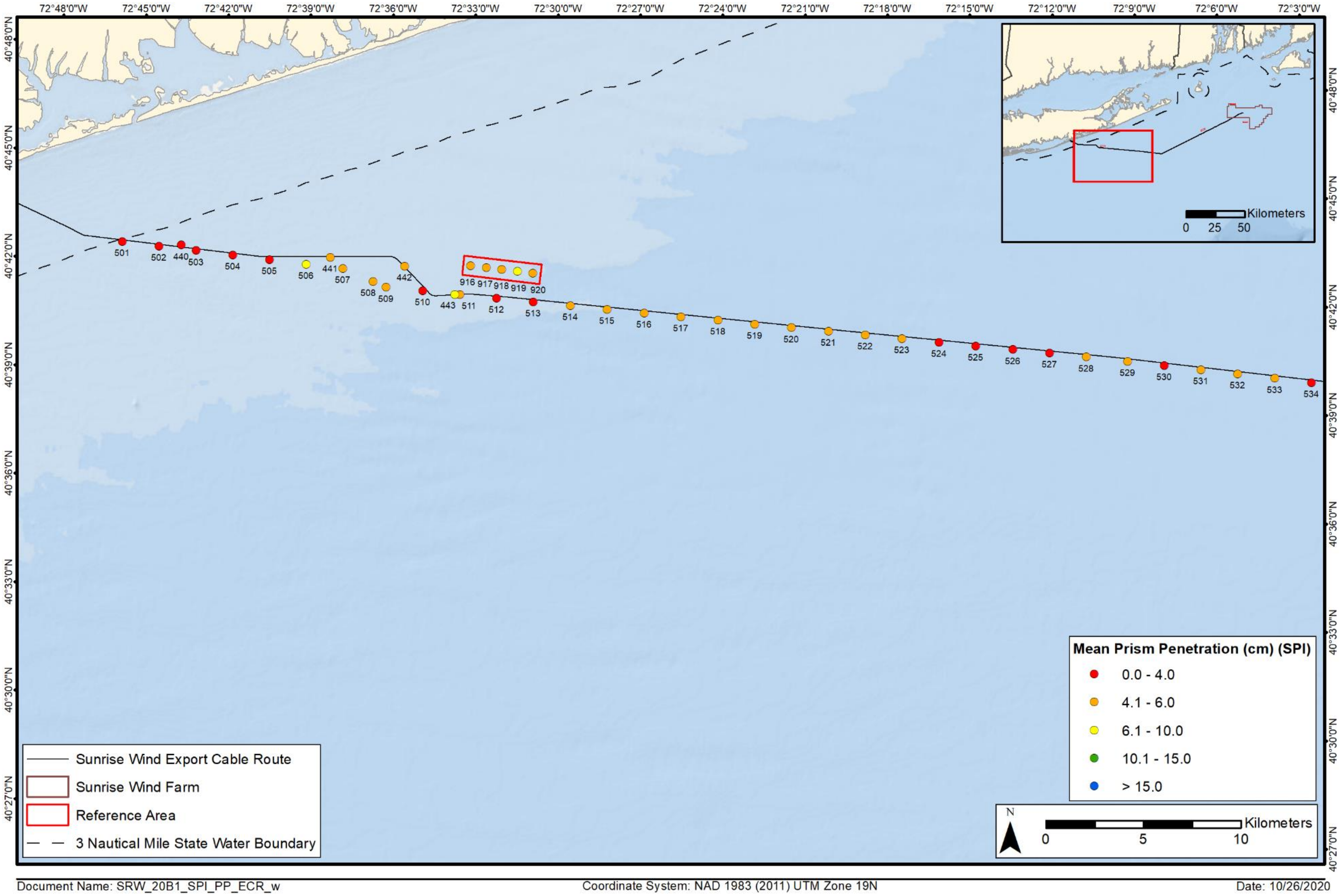


Figure 3.2-8 Mean station camera prism penetration depths (cm) along the western portion of the SRWEC–OCS and a nearby reference area

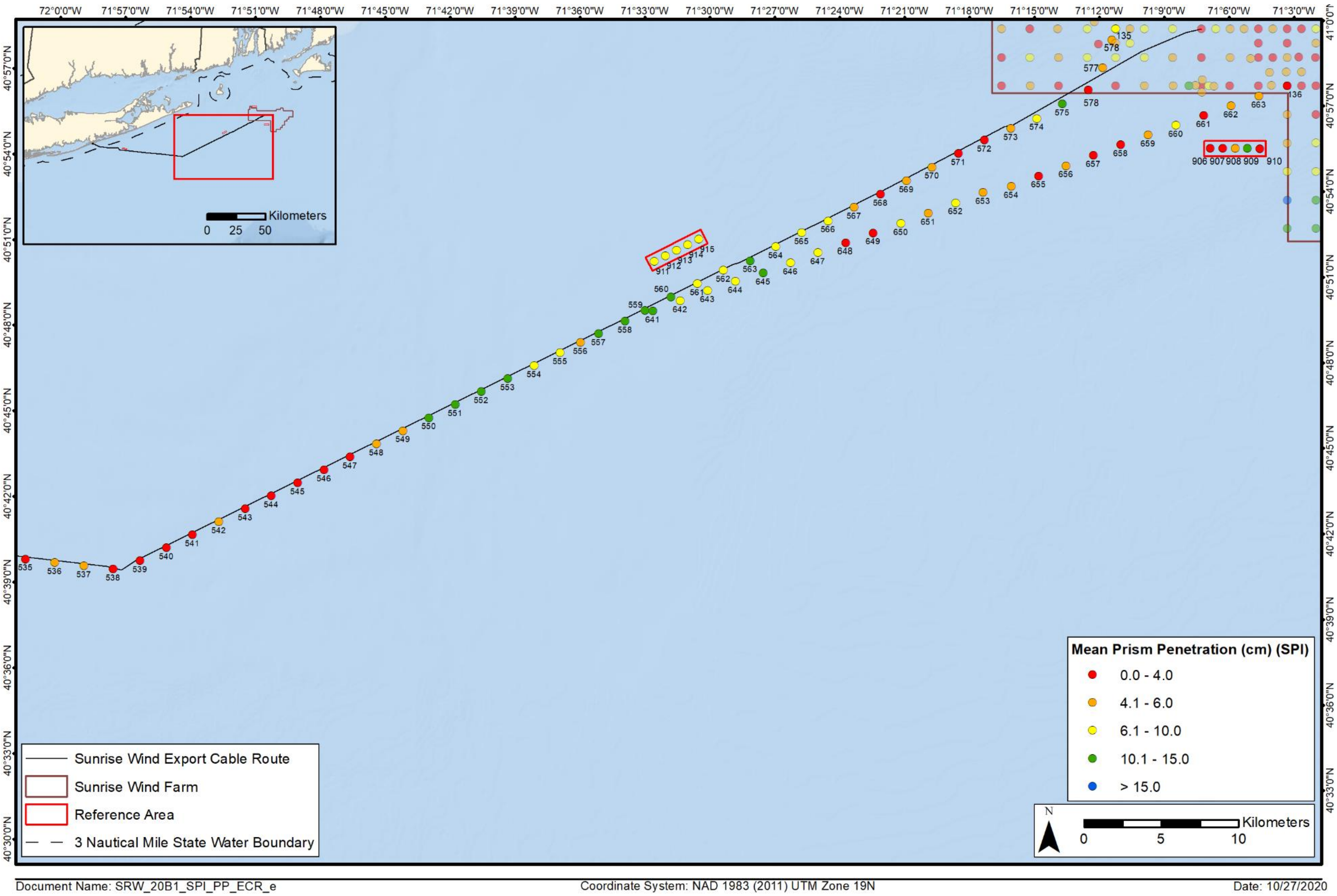


Figure 3.2-9 Mean station camera prism penetration depths (cm) along the eastern portion of the SRWEC–OCS and a nearby reference area

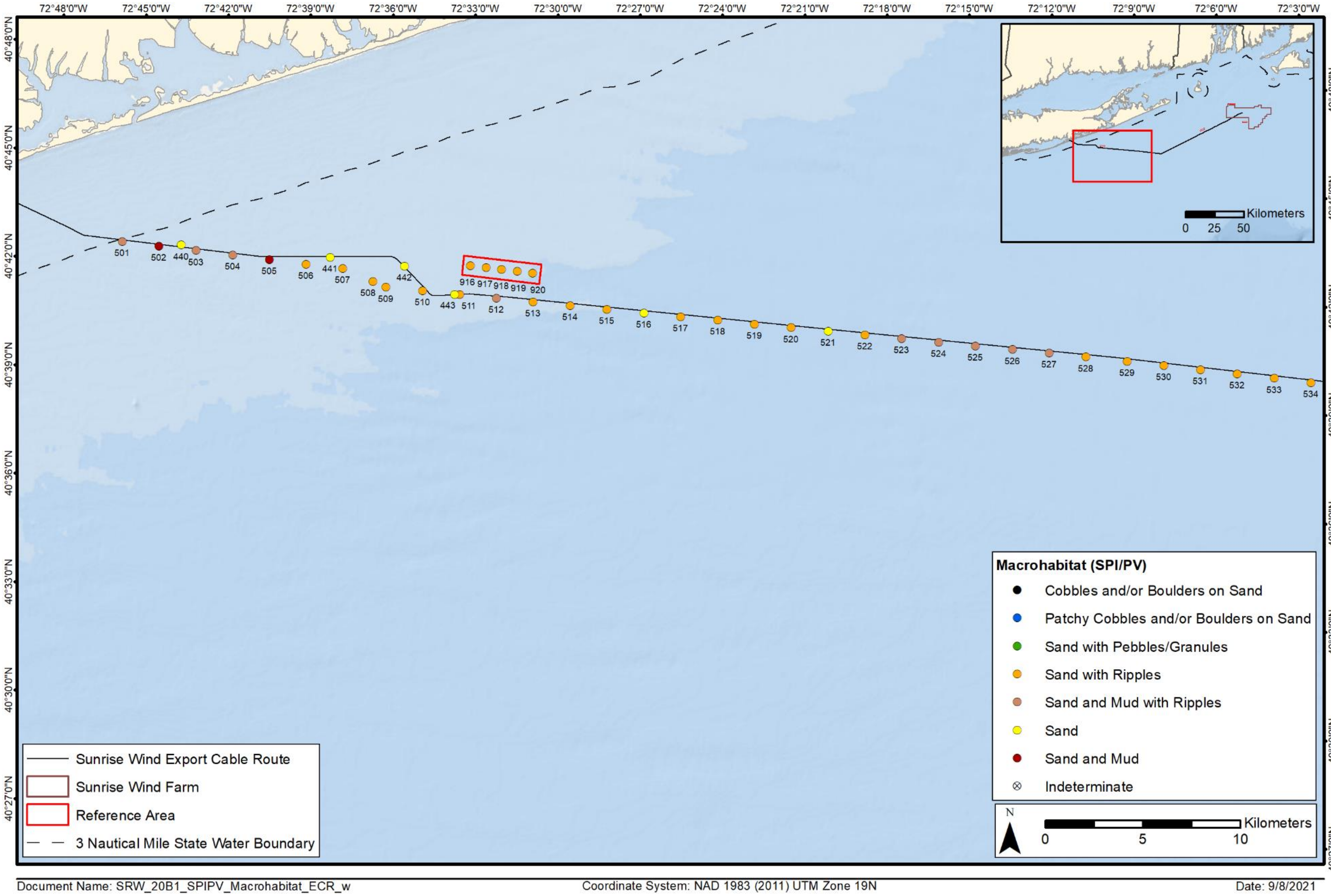


Figure 3.2-10 Macrohabitat type at the western portion of the SRWEC–OCS and one nearby reference area, which was derived from a subset of both SPI and PV parameters including CMECS Substrate Group, maximum gravel size (when present), grain size major mode, and bedform presence

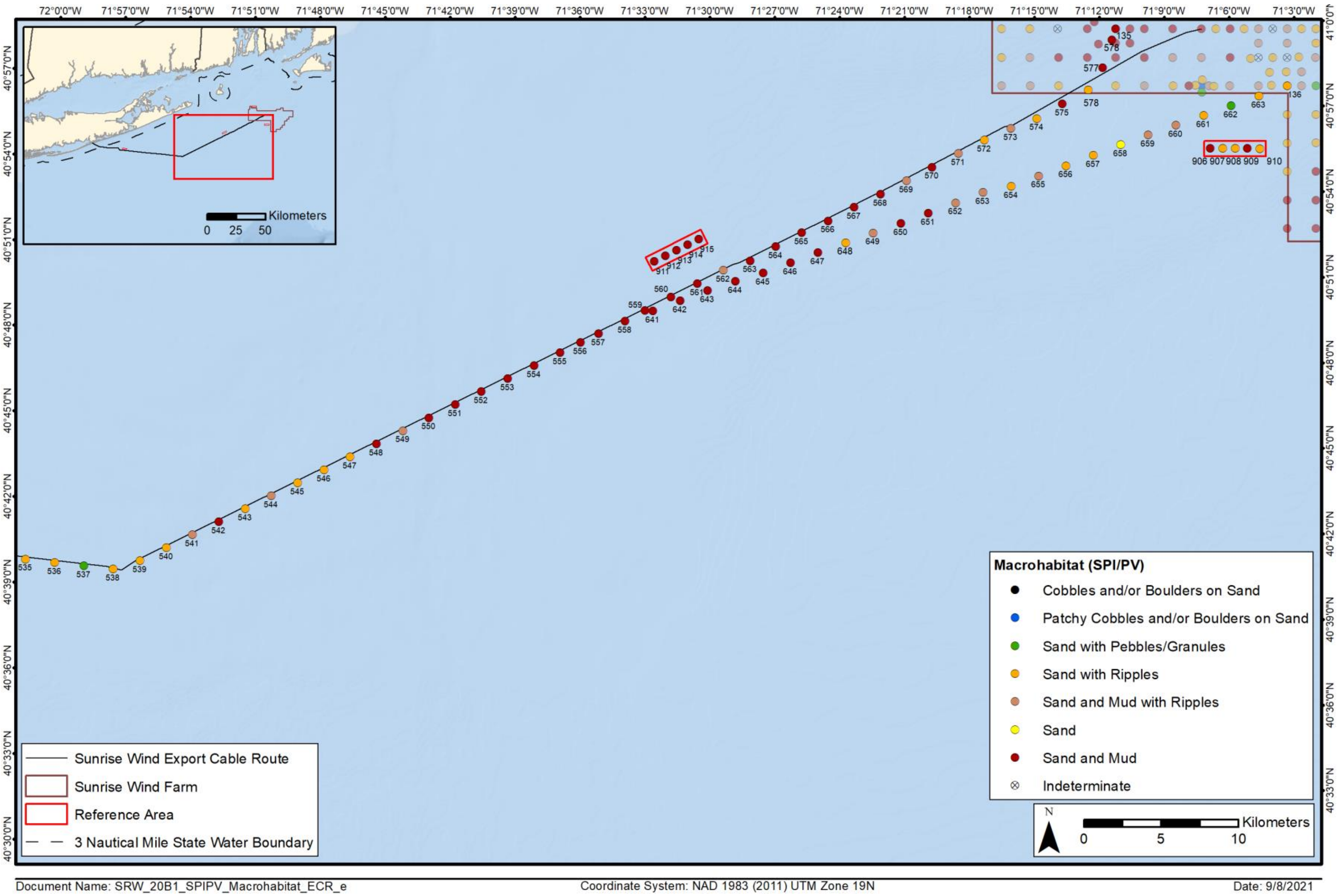


Figure 3.2-11 Macrohabitat type at the eastern portion of the SRWEC–OCS and one nearby reference area, which was derived from a subset of both SPI and PV parameters including CMECS Substrate Group, maximum gravel size (when present), grain size major mode, and bedform presence

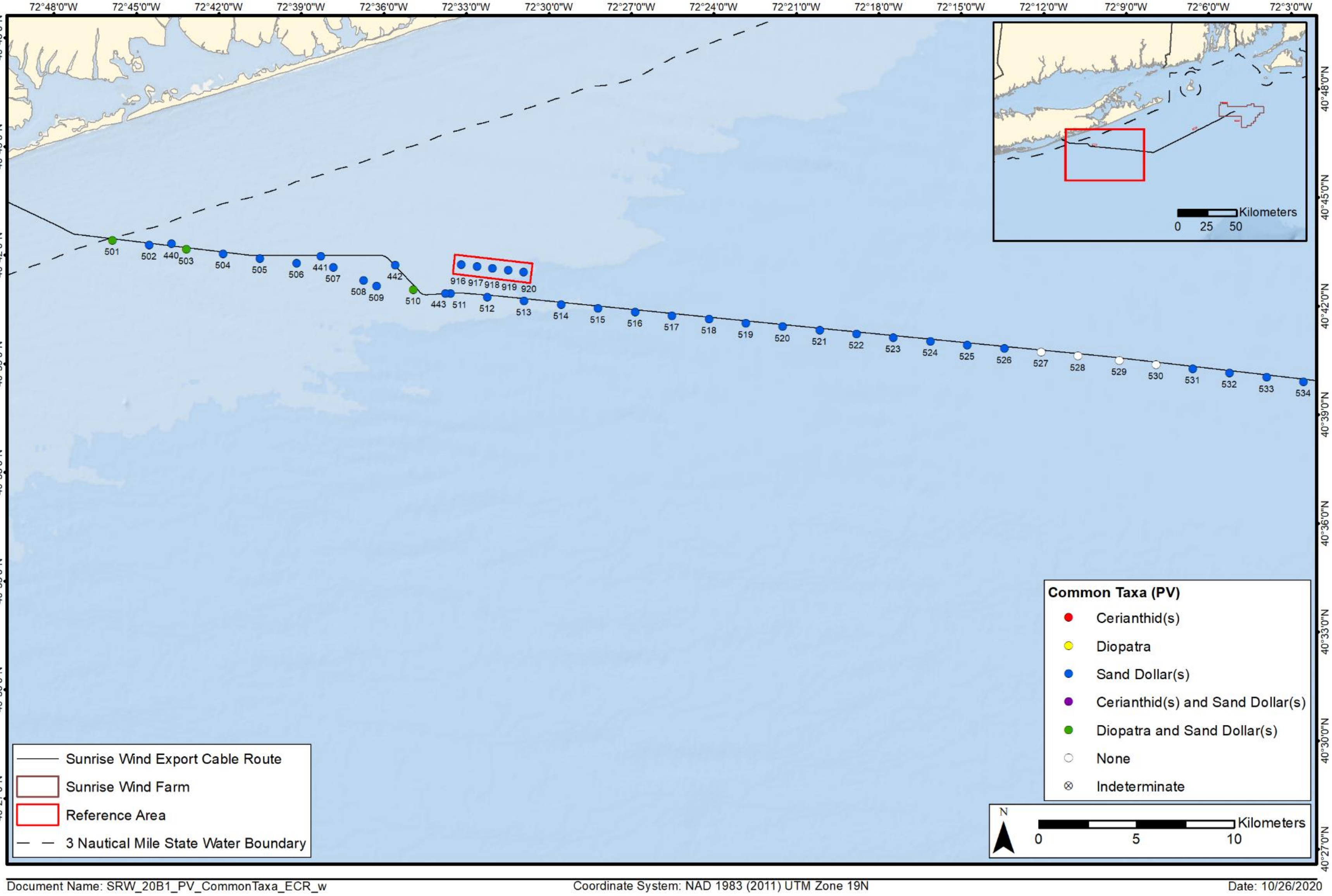


Figure 3.2-12 Distribution of burrowing anemones (cerianthids) and sand dollars, two commonly observed taxa along the western portion of the SRWEC–OCS

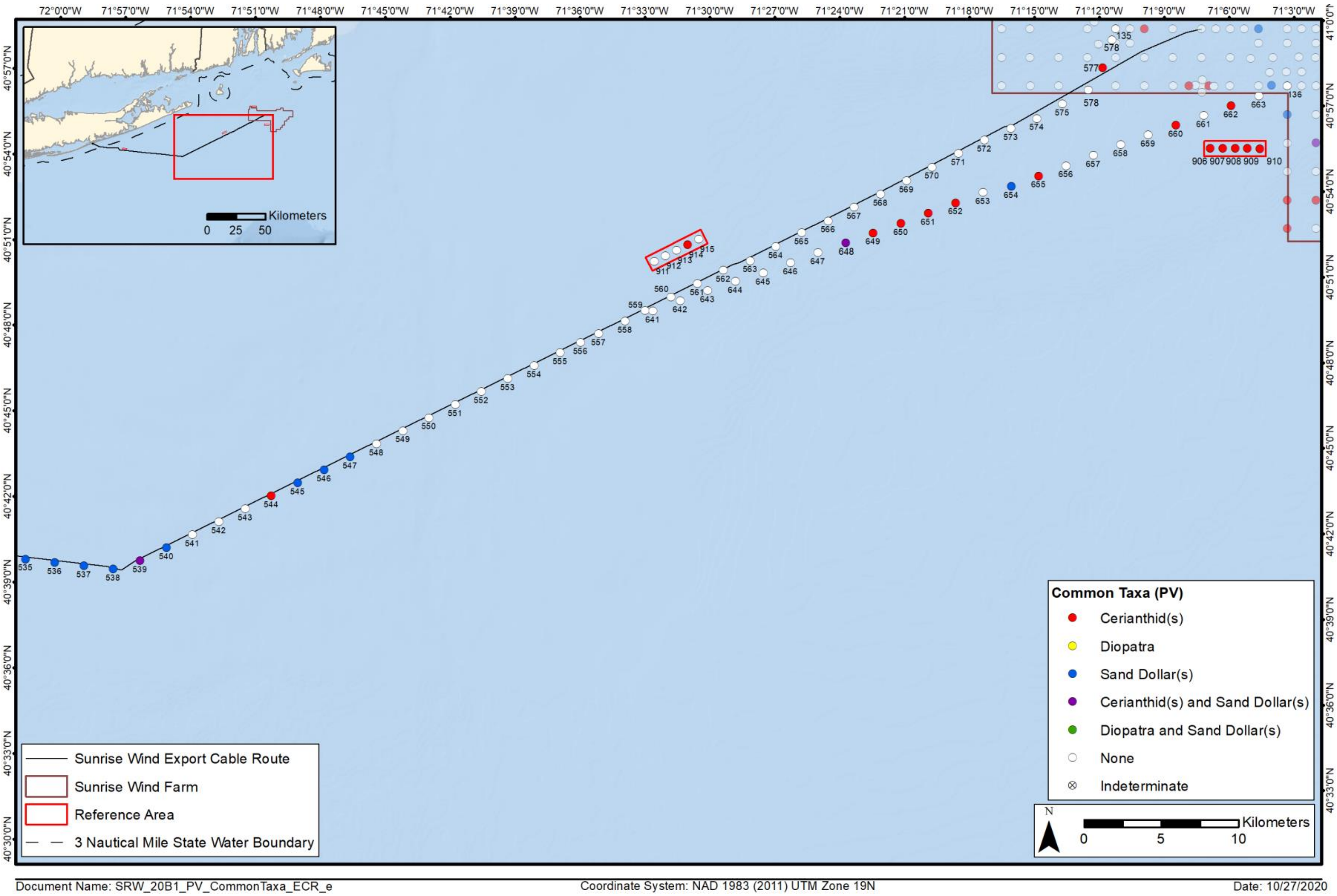


Figure 3.2-13 Distribution of burrowing anemones (cerianthids) and sand dollars, two commonly observed taxa along the eastern portion of the SRWEC–OCS

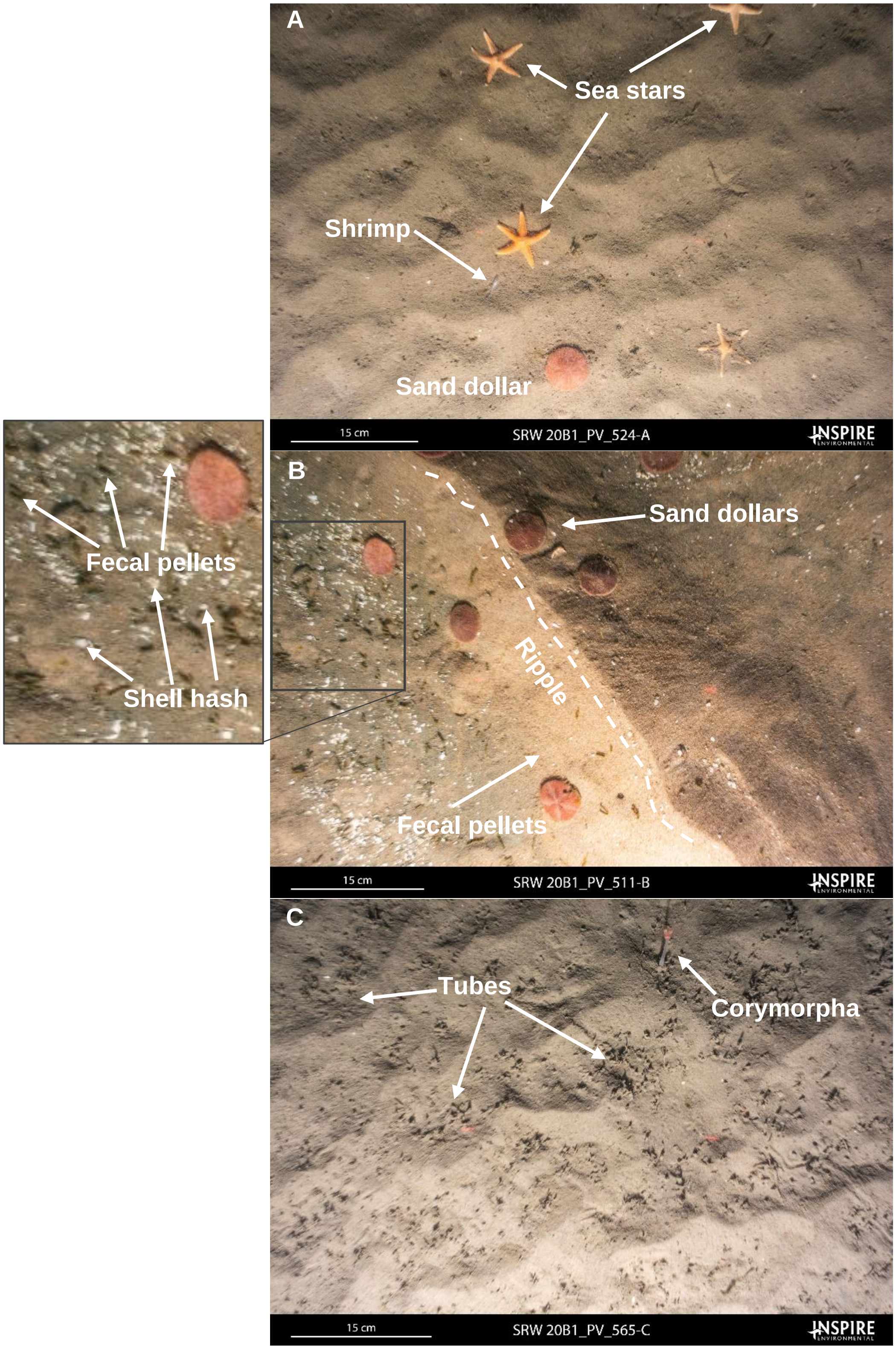


Figure 3.2-14 Representative PV images showing the range of macrohabitat types classified along the SRWEC–OCS including (A) sand and mud with ripples, inhabited by sea stars, sand dollar, and shrimp; (B) sand with ripples, with shell hash, fecal pellets and sand dollars; (C) sand and mud, with numerous tubes and a corymorpha (hydroid)

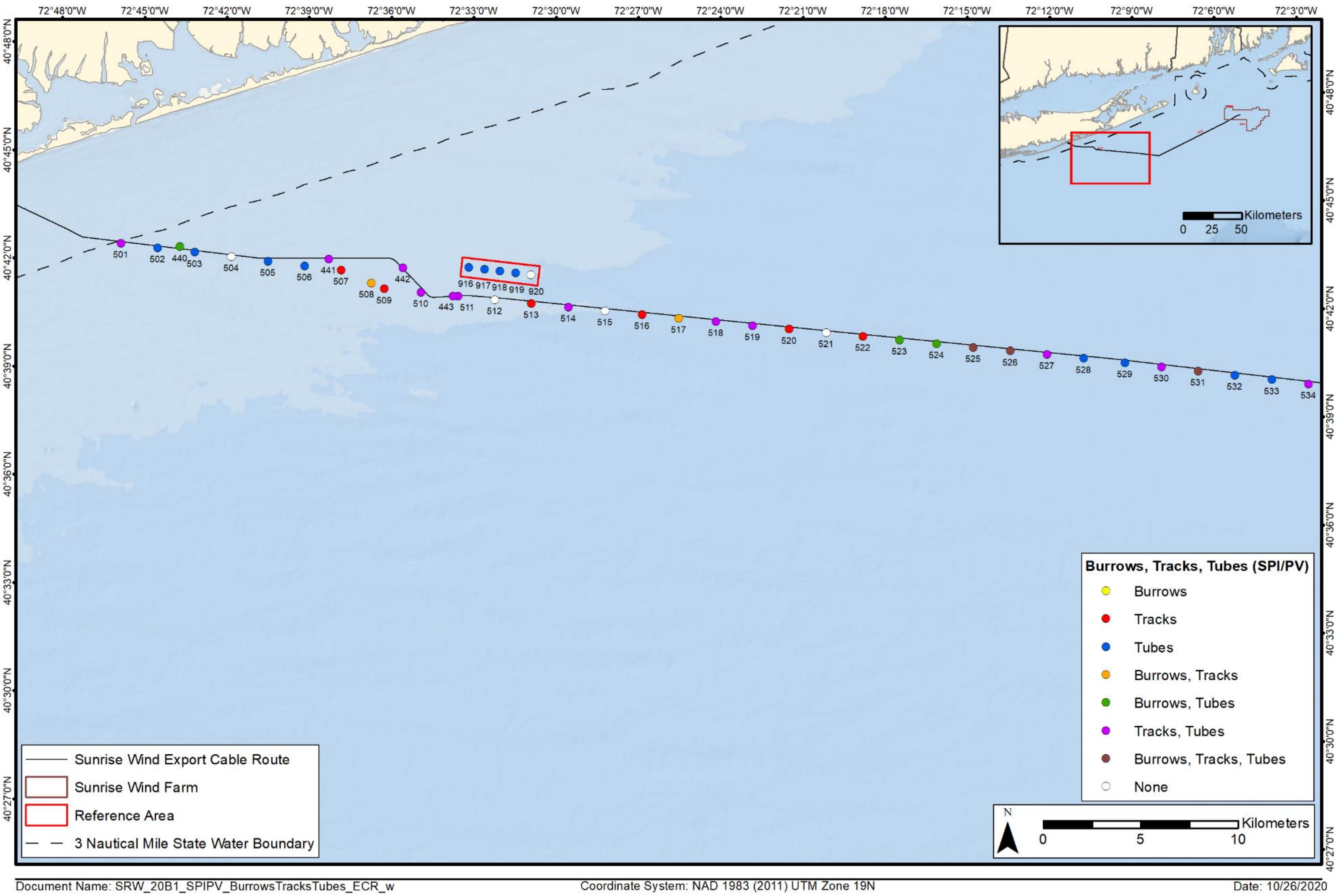


Figure 3.2-15 Occurrences of burrows, tracks, and tubes along the western portion of the SRWEC–OCS and a nearby reference area

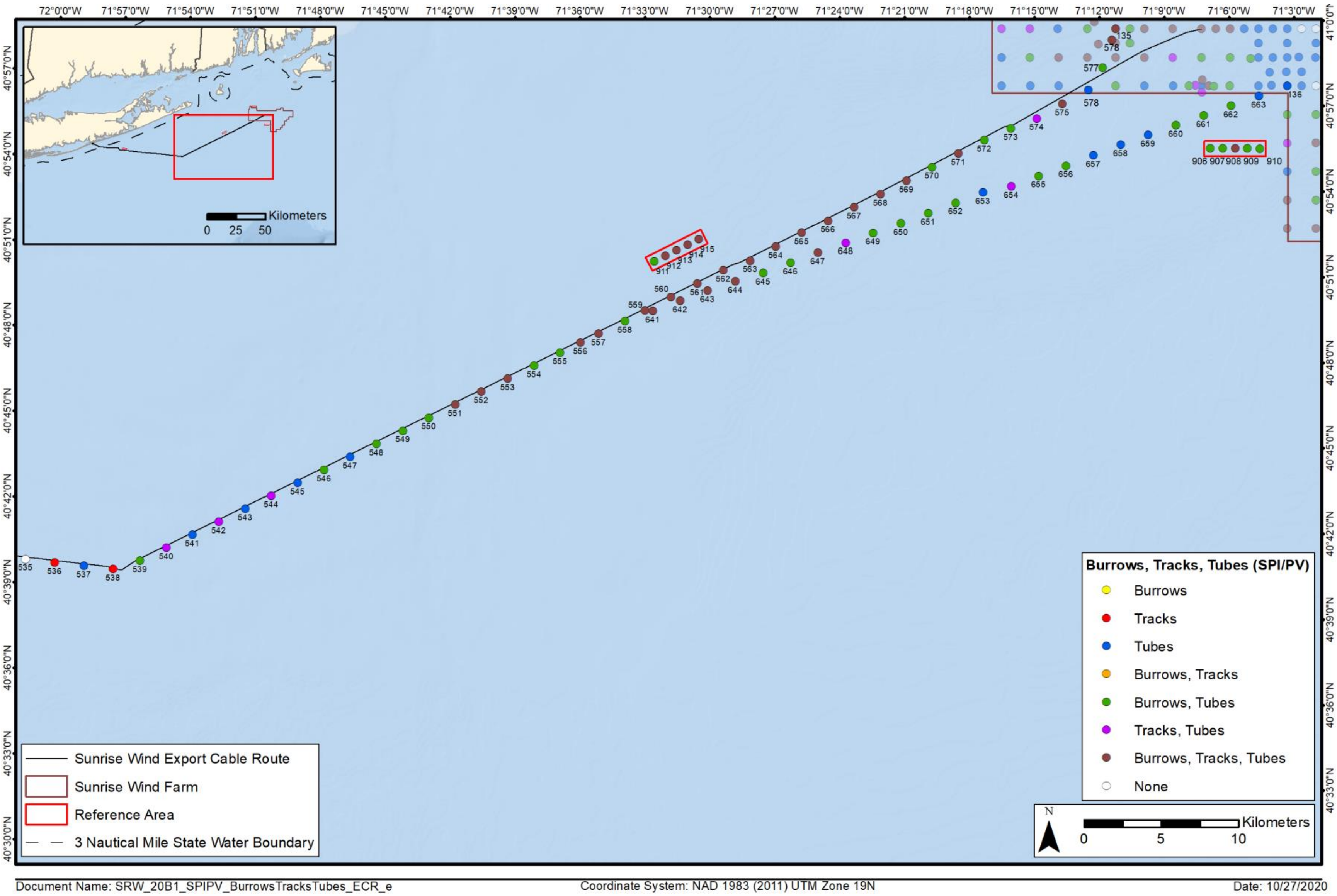
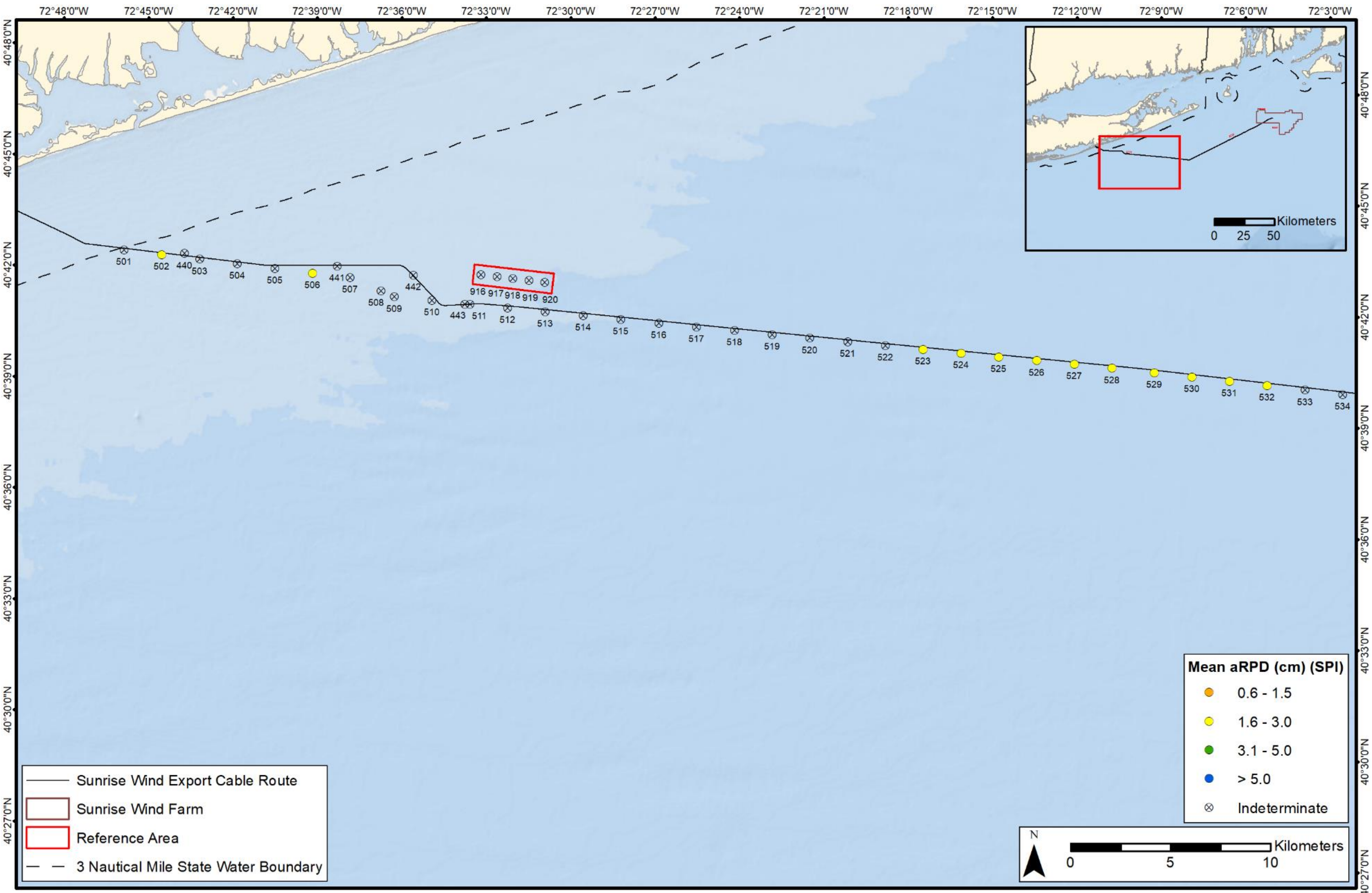


Figure 3.2-16 Occurrences of burrows, tracks, and tubes along the eastern portion of the SRWEC–OCS and a nearby reference area



Document Name: SRW_20B1_SPI_aRDP_ECR_w Coordinate System: NAD 1983 (2011) UTM Zone 19N Date: 10/26/2020

Figure 3.2-17 Mean station aRPD depth (cm) observed in SPI along the western portion of the SRWEC–OCS and a nearby reference area

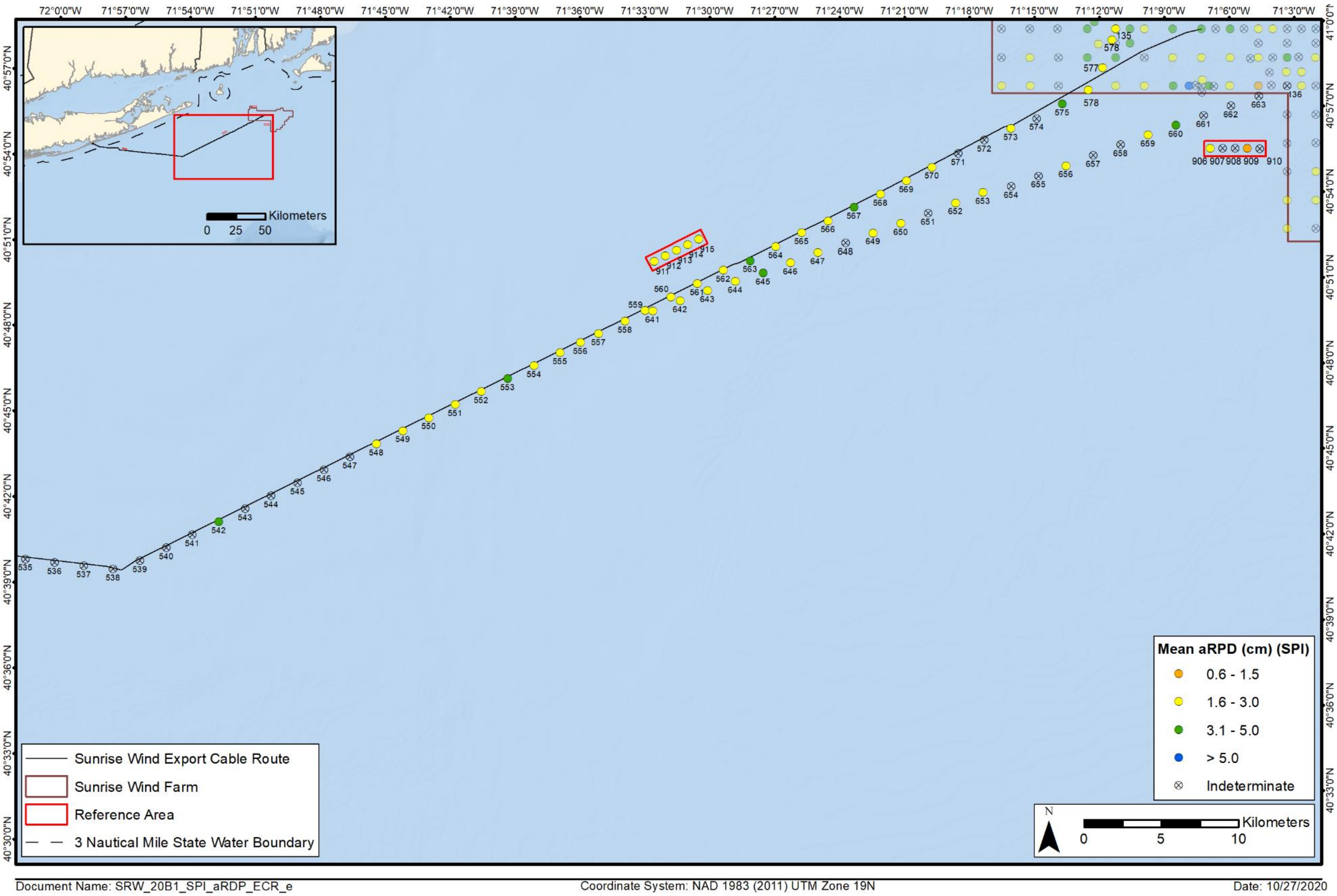


Figure 3.2-18 Mean station aRPD depth (cm) observed in SPI along the eastern portion of the SRWEC–OCS and a nearby reference area

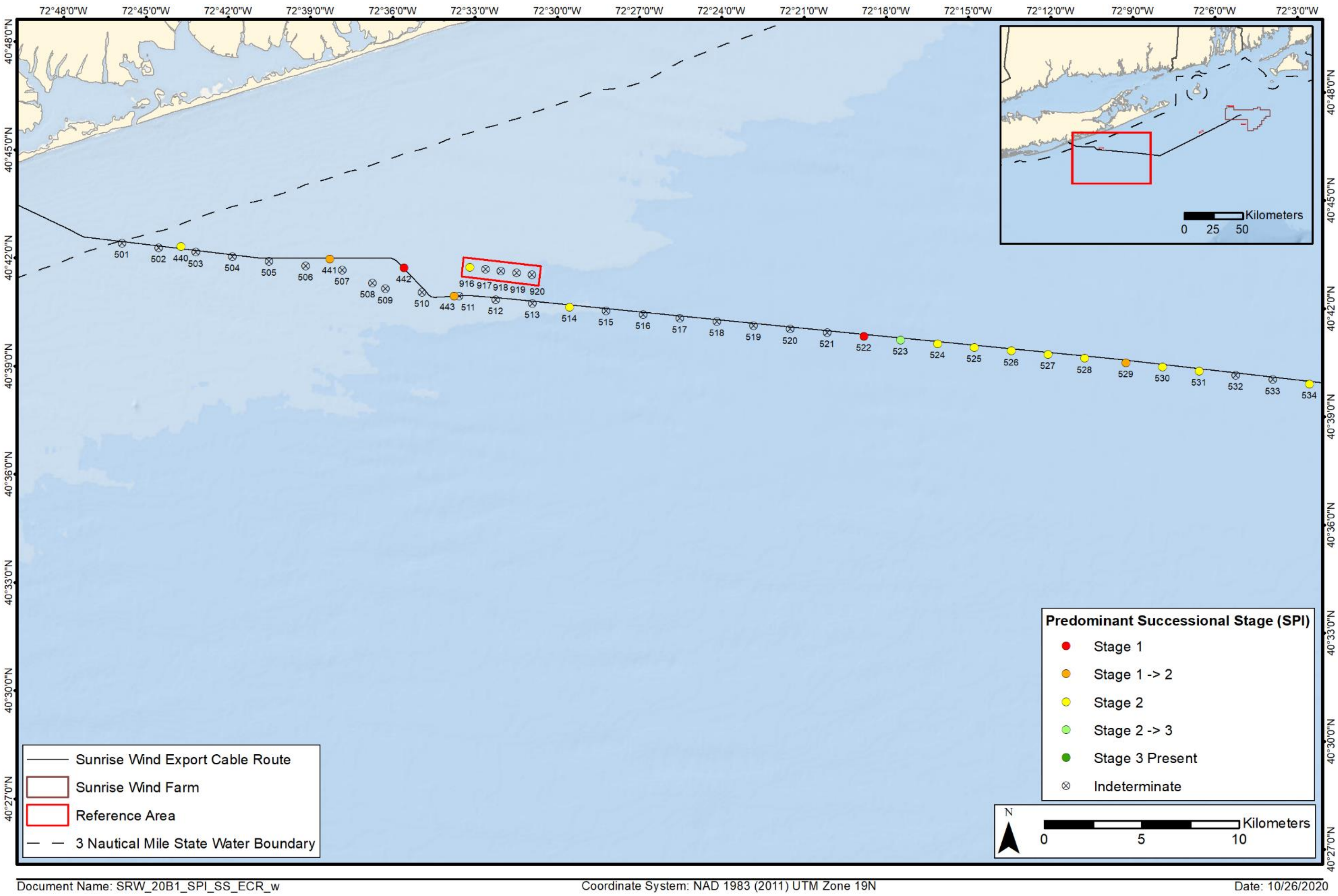


Figure 3.2-19 Successional Stage observed along the western portion of the SRWEC–OCS and a nearby reference area, the most advanced Successional Stage across replicates is shown for each station

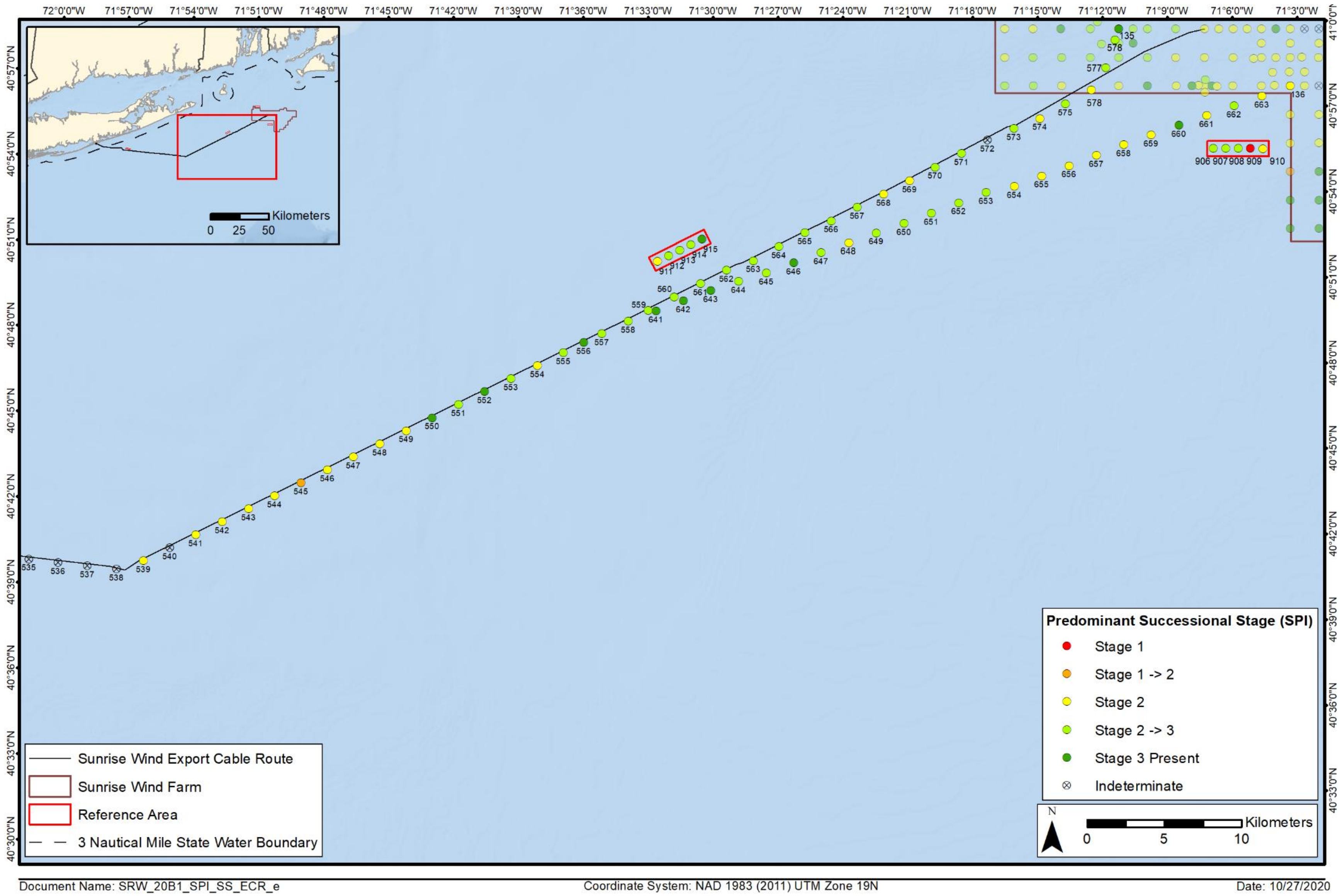


Figure 3.2-20 Successional Stage observed along the eastern portion of the SRWEC–OCS and a nearby reference area, the most advanced Successional Stage across replicates is shown for each station

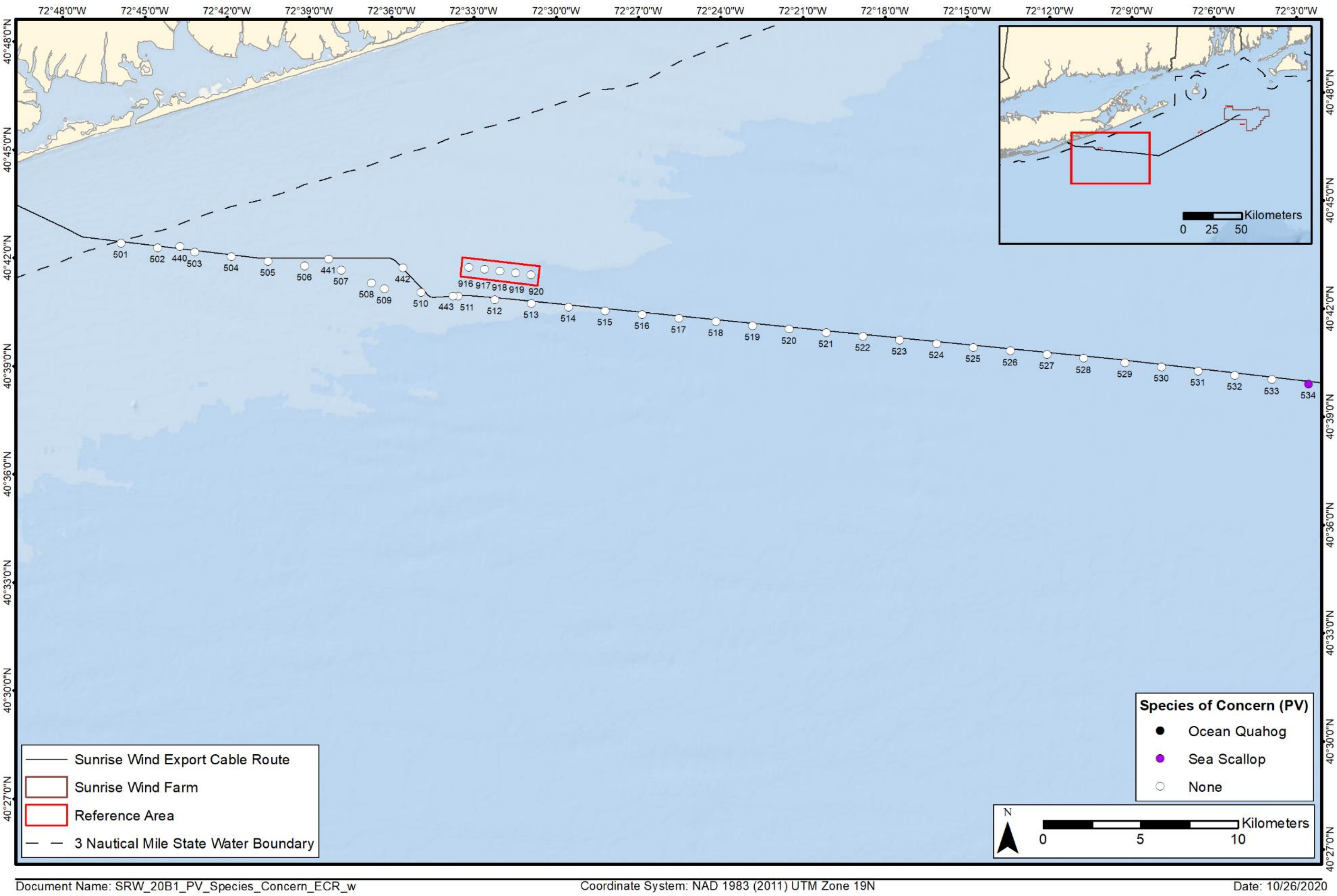


Figure 3.2-21 Species of concern, which only included the sea scallop (*Placopecten magellanicus*), along the western portion of the SRWEC–OCS. No species of concern were observed at the nearby reference area.

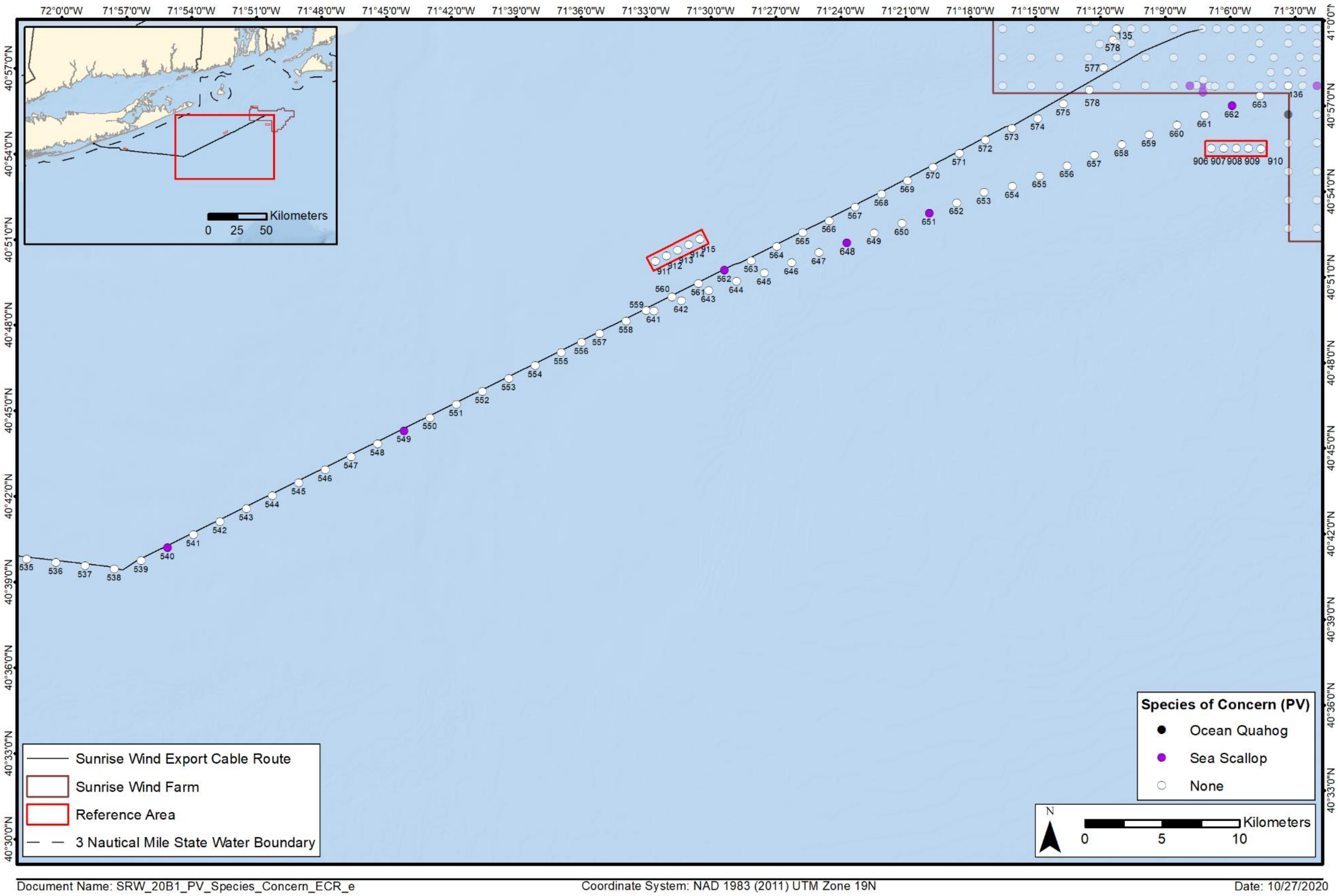


Figure 3.2-22 Species of concern, which only included the sea scallop (*Placopecten magellanicus*), along the eastern portion of the SRWEC–OCS. No species of concern were observed at the nearby reference area.

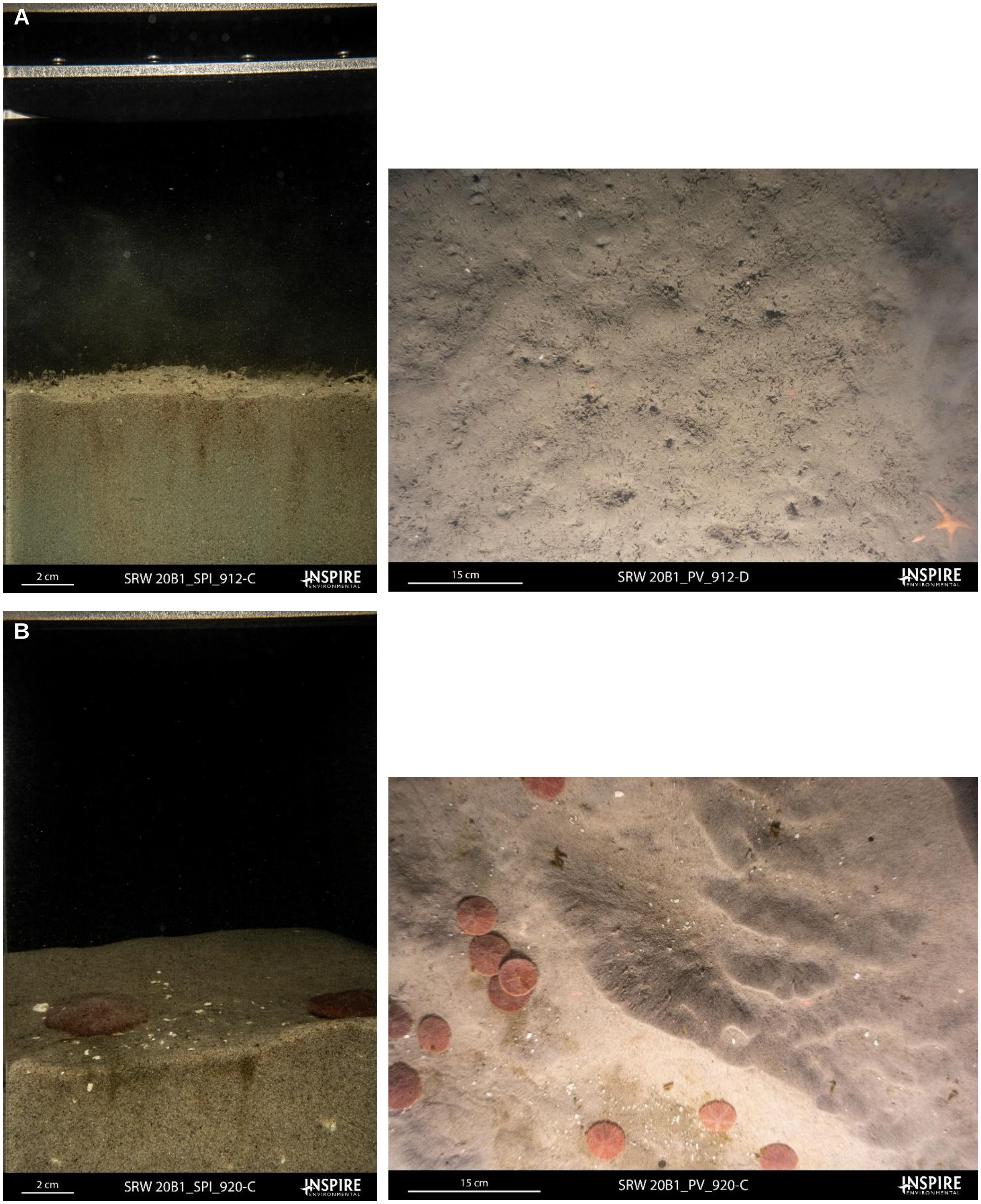


Figure 3.3-1 Representative SPI and plan view images depicting the range of CMECS Substrate Subgroups at the reference sites; (A) Very Fine Sand; (B) Fine Sand; (C) Medium Sand; (D) Gravelly Sand; (E) Mixed Sediment

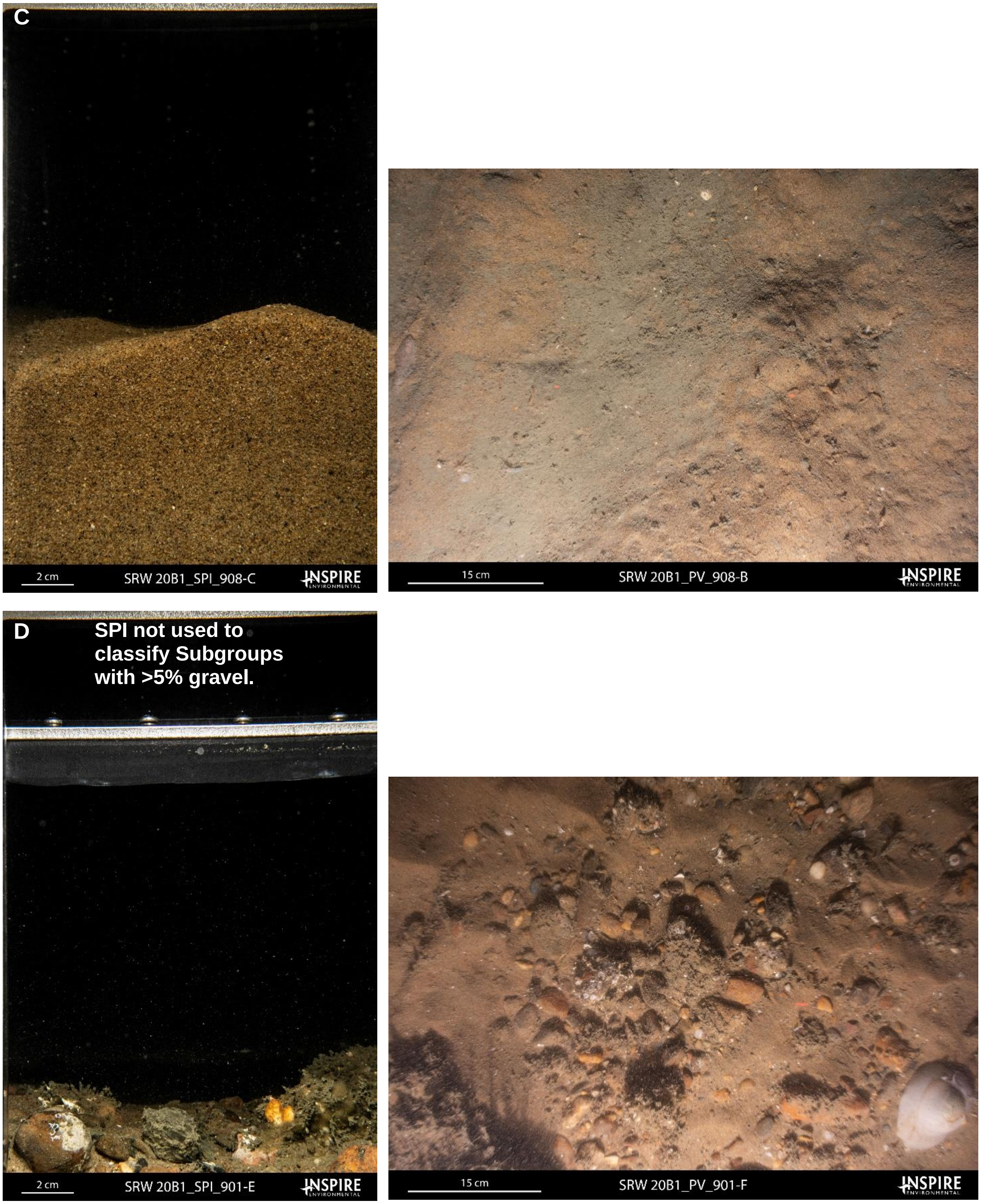


Figure 3.3-1 continued Representative SPI and plan view images depicting the range of CMECS Substrate Subgroups at the reference sites; (A) Very Fine Sand; (B) Fine Sand; (C) Medium Sand; (D) Gravelly Sand; (E) Mixed Sediment

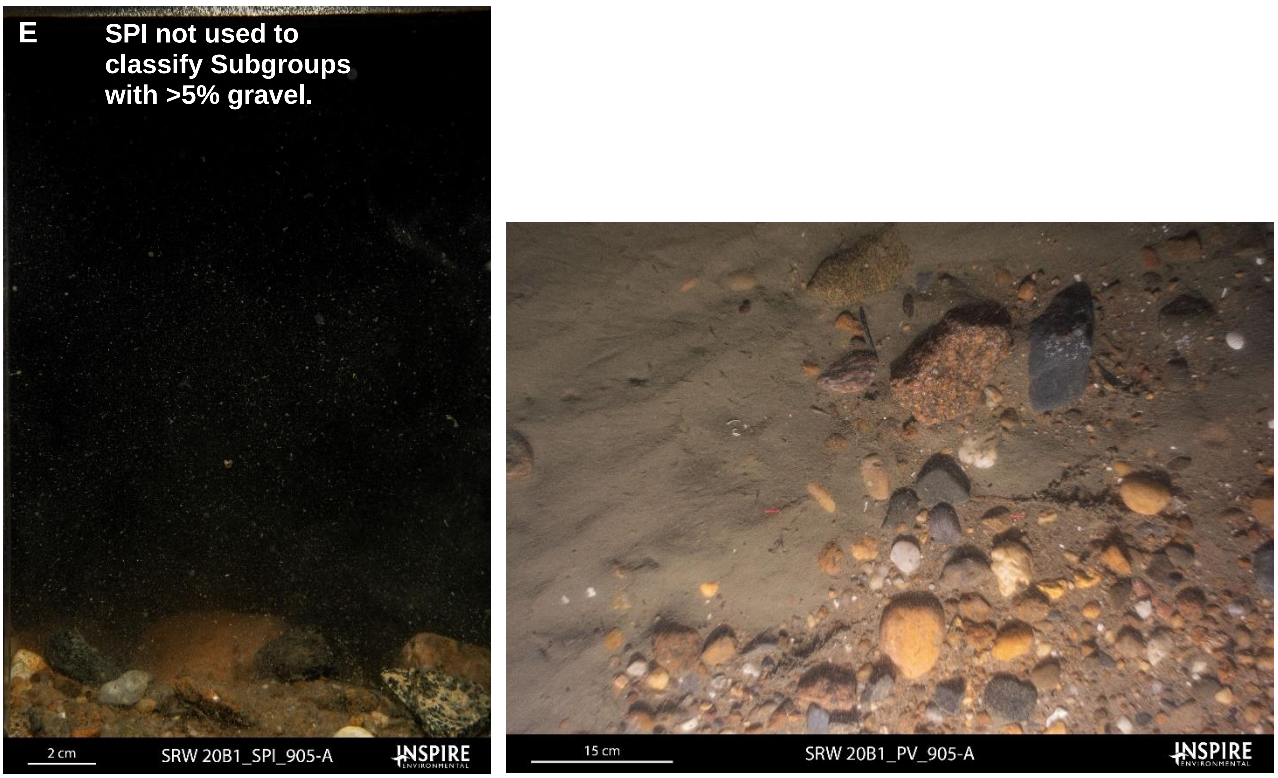


Figure 3.3-1 continued Representative SPI and plan view images depicting the range of CMECS Substrate Subgroups at the reference sites; (A) Very Fine Sand; (B) Fine Sand; (C) Medium Sand; (D) Gravelly Sand; (E) Mixed Sediment

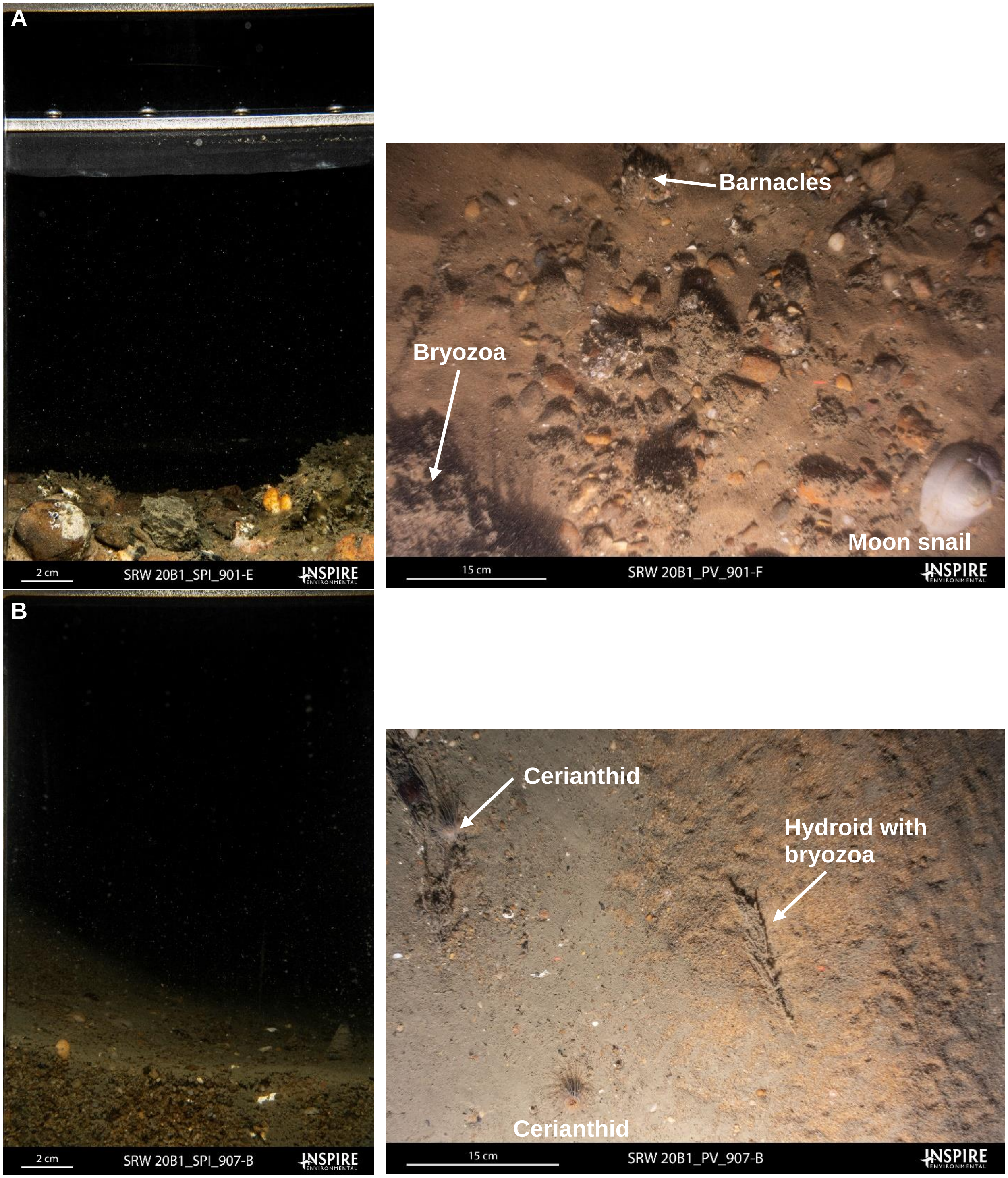
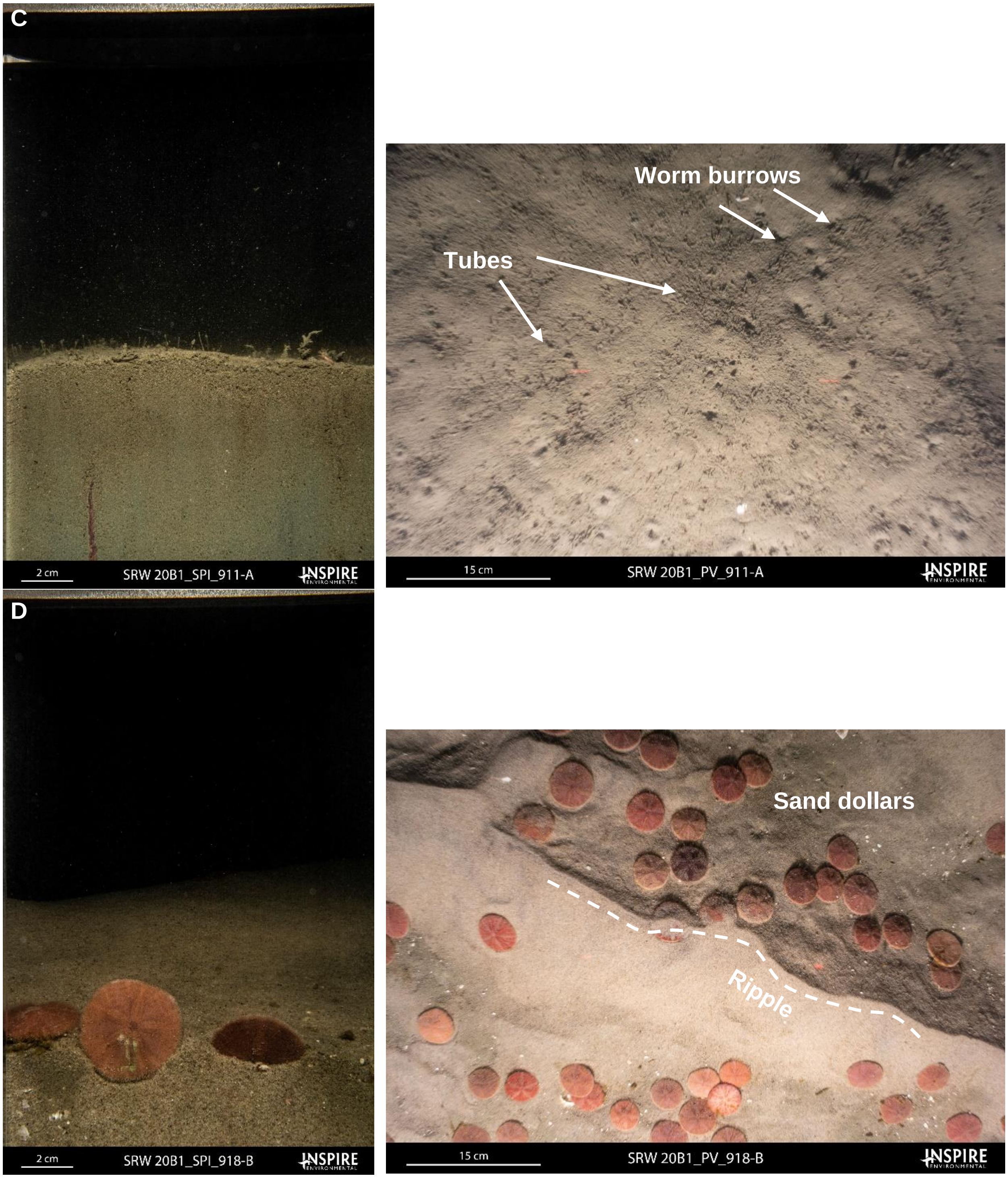


Figure 3.3-2 **Representative SPI and PV images depicting the four reference areas including (A) a station in the northwest reference area characterized as patchy cobbles and/or boulders on sand with bryozoa, a moon snail, and grazed barnacles; (B) a station in the reference area to the south of the SRWF characterized as sand with ripples inhabited by cerianthids, hydroids, and bryozoa; (C) a station in the reference area near the eastern portion of the SRWEC–OCS characterized as sand and mud inhabited by tubes across the surface and deep-burrowing worms; and (D) a station in the reference area near the western portion of the SRWEC–OCS characterized as sand with ripples inhabited by sand dollars.**



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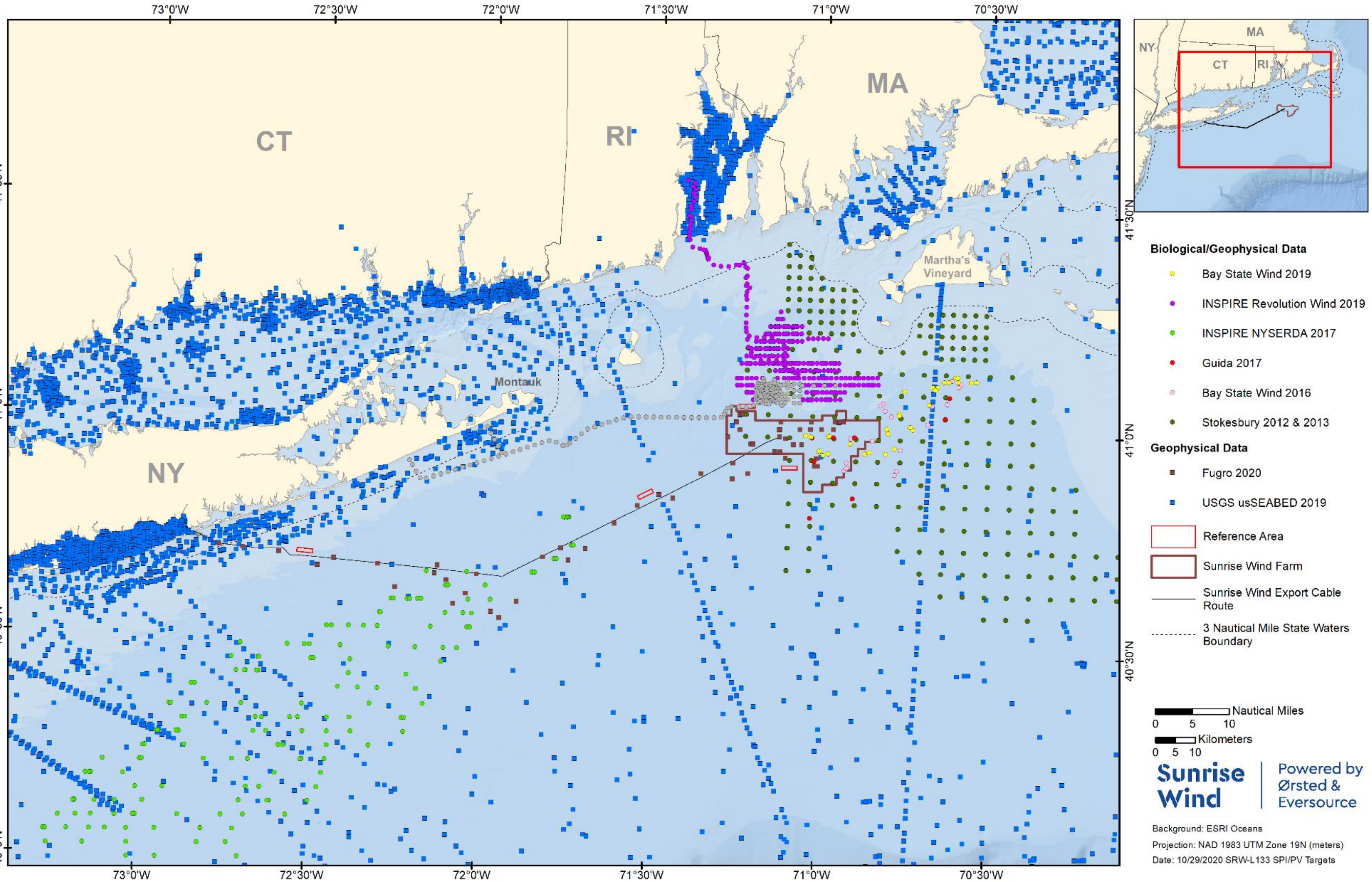

Figure 5.1-1 Additional recent studies and datasets documenting benthic biological and/or geological data in the vicinity of the SRWF

Benthic Resources Characterization Report – Federal Waters

ATTACHMENTS

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