D5. Onshore Export Cable Corridors Benthic Report

Onshore Export Cable Corridors Benthic Report, 2022

November 2022

Maryland Offshore Wind Project

Indian River Bay, Delaware

Prepared for:

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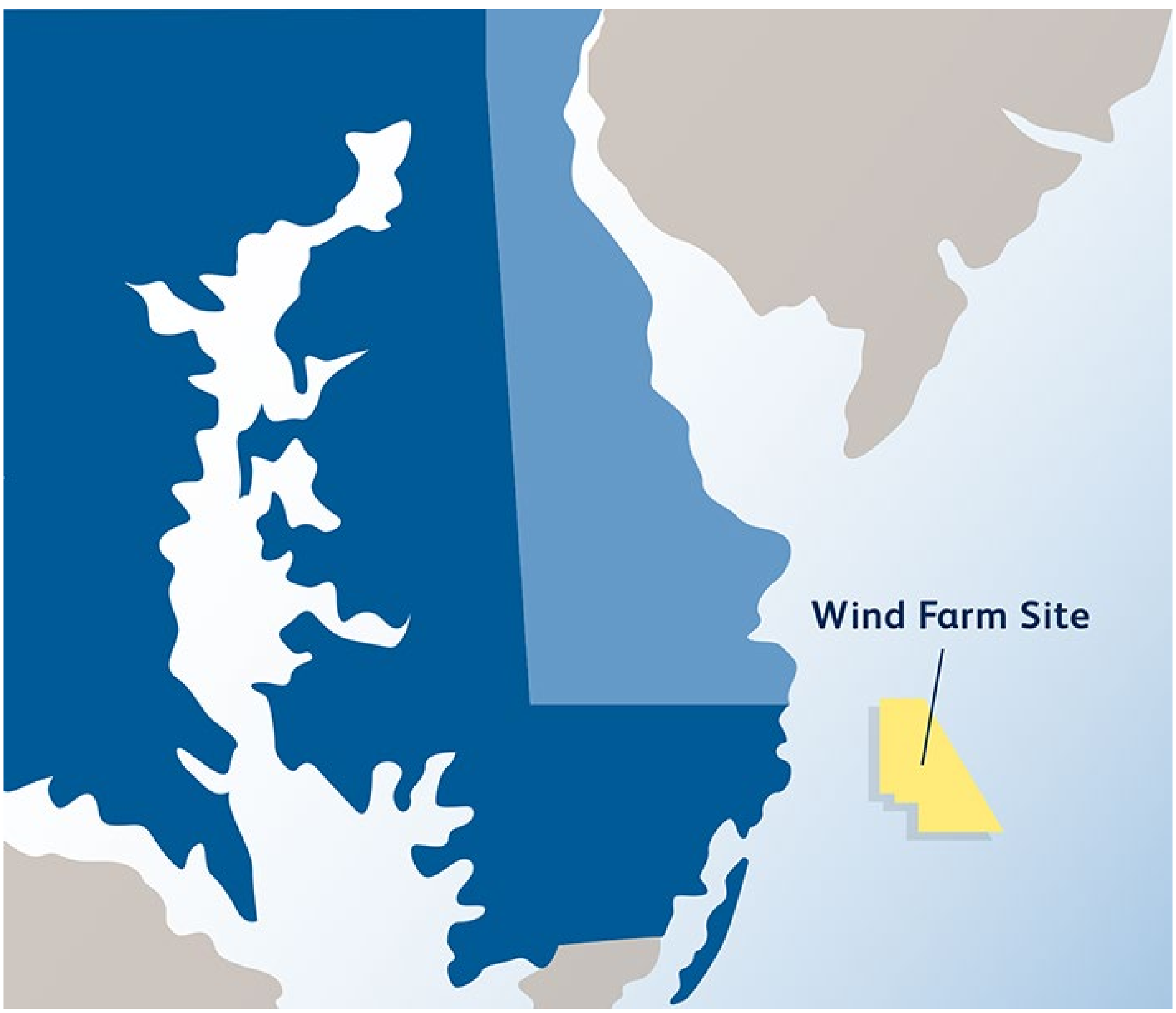

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Acronyms and Abbreviations

Notation	Description
ANOSIM	Analysis of Similarity
ANOVA	Analysis of Variance
Bay, the	Indian River Bay
CMECS	Coastal and Marine Ecological Classification System
COP	Construction and Operations Plan
GARFO	Greater Atlantic Regional Fisheries Office
HSD	Honestly significant difference
NMDS	Non-metric Multidimensional Scaling
NMFS	National Marine Fisheries Service
Project	Maryland Offshore Wind Project
QA/QC	Quality Assurance/Quality Control
RPMC-G	Remove Parent or Merge Children – Group
SIMPER	Similarity Percentages
US Wind	US Wind, Inc.

Executive Summary

US Wind, Inc. (US Wind) is developing the Maryland Offshore Wind Project[1] (the Project), an offshore wind project of up to 2 gigawatts within OCS-A 0490 (the Lease), an area off the coast of Maryland on the Outer Continental Shelf. US Wind obtained the Lease in 2014 when the company won an auction for two leases from the Bureau of Ocean Energy Management (BOEM) which in 2018 were combined into the Lease. The Project would include as many as 121 wind turbine generators (WTG) up to four (4) offshore substations (OSS), and one (1) met tower in the roughly 80,000-acre Lease area. The Project will be interconnected to the onshore electric grid by up to four (4) new 230-275 kV export cables into new substations in Delaware.

TRC conducted a benthic community and habitat assessment survey of Indian River Bay (the Bay) in August 2022 to characterize bay bottom habitats and biological communities associated with the Project's proposed cable corridor for up to 4 cables, designated as Onshore Export Cable Corridor 1 in the Project Construction and Operations Plan (COP) submitted to BOEM. The results of these surveys are included in the *Onshore Export Cable Corridors Benthic Report, 2022*.

Onshore Export Cable Corridor 1 encompasses a large portion of Indian River Bay for the proposed cable corridor from the proposed landing location at 3R'S Beach in Delaware Seashore State Park through the Bay to the point of interconnection (POI) at Indian River Substation in Delaware. The cables would connect to the landing locations via horizontal directional drilling (HDD) and would be buried below the bay bottom such that all the infrastructure would be underground to the new substations to be built adjacent to the POI. For the purposes of this assessment, potential routes for the 4 cables have been identified within Onshore Export Cable Corridor 1. These potential cable alignments are shown in Figure 1 as Onshore Export Cable North Corridor, Onshore Export Cable South Corridor, and Onshore Export Cable Common Corridor.

<u>Approach – Data Collection</u>

The 2022 Onshore Export Cable Corridors benthic community and habitat assessment survey included the collection of 35 benthic macrofaunal grabs from Indian River Bay (including the Onshore Export Cable Common Corridor and the Onshore Export Cable North and South Corridors). Grabs were arranged to provide adequate geographic coverage of, and allow for characterization of benthic habitats within, the Bay. Nineteen grabs were collected in the vicinity of the Onshore Export Cable Common Corridor, nine grabs were collected in the vicinity of the Onshore Export Cable North Corridor, and six grabs were collected in the vicinity of the Onshore Export Cable South Corridor. One grab was located approximately equidistant from the North and South Onshore Export Cable Corridors.

A shellfish density survey (Attachment C) was completed prior to the benthic community and habitat assessment survey. A total of 48 locations were used to assess the shellfish density within Indian River Bay (13 shallow locations accessible via wading and the 35 benthic macrofaunal grab locations).

[1] The Project includes MarWin, a wind farm of approximately 270 MW for which US Wind was awarded Offshore Renewable Energy Credits (ORECs) in 2017 by the state of Maryland; Momentum Wind, 808 MW, which US Wind bid into a second round Maryland OREC process in 2021; and any subsequent development within the Lease area.

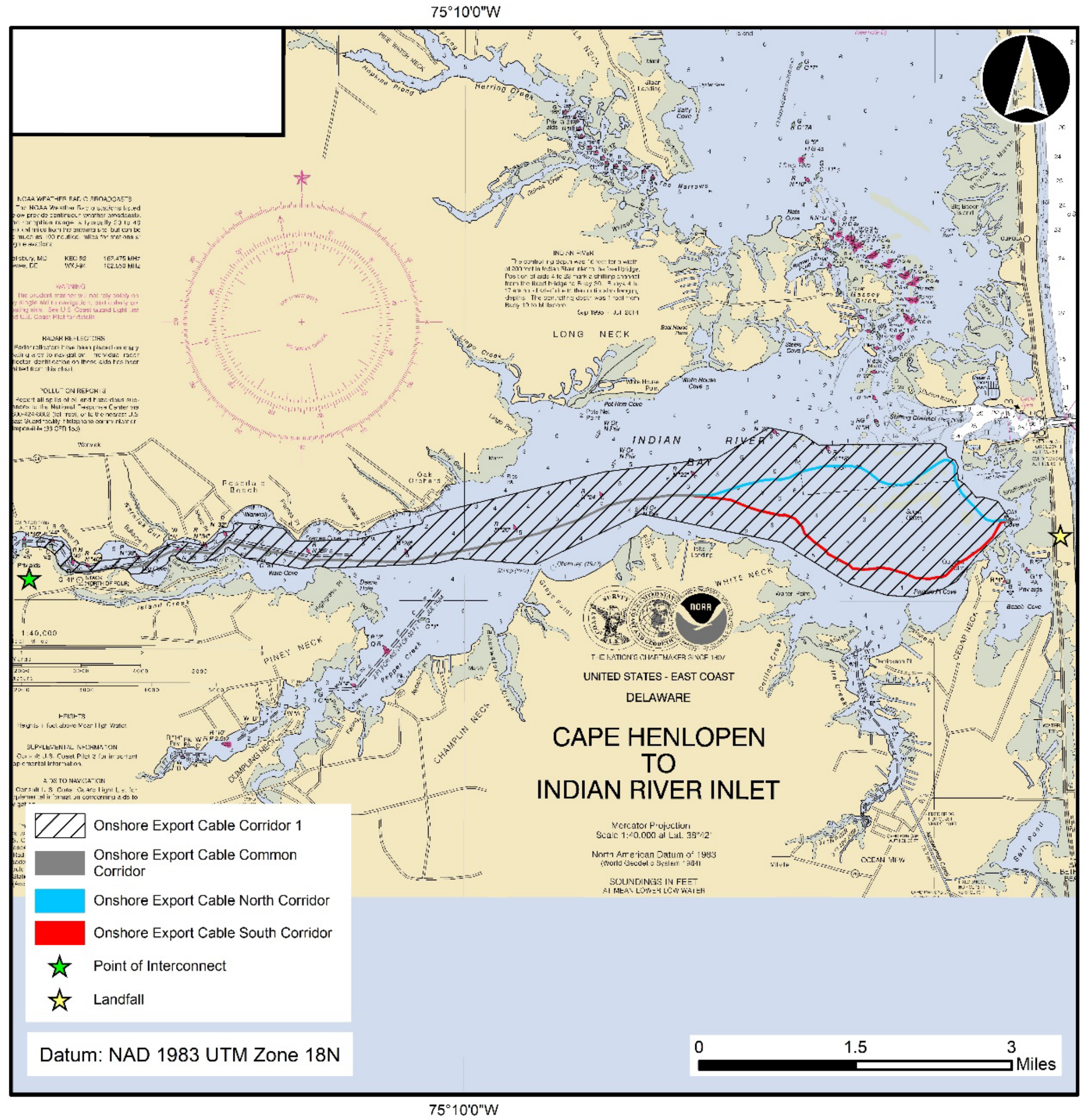

Figure 1. Onshore Export Cable Corridor 1

Approach – Data Analysis

Benthic macrofaunal grab samples were sorted in their entirety and identified by qualified taxonomists to the lowest practicable taxonomic level.

Univariate statistics, including taxa richness and macrofaunal density were calculated for each sample and used to compare diversity and abundance of benthic macrofauna between samples and Project component areas in Indian River Bay, including the Onshore Export Cable Common Corridor, Onshore Export Cable North Corridor, and Onshore Export Cable South Corridor. Additionally, multivariate statistics were used to assess similarities in community composition between Coastal and Marine Ecological Classification System (CMECS) substrate subclasses and Project component areas.

Benthic grain size laboratory results were used to determine the National Marine Fisheries Service (NMFS)-modified CMECS substrate subclass, group, and subgroup classifications for each grab sample location. Post-collection grab imagery, and the physical description of each macrofaunal grab sample made in the field, was used to provide context for the community composition identified through the taxonomic identification and enumeration conducted in the laboratory.

Shellfish collected during the shellfish density survey and the benthic community and habitat assessment survey were identified and measured. The spatial trends in shellfish density per location and shellfish size per location was examined for the locations where shellfish were found. These results are discussed in Attachment C.

Key Findings

No rare species or taxa indicative of sensitive habitats (hard bottom habitat or submerged aquatic vegetation) were present in any of the samples, and no submerged aquatic vegetation was observed during the survey (at sample locations or during transit). Though differences in total organism density and taxa richness were noted, TRC's key findings are consistent with prior surveys conducted for US Wind in 2017 (COP Appendix II-D1).

All samples were classified as fine unconsolidated substrate under the NMFS-modified CMECS system. The majority of samples were classified as mud, though sand and muddy sand substrates were relatively common, and sandy mud substrates were also observed. Substrates were generally finer in samples collected from the western portions of Indian River Bay than the eastern portions.

Though few discernable geographic trends in univariate community metrics were observed, multivariate analyses indicated that the macrofaunal community differed between Onshore Export Cable Common Corridor samples and either Onshore Export Cable North Corridor samples or Onshore Export Cable South Corridor samples. Analyses also indicated that benthic communities found in mud substrates differed from those in sand or muddy sand substrates. Overall observed community differences likely resulted from a combination of variation in sediment type and salinity.

However, communities in all Project component areas included in this assessment are typical of soft-sediment estuarine habitats. Many of the most widespread and abundant taxa in all Project component areas are adapted to periodic disturbance events, and several are also generally tolerant of contamination and organic enrichment.

1.0 Introduction

TRC conducted a benthic community and habitat assessment survey to support the Construction and Operations Plan (COP) for the Maryland Offshore Wind Project leased by US Wind, Inc. (US Wind). This survey included the collection of benthic grabs from Indian River Bay in the area of the Onshore Export Cable Corridors (see Figure 1, including the Onshore Export Cable Common Corridor, Onshore Export Cable North Corridor, and Onshore Export Cable South Corridor) in August 2022. These were collected as part of a larger survey effort that also included the collection of high-resolution geophysical data by others. The results of those surveys are presented in their respective reports under separate cover.

The *Onshore Export Cable Corridors Benthic Report, 2022* documents the approach and methodology used to collect the macrofaunal grab samples. Additionally, it compiles the macrofaunal grab sampling results for the purpose of characterizing the benthic macrofaunal community and habitat in the sampled locations.

The results of this report are integrated with the fully processed acoustic seafloor mapping to produce final map products that include characterization and delineation of benthic habitat for the surveyed extent of the Onshore Export Cable Corridors. These have been developed according to the National Oceanic and Atmospheric Administration Fisheries (NMFS)-modified Coastal and Marine Ecological Classification System (CMECS) taxonomic framework identified in the Greater Atlantic Regional Fisheries Office's March 29, 2021 "Updated Recommendations for Mapping Fish Habitat" and presented under separate cover as part of the Information to Support Essential Fish Habitat Assessment report (COP Volume II, Appendix II-E1).

2.0 Approach

For the benthic habitat assessment and mapping approach in the *Onshore Export Cable Corridors Benthic Report, 2022*, US Wind and TRC followed GARFO's "Updated Recommendations for Mapping Fish Habitat" issued on March 29, 2021. On July 14, 2022, US Wind, TRC, and GARFO met to discuss the proposed survey and any additional guidance.

Specific sampling locations were selected as follows. First, based on site-specific guidance received from GARFO on July 14, 2022, locations previously surveyed by the Delaware Department of Natural Resources and Environmental Control (DNREC) in 2011 (Bott and Wong 2012) were incorporated into this survey, as long as they were located within Onshore Export Cable Corridor 1. These 2011 DNREC locations were also used as a baseline for the shellfish density survey (which focused on shallow areas accessible via wading) and are further described in Attachment C. Then, additional sampling locations were added to provide a higher density of grab samples and fill in gaps in the existing sampling grid. These additional sampling locations were spaced approximately one kilometer apart, as few locations from the Bott and Wong (2012) study fell within Onshore Export Cable Corridor 1. Finally, a third set of sampling locations were selected to investigate potential features of interest identified in the acoustic data from the survey completed by S.T. Hudson Engineers, Inc., in June 2022.

The benthic field surveys of the Onshore Export Cable Corridors (collectively, the Survey Area) were conducted from the *Almar 31* in August 2022. To obtain site-specific information on the benthic community, the survey involved the collection of 35 benthic grab samples. Benthic grab samples were processed for grain size and macrofaunal analysis at each sampling location.

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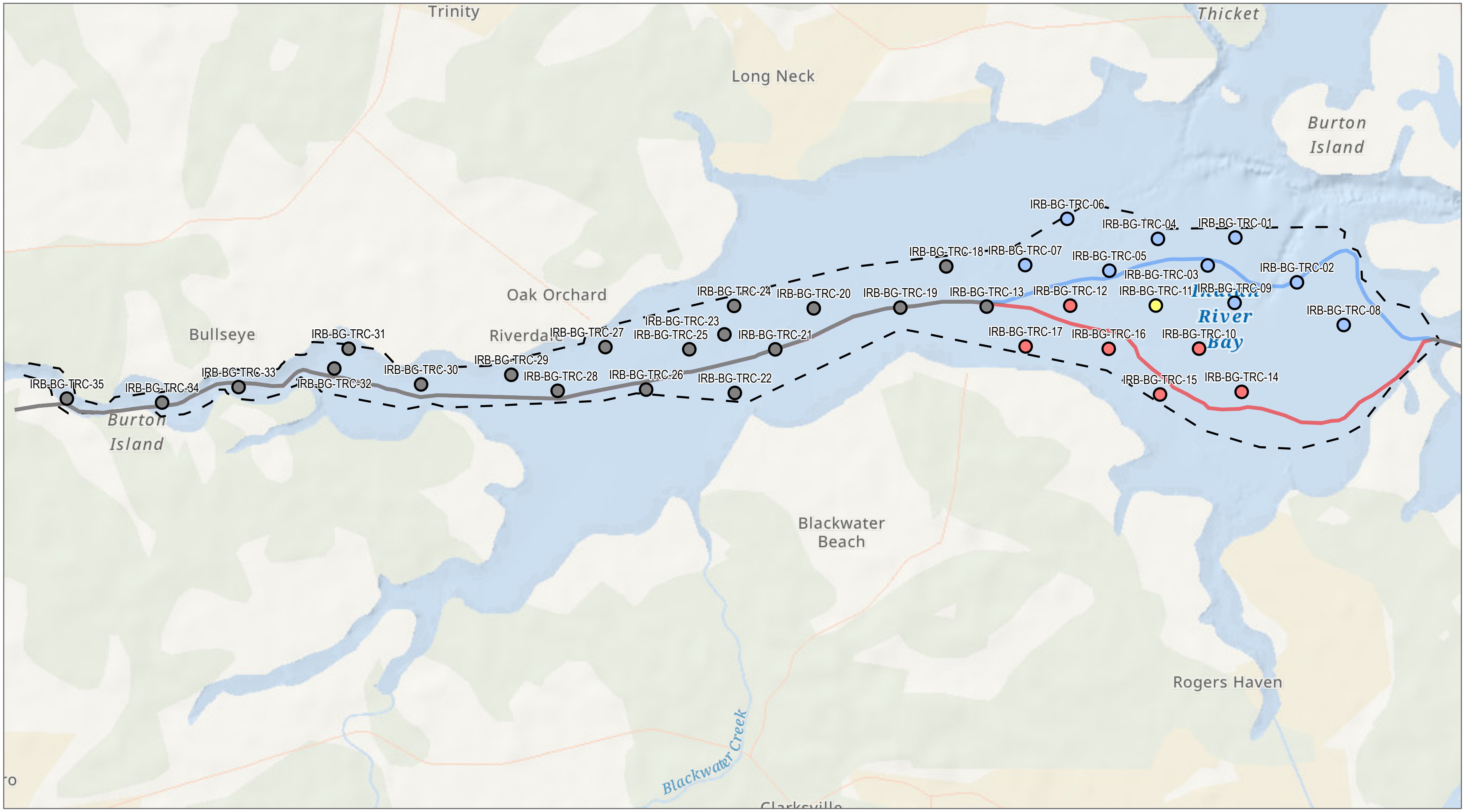
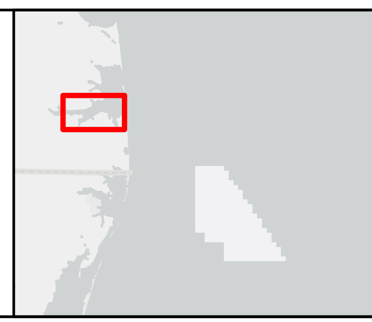


BENTHIC SAMPLING LOCATION

- ONSHORE EXPORT CABLE NORTH CORRIDOR
- ONSHORE EXPORT CABLE SOUTH CORRIDOR
- ONSHORE EXPORT CABLE COMMON CORRIDOR
- NOT CONSIDERED IN STATISTICAL ANALYSIS

- ONSHORE EXPORT CABLE NORTH CORRIDOR
- ONSHORE EXPORT CABLE SOUTH CORRIDOR
- ONSHORE EXPORT CABLE COMMON CORRIDOR
- ONSHORE EXPORT CABLE CORRIDOR 1



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DATA SOURCES: TRC, GPS, 2022
BLACK AND VEATCH CORPORATION, ROUTING, 2022

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TITLE:	**BENTHIC SAMPLING LOCATIONS AND PROJECT COMPONENT AREAS**
DRAWN BY: K. BACHAND	PROJ. NO.: 016310.0080.0000
CHECKED BY: S. DEHAINAUT	**FIGURE 2**
APPROVED BY: A. CHASE	
DATE: NOVEMBER 2022	
FILE:	016310_IRB_BENTHICREPORT_FIGS

2.1 Benthic Grab Sampling

Thirty-five benthic grab samples were collected within Indian River Bay (Figure 2). These locations were selected to ensure broad geographic characterization of the portions of Indian River Bay that may be directly or indirectly impacted by Project construction. Three of these sample locations were selected to examine specific bathymetric features and based on the preliminary results of the 2022 acoustic surveys.

2.1.1 Sample Collection

Surface benthic grab samples were collected using a 12” x 12” Petersen grab sampler at 35 locations within Indian River Bay between August 12 and 14, 2022. After retrieval, each sample was examined for quality and a decision was made to accept or reject the sample based on representativeness of the grab. Sample grabs that did not retain at least 8 cm of material or showed evidence of uneven penetration (i.e. angled sample) were rejected as unrepresentative and the grab was redeployed until an acceptable sample was retained.

Petersen Grab Sampler on the Almar 31

Once an acceptable sample was retrieved, descriptions of sample recovery and sediment type (i.e. grain size) were recorded.

The sample was then divided into equal parts and separate subsamples were collected for three purposes: grain size, a primary benthic sample, and a backup benthic sample. The total fraction of the benthic grab was recorded to assist with future analysis. The primary and backup benthic samples were then sieved in the field. Sieving consisted of gently rinsing the sample material through a bucket sieve with 500-µm mesh to remove fine sediments. Sieved samples were preserved in a solution containing 10% buffered formalin in seawater, which is consistent with prior benthic surveys conducted in the area[2]. Preserved samples were stored in high-density polyethylene quart-size sample jars and labeled with the project name, sample identification code, sampling date, preservative, and the initials of the collector.

Preserved samples were returned to TRC offices for storage and laboratory analysis of benthic infauna.

[2] US Wind conducted a survey of twelve locations along a formerly planned onshore export cable route within Indian River Bay in 2017. Results of this survey can be found in COP Volume II, Appendix II-D1.

2.1.2 Laboratory Analysis

Upon receipt at the laboratory, each sample was logged in and decanted through a 500-µm sieve. Samples were gently rinsed in the sieve to remove the formalin fixative and any additional fine sediment that remained after the initial field sieving process. Once thoroughly rinsed, each sample was returned to a labeled jar and preserved with 70% ethanol for storage.

For sorting, the contents of each sample were examined using a high-power dissecting microscope (7X to 45X magnification) and high-intensity gooseneck fiber optic lamp. All samples were sorted in their entirety. Organisms found during the sorting process were removed with forceps and placed in 70% ethanol. Each vial was labeled with the project name, collection date and sample identification number. All residue (sediment and organic matter) from the sorted and unsorted portion of each sample was placed in a separate labeled container and re-preserved in 70% ethanol, which is consistent with prior benthic surveys conducted in the area (Volume II, Appendices II-D1 through II-D4).

Sorted organisms were subsequently identified by a qualified taxonomist to the lowest taxonomic level possible using a dissecting microscope and readily available taxonomic keys and references (e.g., Bartholomew 2001; Martinez 1999; Pollock 1998; Abbott and Morris 1995; Weiss 1995; Gosner 1978; Bousfield 1973; Gosner 1971; Smith 1964; Pettibone 1963). Temporary slide mounts were prepared for oligochaete worms, capitellid polychaetes, and certain amphipod taxa as necessary to improve the taxonomic precision of identification for these groups. Slide-mounted organisms were identified under a compound microscope capable of 64X to 1600X magnification.

For quality assurance and control (QA/QC) purposes, a second qualified staff member (quality assurance officer) resorted 10% of the samples (or one, whichever was greater) analyzed by each sorter to ensure organisms were being adequately removed from the samples. The quality assurance officer checked the sorted sample material for remaining organisms and calculated an efficiency rating (E) using the following formula:

$$E = 100 \times \frac{n_a}{n_a + n_b}$$

Where n_a is the number of individuals originally sorted and verified as identifiable organisms by the QC checker and n_b is the number of organisms recovered by the QC checker. If the original sorter achieved $E < 90\%$ (i.e., less than 90% of the organisms in the sample removed), corrective action was taken to ensure greater sorting efficiency for other samples sorted by the same individual. Corrective action includes but is not necessarily limited to additional training on organism recognition and re-sorting of sample material.

2.1.3 Data Analysis

Univariate Analyses

Measures of benthic abundance, diversity, and community structure were selected to describe the affected environment. The rationale behind selection of each measure is as follows:

Taxa richness is the number of different taxa that are found within a given area or community and is widely accepted as a good assessment measure of diversity (Magurran 2003). Determination of taxa richness from macroinvertebrate data is complicated by the presence of immature or damaged specimens, which often prevent the identification of all organisms to the same taxonomic level (Cuffney et al. 2007, Meredith et al. 2019). These conditions result in datasets that contain abundances associated with multiple levels within the taxonomic hierarchy (e.g. abundances associated with the amphipod genus *Ampelisca* sp. as well as the parent family of that genus, Ampeliscidae). To resolve these ambiguous parent-child pairs while preserving taxa richness and abundance to the extent possible, we employed the RPMC-G (Remove Parent or Merge Children – Group) method described in Cuffney et al. (2007). This method involves the removal of an ambiguous parent taxon if its abundance is less than the sum of abundance(s) reported from its taxonomic children. If abundance of a parent taxon exceeds that of its taxonomic children, then the abundance of the children are merged with the parent. As the derivation of abundance and richness metrics should not be decoupled (Cuffney et al. 2007), the RPMC-G resolved dataset was used for calculation of all metrics presented below.

Macrofaunal density is a measure of abundance expressed as an estimate of the number of individuals per unit area. Although macrofaunal density can reflect the productivity of marine habitats (Taylor 1998), it may also serve as an indication of stress or disturbance at a location (Dean 2008). Consequently, the density of benthic organisms may increase or decrease in response to different types of stress (e.g., thermal or chemical pollution, sediment deposition, physical abrasion or displacement).

The density of benthic organisms responds to disturbance as mitigated by the tolerance (or preference) of a given organism to the particular source of disturbance. However, density may vary substantially over small areas or short periods of time and should therefore be interpreted cautiously. For this study, macrofaunal density is expressed as the number of organisms per square meter.

Analysis of variance (ANOVA) was used to compare average taxa richness and organism density between Project component areas and NMFS-modified CMECS substrate subclass. Density data were log transformed prior to analysis to better meet the assumptions of parametric statistical tests.

<u>**Multivariate Analyses**</u>

Community composition describes the identity and relative abundance of each taxon within a community. Benthic community composition is dependent upon a variety of factors, including sediment grain size and disturbance regime, substrate type, above-sediment structure, and exposure to predation (Byers and Grabowski 2014).

Non-metric Multidimensional Scaling (NMDS) ordination was used to visualize divergence in community composition between samples. Samples were then grouped by Project component areas and NMFS-modified CMECS substrate subclass. NMDS is a non-parametric distance-preserving ordination approach that reduces the complexity of multivariate data and is well suited for use on sparse data sets (Kruskal 1964). NMDS results in the generation of a plot, which represents the community composition of each sample by its relative position in unitless ordination space. The relative distance between points is indicative of the similarity of sample communities; points that are closer together in ordination space indicate more similar communities, those that are farther apart indicate less similar communities. To decrease the influence of rare species, all taxa present in less than 5% of samples were excluded from analysis. Densities were then fourth root transformed to down-weight the influence of highly abundant species. All multivariate analyses were conducted in PRIMER version 6.1.18 (Clarke and Gorley 2006) using Bray-Curtis (Sorensen) distance measures (Bray and Curtis 1957).

Analysis of similarity (ANOSIM), another non-parametric statistical approach, was used to test for differences in community composition between areas of CMECS-classified fine and coarse unconsolidated substrates as well as between samples collected from different Project component areas. ANOSIM tests for significant differences between specified groups of samples through permutation-based hypothesis testing. ANOSIM generates R statistics that represents the ratio between within-group and between-group dissimilarities; values close to 0 indicate a lack of separation of groups, and values close to 1 indicate complete segregation of groups. ANOSIM was run using default settings and included 999 permutations for each analysis. When ANOSIM revealed significant differences in community composition between groups, similarity percentages analysis (SIMPER) was performed to determine the contribution of individual species to observed differences in community composition between groups.

3.0 Results

Section 3.0 presents results in the context of each portion of the cable corridors as shown in Figure 2.

3.1 Onshore Export Cable Common Corridor

Results of the analysis of macrofaunal benthic grab samples collected from the vicinity of the Onshore Export Cable Common Corridor are presented below (Table 1) and in Attachment A. Additionally, charts and tables describing the macrofaunal community composition and basic statistics for each sample are presented in Attachment B.

Table 1. Summary of Key Statistics from the Onshore Export Cable Common Corridor Benthic Sample Analysis

Statistic	Value
Number of Samples	19
Mean Density per Square Meter (±1 SD)	532 ± 759
Mean Taxa Richness (±1 SD)	2.9 ± 1.9
Total Number of Taxa	16
Number of Taxa Observed by Taxonomic Group	
Polychaete worms	11
Crustaceans	3
Mollusks	0
Oligochaete worms	1
Other	1
Percent of Total Abundance by Taxonomic Group	
Polychaete worms	86.8%
Crustaceans	7.2%
Mollusks	0.0%
Oligochaete worms	4.3%
Other	1.7%

*All metrics calculated after taxonomic ambiguity in the dataset was resolved using the RPMC-G method described in Cuffney et al. (2007)

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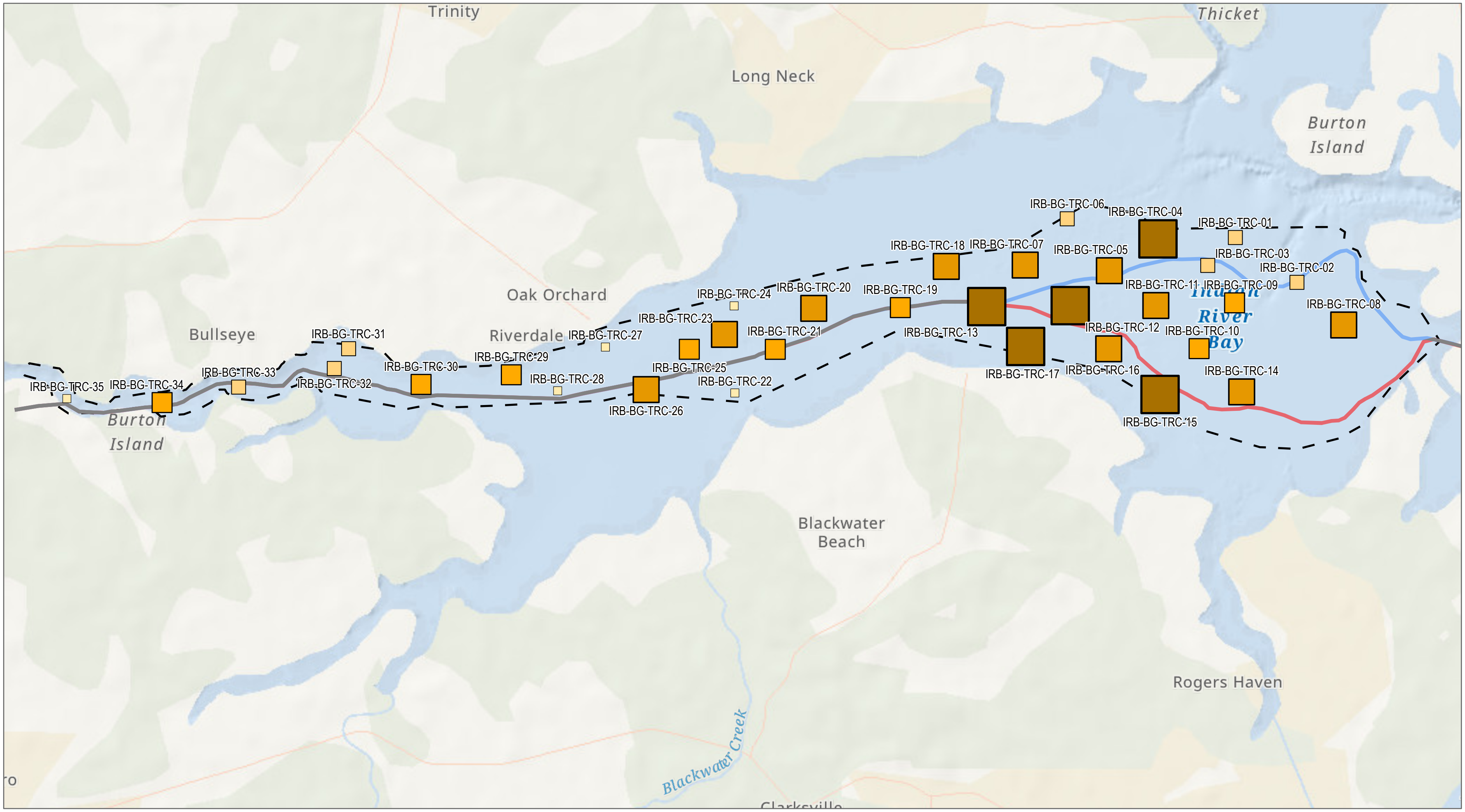
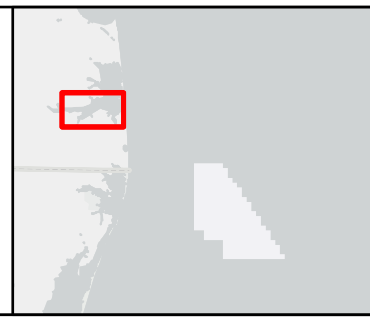


TAXA RICHNESS

- 0 - 1
- 2
- 3 - 4
- 5 - 6
- 7 - 8

- ONSHORE EXPORT CABLE NORTH CORRIDOR
- ONSHORE EXPORT CABLE SOUTH CORRIDOR
- ONSHORE EXPORT CABLE COMMON CORRIDOR
- ONSHORE EXPORT CABLE CORRIDOR 1



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TITLE:	BENTHIC TAXA RICHNESS BY PROJECT COMPONENT AREA
DRAWN BY: K. BACHAND	PROJ. NO.: 016310.0080.0000
CHECKED BY: S. DEHAINAUT	FIGURE 3
APPROVED BY: A. CHASE	
DATE: NOVEMBER 2022	
FILE:	016310_IRB_BENTHICREPORT_FIGS

BASE MAP: ESRI, WORLD OCEAN BASE
DATA SOURCES: TRC, GPS, 2022
BLACK AND VEATCH CORPORATION, ROUTING, 2022

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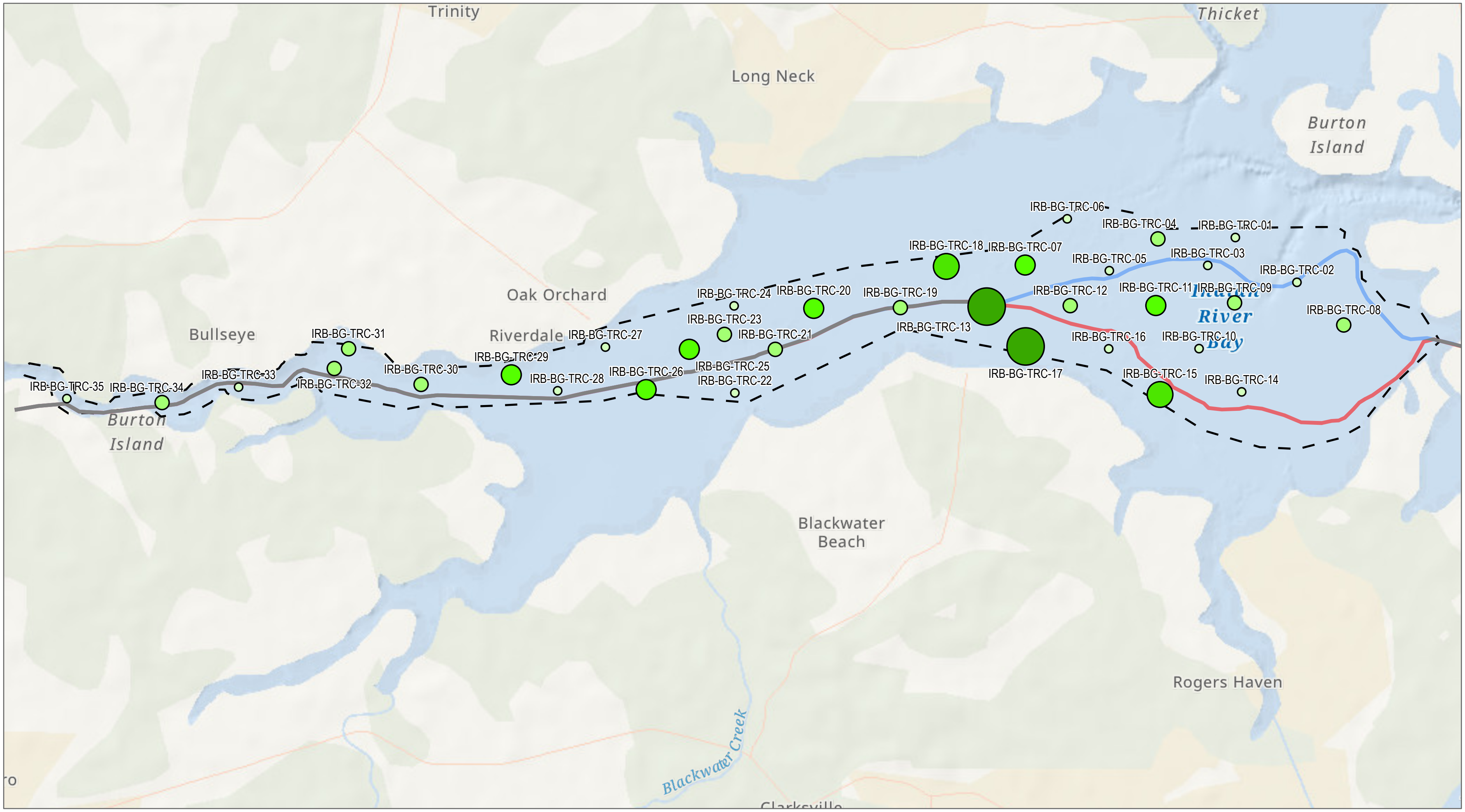
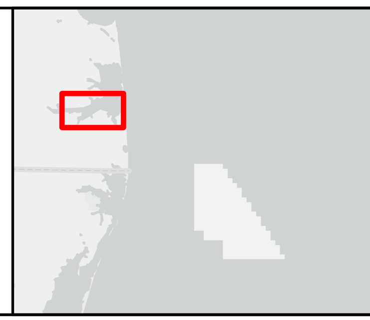


TOTAL DENSITY

- 0 - 172
- 172 - 431
- 431 - 861
- 861 - 1378
- 1378 - 4672

- ONSHORE EXPORT CABLE NORTH CORRIDOR
- ONSHORE EXPORT CABLE SOUTH CORRIDOR
- ONSHORE EXPORT CABLE COMMON CORRIDOR
- ONSHORE EXPORT CABLE CORRIDOR 1



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CHECKED BY:	S. DEHAINAUT
APPROVED BY:	A. CHASE
DATE:	NOVEMBER 2022
PROJ. NO.:	016310.0080.0000
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FILE:	016310_IRB_BENTHICREPORT_FIGS

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DATA SOURCES: TRC, GPS, 2022
BLACK AND VEATCH CORPORATION, ROUTING, 2022

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TRC

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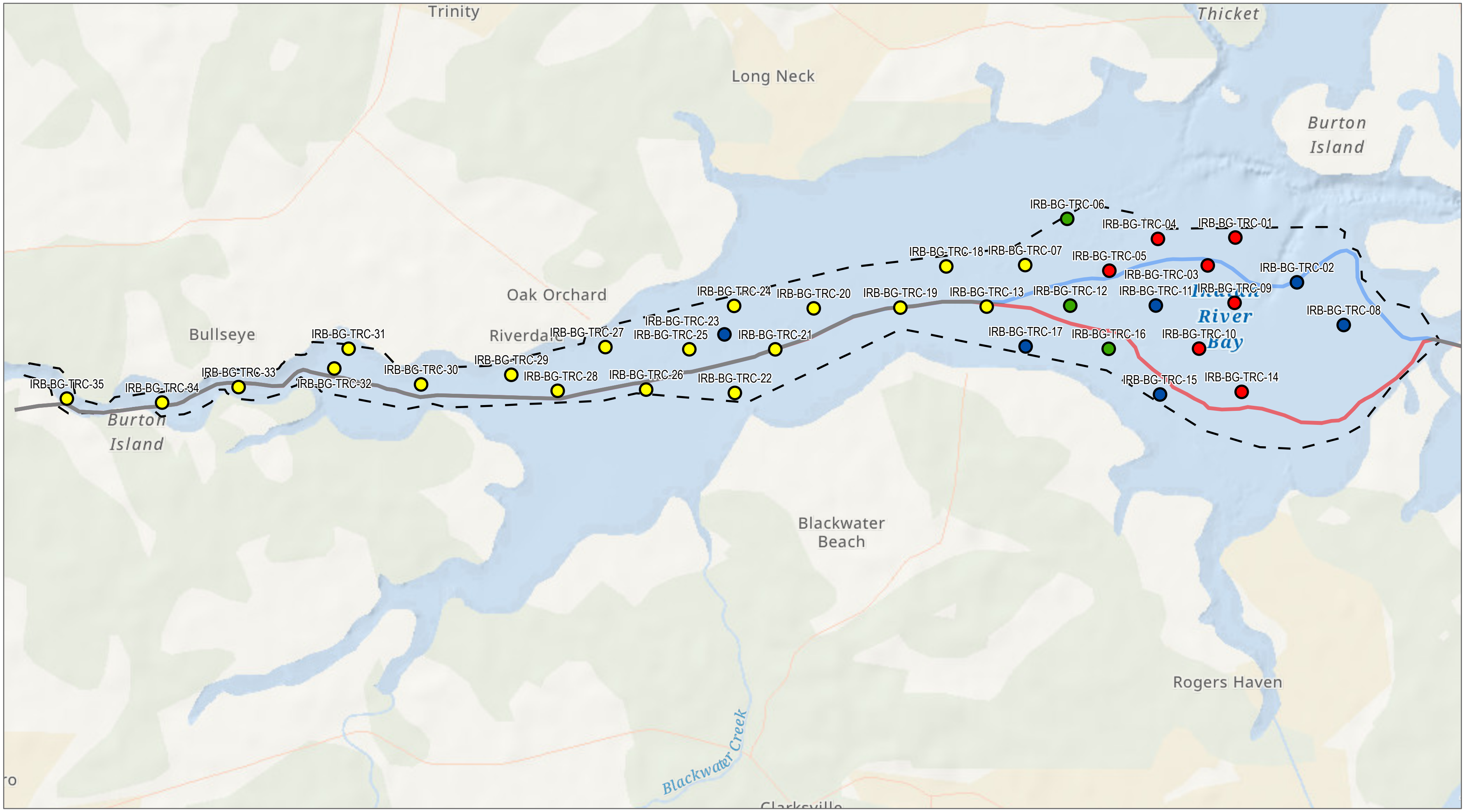
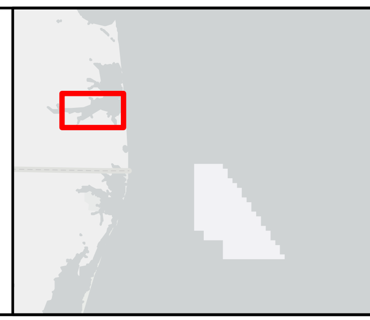


CMECS SUBSTRATE GROUP AT EACH BENTHIC SAMPLE LOCATION

- MUD
- MUDDY SAND
- SAND
- SANDY MUD

- ONSHORE EXPORT CABLE SOUTH CORRIDOR
- ONSHORE EXPORT CABLE NORTH CORRIDOR
- ONSHORE EXPORT CABLE COMMON CORRIDOR
- ONSHORE EXPORT CABLE CORRIDOR 1



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TITLE:	BENTHIC SAMPLING LOCATIONS BY CMECS SUBSTRATE GROUP
DRAWN BY:	K. BACHAND
CHECKED BY:	S. DEHAINAUT
APPROVED BY:	A. CHASE
DATE:	NOVEMBER 2022
PROJ. NO.:	016310.0080.0000
	FIGURE 5
FILE:	016310_IRB_BENTHICREPORT_FIGS

Taxa Richness

Overall, 16 taxa of benthic fauna were observed in the 19 grab samples collected from the Onshore Export Cable Common Corridor in 2022 (Table 1). Taxa richness per sample ranged from 0 to 7, and mean taxa richness was 2.9 ± 1.9 (mean ± SD) per site (Table 1 and Attachment A). Taxa richness per sample appeared to be greatest in the eastern portion of the Onshore Export Cable Common Corridor (Figure 3).

Macrofaunal Density

The mean macrofaunal density for samples collected from the Onshore Export Cable Common Corridor was 532 ± 759 (mean ± SD) individuals/m^2 (Table 1). The highest macrofaunal density (3,950 individuals/m^2) was found at IRB-BG-TRC-13, while macrofaunal density was lowest (0 individuals/m^2) at IRB-BG-TRC-28 (Attachment B). Of the 19 samples analyzed, only two were characterized by densities of 1000 individuals/m^2 or more (11% of samples). No consistent spatial patterns in total organism density were observed in samples collected in the vicinity of the Onshore Export Cable Common Corridor (Figure 4).

Community Composition

The benthic macrofaunal assemblage documented in the analyzed samples consisted of polychaete worms, crustaceans, oligochaete worms, and nemertean ribbon worms (Attachments A and B).

The most speciose taxonomic group was polychaete worms, which contributed over 68% of the taxa documented in the analyzed samples. Crustaceans accounted for approximately 18%, and oligochaete worms and nemertean ribbon worms each accounted for approximately 6%, of all taxa in Onshore Export Cable Common Corridor samples. The majority of organisms encountered were polychaete worms (over 86% of total organism abundance), followed by crustaceans and oligochaete worms (approximately 7% and 4%) (Table 1).

The most abundant taxon in Onshore Export Cable Common Corridor samples were the spionid polychaete *Polydora* sp., and the orbiniid polychaete *Leitoscoloplos* sp., which accounted for nearly 25% and 22% of all individuals identified, respectively. The spionid polychaete *Streblospio benedicti,* capitellid polychaete *Notomastus* sp., and the liljeborgiid amphipod *Idunella* sp. were the next most abundant taxa, each accounting for more than 5% of all organisms (Table 2).

Mollusks were not observed in Onshore Export Cable Common Corridor benthic samples, though hard clam (*Mercenaria mercenaria*) a shellfish species of potential commercial importance, were encountered at site IRB-BG-TRC-23 (see Attachment C for additional information on hard clams in Indian River Bay). No taxa indicative of sensitive habitats (hard bottom areas, cold water coral reefs, seagrass beds, etc.) were observed in samples collected in the vicinity of the Onshore Export Cable Common Corridor, and no submerged aquatic vegetation was observed during sample collection.

Table 2. Relative Abundance of Taxa Encountered in Onshore Export Cable Common Corridor

Scientific Name	Common Name	Relative Abundance (%)
Polydora sp.	Spionid Polychaete	24.7
Leitoscoloplos sp.	Orbiniid Polychaete	21.9
Streblospio benedicti	Spionid Polychaete	14.7
Notomastus sp.	Capitellid Polychaete	12.1
Idunella sp.	Liljeborgiid Amphipod	5.5
Mediomastus sp.	Capitellid Polychaete	4.7
Naididae w/out hair chaetae	Oligochaete Worm	4.3
Paraprionospio sp.	Spionid Polychaete	2.6

*Includes taxa accounting for ≥ 2.5% of total abundance

The most widespread taxa (i.e., observed in the most samples) were the orbiniid polychaete *Leitoscoloplos* sp., and the spionid polychaete *Streblospio benedicti*, which were present in over 50% of samples collected within the Lease area (≥10 samples, Table 3). Other relatively widely distributed taxa included the capitellid polychaete *Notomastus* sp., the liljeborgiid amphipod *Idunella* sp., and the capitellid polychaete *Mediomastus* sp. (all found in at least 20% of samples).

Table 3. Most Widespread Taxa Encountered in Onshore Export Cable Common Corridor Samples

Scientific Name	Common Name	Number of Samples Containing this Taxon
Leitoscoloplos sp.	Orbiniid Polychaete	13
Streblospio benedicti	Spionid Polychaete	10
Notomastus sp.	Capitellid Polychaete	5
Idunella sp.	Liljeborgiid Amphipod	4
Mediomastus sp.	Capitellid Polychaete	4
Naididae w/out hair chaetae	Oligochaete Worm	3
Goniadidae	Goniadid Polychaete	3
Paraprionospio sp.	Spionid Polychaete	3

*Includes taxa observed in ≥ 3 samples (≥19% of samples)

The taxa observed in grab samples collected from the Onshore Export Cable Common Corridor are typical of soft-sediment habitats. Orbiniid polychaetes like *Leitoscoloplos* sp. are deposit feeders commonly encountered in sandy and muddy areas throughout the world's oceans (Fauchald and Jumars 1979). Orbiniids can be found burrowing in sediments at a range of depths, from coastal salt marshes from deep offshore areas, but are most common in nearshore environments (Blake 2021, Fauchald and Jumars 1979). *Streblospio benedicti*, another common and widespread species in Onshore Export Cable Common Corridor samples, is a small tube-dwelling spionid polychaete that inhabits the top few centimeters of mudflats and soft sediments in North America estuaries (SERC 2022). This deposit and suspension feeder is found in habitats with a wide range of temperatures and salinities (Levin and Creed 1986, Palmer et al. 2002) and is regarded as an opportunistic pioneer species that is generally tolerant of contamination and organic enrichment (Thompson and Lowe 2004) and can survive intermittent periods of hypoxia (Llansó 1991). Similarly, the capitellid polychaetes *Notomastus* sp. and *Mediomastus* sp. tolerate disturbance and excess organic content (Borja et al. 2000) and are often associated with moderate to high contamination levels (Rakocinshi et al. 2000). *Notomastus* sp. is a burrowing deposit feeder (Kikuchi 1987), frequently found in shallow soft-sediment habitats with high levels of organic debris (Pollock 1998). The liljeborgiid amphipod *Idunella* sp. is a cosmopolitan genus in shallow waters and is commensal in tubes of polychaetes (Bousfield 1973, Lazo-Wasem 1985).

The benthic community present in samples collected from the vicinity of the Onshore Export Cable Common Corridor aligns with expectations, given the known fine-grain substrates present in Indian River Bay. The infaunal sampling results also align with the CMECS habitat classifications for the area; all samples were classified as fine unconsolidated substrate under the NMFS-modified CMECS framework. In contrast to Onshore Export Cable North Corridor and Onshore Export Cable South Corridor samples (see sections 3.2 and 3.3 below), the substrate group for nearly all Onshore Export Cable Common Corridor samples (95%) was mud (Table 4, Figure 5).

Table 4. Onshore Export Cable Common Corridor Benthic Grab Sample Substrate Classifications

CMECS Substrate Group	CMECS Substrate Subgroup(s)	No. of Locations	% of Transects
Mud	N/A	18	95%
Sandy Mud	N/A	0	0%
Muddy Sand	N/A	1	5%
Sand	Fine/Very Fine Sand	0	0%
Total		**19**	**100%**

3.2 Onshore Export Cable North Corridor

Results of the analysis of benthic grab samples collected from within the Onshore Export Cable North Corridor in 2022 are presented below (Table 5) and Attachment A. Additionally, charts and tables describing the macrofaunal community composition and basic statistics for each sample are presented in Attachment B.

Table 5. Summary of Key Statistics from the Onshore Export Cable North Corridor Benthic Sample Analysis

Statistic	Value
Number of Samples	9
Mean Density per Square Meter (±1 SD)	211 ± 184
Mean Taxa Richness (±1 SD)	4 ± 2.2
Total Number of Taxa	22
Number of Taxa Observed by Taxonomic Group	
Polychaete worms	9
Crustaceans	9
Mollusks	3
Oligochaete worms	1
Other	0
Percent of Total Abundance by Taxonomic Group	
Polychaete worms	52.5%
Crustaceans	29.4%
Mollusks	13.6%
Oligochaete worms	4.5%
Other	0.0%

*All metrics calculated after taxonomic ambiguity in the dataset was resolved using the RPMC-G method described in Cuffney et al. (2007)

Taxa Richness

Overall, 22 taxa of benthic fauna were observed in the nine grab samples collected from the Onshore Export Cable North Corridor in 2022 (Table 5). Taxa richness per sample ranged from 2 to 8, and mean taxa richness was 4 ± 2.2 (mean ± SD) per site (Table 5 and Attachment A). No consistent spatial patterns in taxa richness per sample were observed in samples collected in the vicinity of the Onshore Export Cable North Corridor (Figure 3).

Macrofaunal Density

The mean macrofaunal density for samples collected from the Onshore Export Cable North Corridor was 211 ± 184 (mean ± SD) individuals/m^2 (Table 5). The highest macrofaunal density (517 individuals/m^2) was found at IRB-BG-TRC-07, while macrofaunal density was lowest (43 individuals/m^2) at IRB-GB-TRC-01 (Attachment B). Of the nine samples analyzed, none were characterized by densities of 1000 individuals/m^2 or more. No consistent spatial patterns in total organism density were observed in samples collected in the vicinity of the Onshore Export Cable North Corridor (Figure 4).

Community Composition

The benthic macrofaunal assemblage documented in the analyzed samples consisted of polychaete worms, crustaceans, mollusks, and oligochaete worms (Attachments A and B).

The most speciose taxonomic groups were polychaete worms and crustaceans, which each contributed over 40% of the taxa documented in the analyzed samples. Mollusks and oligochaete worms accounted for approximately 13% and 5% of taxa in the Onshore Export Cable North Corridor samples, respectively. Polychaetes accounted for the greatest percentage of total organism abundance of any taxa group (over 52%), followed by crustaceans and mollusks (approximately 29% and 14%, respectively) (Table 5).

The most abundant taxon in Onshore Export Cable North Corridor samples was the spionid polychaete *Streblospio benedicti*, which accounted for over 18% of all individuals identified. Tellin clams (Tellinidae) and the orbiniid polychaete *Leitoscoloplos* sp. were the next most abundant taxa, each accounting for more than 11% of all organisms (Table 6).

The only mollusk taxa observed in Onshore Export Cable North Corridor samples were tellin clams (Tellininae, found in four samples) and razor shells (Solenidae, found in one sample). Hard clam, a shellfish species of potential commercial importance, was observed as a single individual in two samples. No other taxa indicative of sensitive habitats (hard bottom areas, cold water coral reefs, seagrass beds, etc.) were observed in the samples collected in the vicinity of the Onshore Export Cable North Corridor, and no submerged aquatic vegetation was observed during sample collection.

Table 6. Relative Abundance of Taxa Encountered in Onshore Export Cable North Corridor Area Samples

Scientific Name	Common Name	Relative Abundance (%)
Streblospio benedicti	Spionid Polychaete	18.1
Tellininae	Tellin Clam	12.4
Leitoscoloplos sp.	Orbiniid Polychaete	11.3
Rhepoxynius epistomus	Phoxocephalid Amphipod	9.0
Idunella sp.	Liljeborgiid Amphipod	5.6
Corophium sp.	Corophiid Amphipod	5.1
Cirratulidae	Cirratulid Polychaete	5.1
Polydora sp.	Spionid Polychaete	4.5
Naididae w/out hair chaetae	Oligochaete Worm	4.5
Notomastus sp.	Capitellid Polychaete	4.5
Nephtys bucera	Nephtyid Polychaete	4.0
Goniadidae	Goniadid Polychaete	3.4

*Includes taxa accounting for ≥ 2.5% of total abundance

The most widespread taxa (i.e., observed in the most samples) were tellin clams and the spionid polychaete *Streblospio benedicti*, which were present in over 18% of Onshore Export Cable North Corridor samples (4 samples, Table 7). Other relatively widely distributed taxa included the catworm *Nephtys bucera* and the orbiniid polychaete *Leitoscoloplos* sp., which were found in at least 14 percent of samples (3 samples).

Table 7. Most Widespread Taxa Encountered in Onshore Export Cable North Corridor Samples

Scientific Name	Common Name	Number of Samples Containing this Taxon
Tellininae	Tellin Clam	4
Streblospio benedicti	Spionid Polychaete	4
Nephtys bucera	Catworm/Nephtyid Polychaete	3
Leitoscoloplos sp.	Orbiniid Polychaete	3
Corophium sp.	Corophiid Amphipod	2
Idunella sp.	Liljeborgiid Amphipod	2
Goniadidae	Goniadid Polychaete	2
Cirratulidae	Cirratulid Polychaete	2

*Includes taxa observed in ≥ 2 samples (≥ 9% of samples)

The taxa observed in grab samples collected from the vicinity of the Onshore Export Cable North Corridor were generally similar to those found in samples collected from the Onshore Export Cable Common Corridor (described in Section 3.1 above) and are typical of soft-sediment habitats. However, some taxa, including tellin clams and nephtyid polychaetes, were notably more abundant and widespread in Onshore Export Cable North Corridor samples than in Onshore Export Cable Common Corridor samples. Tellin clams are small bivalves that use long siphons to filter feed while burrowed horizontally in a variety of soft sediment habitats (Mikkelsen and Bieler 2021, Pollock 1998). Nephtyid polychaetes like *Nephtys bucera* are also typical of soft sediment habitats (mud and sand) from the high intertidal to offshore areas (Pettibone 1963). *N. bucera* is a highly motile predator of polychaetes and crustaceans which is widely distributed along the east coast of the United States (Pettibone 1963).

The infaunal sampling results align with expectations, given the NMFS-modified CMECS habitat classifications for samples collected in the vicinity of the Onshore Export Cable North Corridor; all nine samples were classified as fine unconsolidated substrates under the CMECS framework. The majority of samples were classified as sand habitats (5 samples, 56%), though muddy sand, sandy mud, and mud substrates were also observed (Table 8, Figure 5). This distribution of CMECS substrate group classifications differs from Onshore Export Cable Common Corridor sites, which were nearly all mud substrates (see section 3.1 above). However, substrate groups in Onshore Export Cable North Corridor samples were generally similar to those observed in Onshore Export Cable South Corridor samples (see section 3.3 below).

Table 8. Onshore Export Cable North Corridor Benthic Grab Sample Substrate Classifications

CMECS Substrate Group	CMECS Substrate Subgroup(s)	No. of Locations	% of Transects
Mud	N/A	1	11%
Sandy Mud	N/A	1	11%
Muddy Sand	N/A	2	22%
Sand	Fine/Very Fine Sand	5	56%
Total		**9**	**100%**

3.3 Onshore Export Cable South Corridor

Results of the analysis of benthic grab samples collected from the vicinity of the Onshore Export Cable South Corridor in 2022 are presented below (Table 9and Attachment A). Charts and tables describing the macrofaunal community composition and basic statistics for each sample are presented in Attachment B.

Table 9. Summary of Key Statistics from the Onshore Export Cable South Corridor Benthic Sample Analysis

Statistic	Value
Number of Samples	6
Mean Density per Square Meter (±1 SD)	1,102 ± 1,800
Mean Taxa Richness (±1 SD)	6 ± 2.0
Total Number of Taxa	21
Number of Taxa Observed by Taxonomic Group	
Polychaete worms	11
Crustaceans	5
Mollusks	3
Oligochaete worms	1
Other	1
Percent of Total Abundance by Taxonomic Group	
Polychaete worms	85.8%
Crustaceans	4.2%
Mollusks	5.5%
Oligochaete worms	4.1%
Other	0.3%

*All metrics calculated after taxonomic ambiguity in the dataset was resolved using the RPMC-G method described in Cuffney et al. (2007)

Taxa Richness

Overall, 21 taxa of benthic fauna were observed in the six grab samples collected from the Onshore Export Cable South Corridor in 2022 (Table 9). Taxa richness per sample ranged from 3 to 8, and mean taxa richness was 6 ± 2.0 (mean ± SD) per site (Table 9 and Attachment A). No consistent spatial patterns in taxa richness per sample were observed in samples collected in the vicinity of the Onshore Export Cable South Corridor (Figure 3).

Macrofaunal Density

The mean macrofaunal density for samples collected from Onshore Export Cable South Corridor was 1,102 ± 1,800 (mean ± SD) individuals/m^2 (Table 9). The highest macrofaunal density (4,672 individuals/m^2) was found at IRB-BG-TRC-17, while macrofaunal density was lowest (86 individuals/m^2) at IRB-BG-TRC-10 (Attachment B). Of the six samples analyzed, two were characterized by densities of 1000 individuals/m^2 or more (33% of samples). No consistent spatial patterns in total organism density were observed in samples collected in the vicinity of the Onshore Export Cable South Corridor (Figure 4).

Community Composition

The benthic macrofaunal assemblage documented in the analyzed samples consisted of polychaete worms, mollusks, crustaceans, oligochaete worms, and nemertean ribbon worms (Attachment B).

The most speciose taxonomic group was polychaete worms, which contributed over 52% of the taxa documented in the analyzed samples. Crustaceans and mollusks each accounted for approximately 24% and 14% of taxa in the Onshore Export Cable South Corridor samples, respectively. Polychaete worms accounted for the greatest percentage of total organism abundance of any taxa group (over 85%, Table 9).

The most abundant taxon in the Onshore Export Cable South Corridor samples was the spionid polychaete *Streblospio benedicti*, which accounted for over 53% of all individuals identified (Table 10). The capitellid polychaete *Mediomastus* sp., and cirratulid polychaetes were the next most abundant taxa, each accounting for more than 11% of all organisms (Table 10).

The only mollusk taxa observed in Onshore Export Cable South Corridor samples were tellin clams (Tellininae, found in two samples), chestnut clams (*Astarte* sp., found in one sample), and a taxon of minute immature bivalve (bivalvia type a, found in one sample). Hard clam, a shellfish species of potential commercial importance, was observed as a single individual in one sample. No taxa indicative of sensitive habitats (hard bottom areas, cold water coral reefs, seagrass beds, etc.) were observed in the samples collected in the vicinity of the Onshore Export Cable South Corridor, and no submerged aquatic vegetation was observed during sample collection.

Table 10. Relative Abundance of Taxa Encountered in Onshore Export Cable South Corridor Samples

Scientific Name	Common Name	Relative Abundance (%)
Streblospio benedicti	Spionid Polychaete	53.3
Mediomastus sp.	Capitellid Polychaete	13.0
Cirratulidae	Cirratulid Polychaete	11.4
Naididae w/out hair chaetae	Oligochaete Worm	4.1
Goniadidae	Goniadid Polychaete	2.9
Idunella sp.	Liljeborgiid Amphipod	2.3
Astarte sp.	Chestnut Clam	2.3
Bivalvia type a	Immature Clam	2.3

*Includes taxa accounting for ≥ 2.0% of total abundance

The most widespread taxa (i.e., observed in the most samples) were the spionid polychaete *Streblospio benedicti* and cirratulid polychaetes, which were each present in over 19% of Onshore Export Cable South Corridor samples (4 samples, Table 11). Other relatively widely distributed taxa included the liljeborgiid amphipod *Idunella* sp., naidid oligochaete worms without hair chaetae, and goniadid polychaetes, which were all found in at least 14 percent of samples.

Table 11. Most Widespread Taxa Encountered in Onshore Export Cable South Corridor Samples

Scientific Name	Common Name	Number of Samples Containing this Taxon
Streblospio benedicti	Spionid Polychaete	4
Cirratulidae	Cirratulid Polychaete	4
Idunella sp.	Liljeborgiid Amphipod	3
Naididae w/out hair chaetae	Oligochaete Worm	3
Goniadidae	Goniadid Polychaete	3
Tellininae	Tellin Clam	2
Polydora sp.	Spionid Polychaete	2
Mediomastus sp.	Capitellid Polychaete	2

*Includes taxa observed in ≥ 2 samples (≥10% of samples)

The taxa observed in grab samples collected from the vicinity of the Onshore Export Cable South Corridor were typical of soft sediment habitats and generally similar to those found in samples collected from the Onshore Export Cable Common Corridor and the Onshore Export Cable North Corridor (described in Sections 3.1 and 3.2 above). Additional organisms found in Onshore Export Cable South Corridor samples included cirratulid and goniadid polychaetes. Cirratulid worms are deposit feeders that reside in soft sediment habitats (Gosner 1978) and are regarded as somewhat opportunistic taxa (Borja et al. 2000). Goniadid worms are carnivores (Pettibone 1963) found in sand and mud (Pollock 1998).

The infaunal sampling results align with expectations, given the NMFS-modified CMECS habitat classifications for samples collected in the vicinity of the Onshore Export Cable South Corridor. Like Onshore Export Cable Common Corridor samples and Onshore Export Cable North Corridor Samples, all Onshore Export Cable South Corridor samples were classified as fine unconsolidated substrate under the CMECS framework. An equal distribution of sand, muddy sand, and sandy mud habitats were observed in the Onshore Export Cable South Corridor samples (Table 12, Figure 5). This is generally similar to substrates observed in Onshore Export Cable North Corridor samples (though with a smaller percentage of sand habitats), but differs notably from Onshore Export Cable Common Corridor samples, which were composed nearly entirely of finer mud substrates (see sections 3.2 and 3.1).

Table 12. Onshore Export Cable South Corridor Benthic Grab Sample Substrate Classifications

CMECS Substrate Group	CMECS Substrate Subgroup(s)	No. of Locations	% of Transects
Mud	N/A	0	0%
Sandy Mud	N/A	2	33%
Muddy Sand	N/A	2	33%
Sand	Fine/Very Fine Sand	2	33%
Total		**6**	**100%**

3.4 Statistical Comparisons

3.4.1 Project Component Areas

Univariate statistical tests were used to compare average organism density in samples collected from the three Project component areas. Though log transformed average organism density was greater in Onshore Export Cable South Corridor samples than Onshore Export Cable North Corridor and Onshore Export Cable Common Corridor samples, this difference was not statistically significant (Figure 6, one-way ANOVA, F=1.90, P=0.17). Consistent spatial trends in organism density across the three component areas were not observed, and density often varied notably between neighboring samples (Figure 4).

Unlike organism density, significant differences in taxa richness between Project component areas were observed. Average taxa richness per sample was significantly greater in Onshore Export Cable South Corridor samples than in Onshore Export Cable Common Corridor samples (Figure 6, one-way ANOVA, F=5.44, p<0.010, Tukey's HSD, P<0.05). No significant differences in taxa richness existed between samples from the Onshore Export Cable North Corridor and the other two Project component areas. Taxa richness was generally greatest in the central region of Indian River Bay, in the eastern portion of the Onshore Export Cable Common Corridor, and the western portions of the Onshore Export Cable North Corridor and Onshore Export Cable South Corridors (Figure 3).

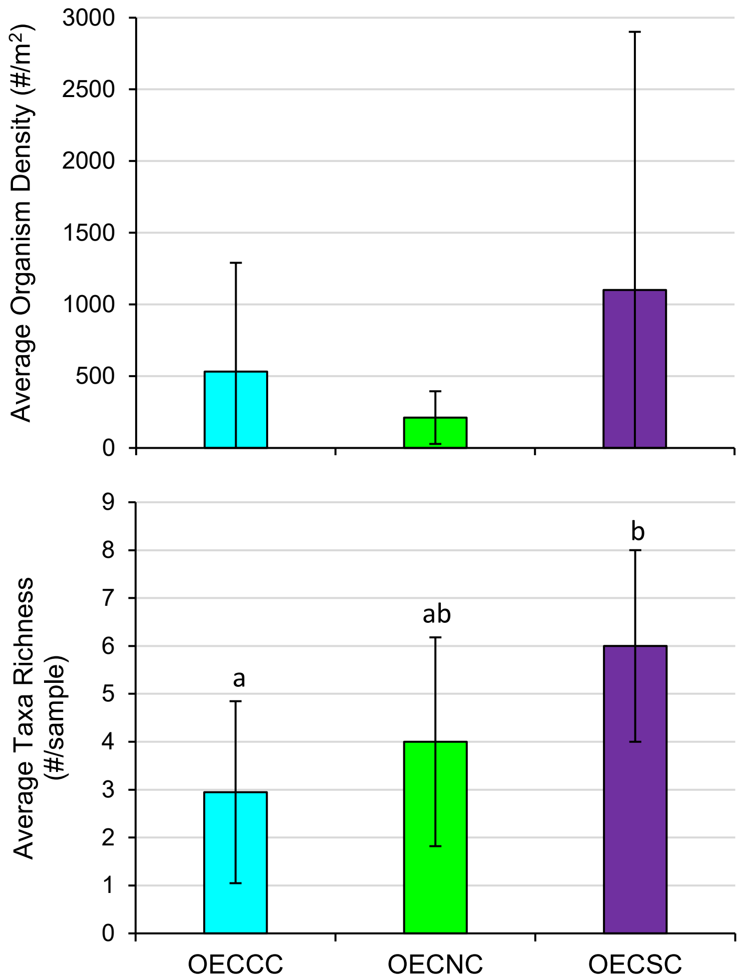


Figure 6. Average Organism Density and Average Taxa Richness of Benthic Samples by Project Component Areas

Log transformed organism density did not differ significantly between the three Onshore Export Cable Corridor project component areas (One-way ANOVA: F=1.90, p=0.166). Taxa richness was significantly lower in Onshore Export Cable Common Corridor samples than in Onshore Export Cable South Corridor samples (One-way ANOVA, F=5.44, p =0.009, Tukey's HSD, p < 0.05). Onshore Export Cable Common Corridor N= 19, Onshore Export Cable North Corridor N= 9, Onshore Export Cable South Corridor N= 6.

Multivariate approaches were used to determine if overall benthic community composition differed between Project component areas. Note that sample IRB-BG-TRC-28 (located within the Onshore Export Cable Common Corridor) was excluded from multivariate analyses, as no macroinvertebrates were recovered from this infaunal sample. Sample IRB-BG-TRC-11 which was located approximately equidistant from the Onshore Export Cable North Corridor and the Onshore Export Cable South Corridor, was included in multivariate analyses (assigned N/A as a project component area designation) for completeness.

ANOSIM indicated that significant differences in community composition did exist between certain Project component areas (p=0.014), though the R value for this analysis was low (global R = 0.172), indicating low levels of separation between communities. Pairwise comparisons determined that significant differences in community composition existed between Onshore Export Cable Common Corridor samples and Onshore Export Cable North Corridor samples (p=0.018, R=0.232) and between Onshore Export Cable Common Corridor samples and Onshore Export Cable South Corridor samples (p=0.034, R=0.234). These findings are illustrated by the NMDS ordination, which demonstrates separation between Onshore Export Cable Common Corridor samples and the other two Project component areas (Figure 7).

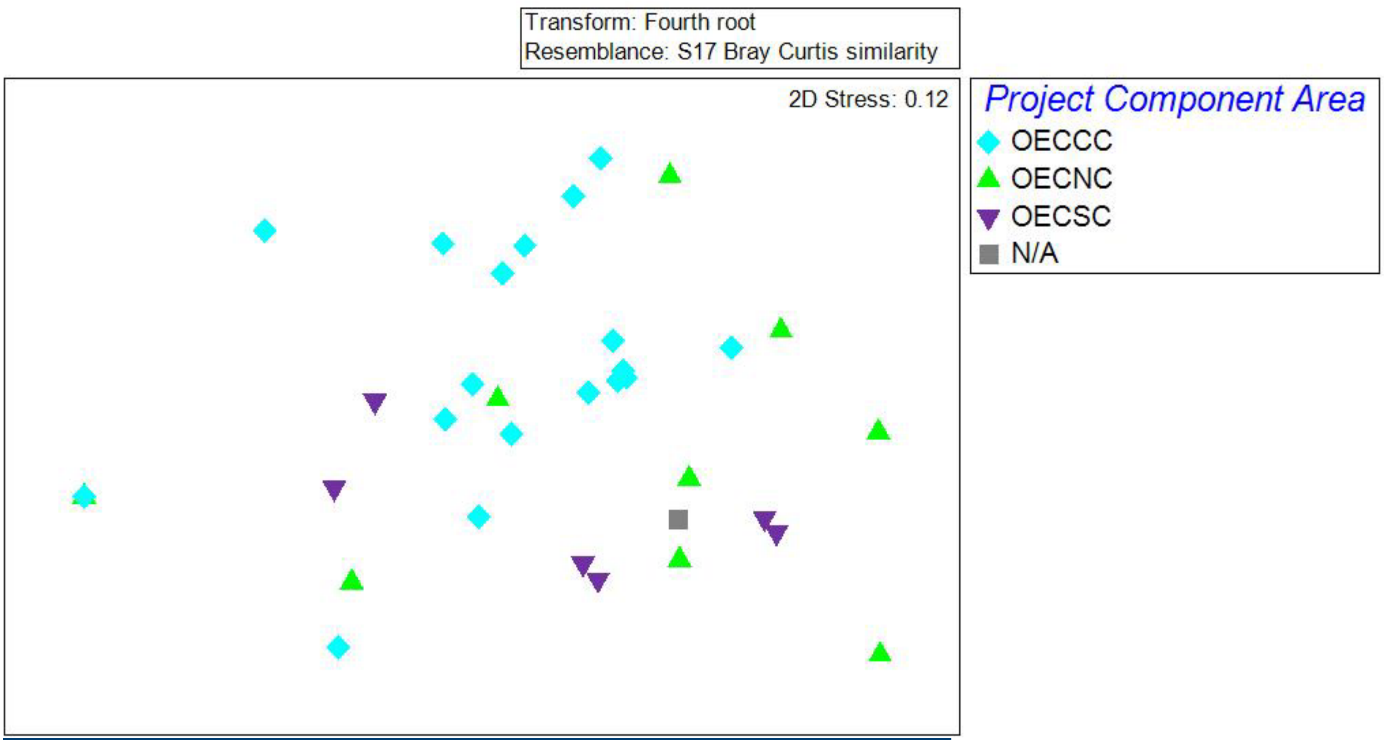


Figure 7. NMDS Ordination of Benthic Community Composition by Project Component Area

SIMPER analysis identified the orbiniid polychaete *Leitoscoloplos* sp., the spionid polychaete *Streblospio benedicti*, cirratulid polychaetes, tellin clams, the capitellid polychaetes *Mediomastus* sp. and *Notomastus* sp., and the liljeborgiid amphipod *Idunella* sp. as the taxa most responsible for differences between Onshore Export Common Common Corridor sites and the other two Project component areas (the contribution of each taxon to total dissimilarity between the benthic communities was at least 5.3% for both pairwise comparisons).

The orbiniid polychaete *Leitoscoloplos* sp. and the capitellid polychaete *Notomastus* sp. were generally present at higher densities in Onshore Export Cable Common Corridor samples than in either of the other two Project component areas. Tellin clams were present at lower densities in Onshore Export Cable Common Corridor samples than samples from other Project component areas. Additionally, *Streblospio benedicti, Idunella* sp., and *Mediomastus* sp. were generally found in Onshore Export Cable Common Corridor samples at greater densities than in Onshore Export Cable North Corridor samples, but lower densities than in Onshore Export Cable South Corridor samples.

Community-level differences between Project component areas are likely driven by differences in soft-bottom habitat types (see Section 3.4.2). Substrates in Onshore Export Cable Common Corridor samples were consistently finer than in the other two Project component areas (Figure 5, Figure 8). Onshore Export Cable Common Corridor samples were also spread over a much larger area than the Onshore Export Cable North Corridor or Onshore Export Cable South Corridor samples and are located closer to the mouth of Indian River, in less saline waters of the Bay.

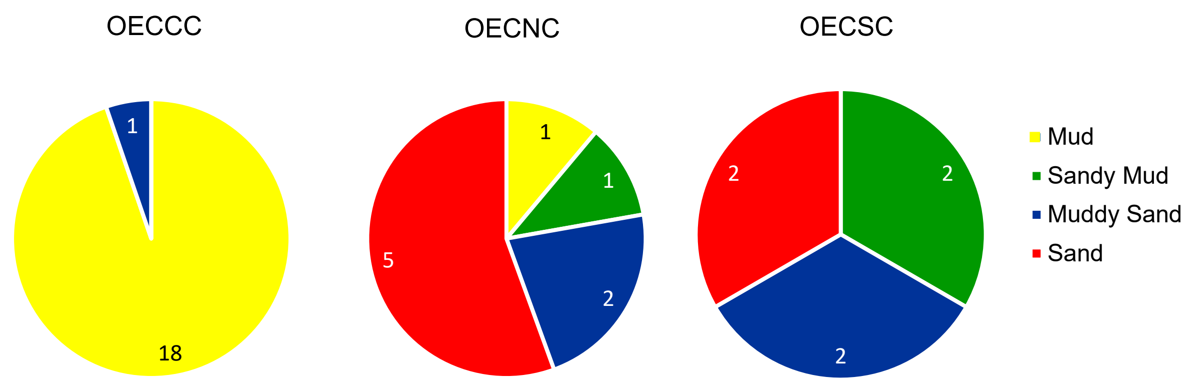


Figure 8. NMFS-modified CMECS Substrate Group by Project Component Area

Data labels indicate number of samples, total Onshore Export Cable Common Corridor N= 19, Onshore Export Cable North Corridor N= 9, Onshore Export Cable South Corridor N= 6.

3.4.2 CMECS Substrate Groups

Univariate comparison of NMFS-modified CMECS substrate group revealed no significant differences in average organism density (Figure 9, one-way ANOVA, F=1.14, P=0.35). However, average taxa richness per sample was significantly greater in samples collected from muddy sand substrates than from samples collected from mud substrates (Figure 9, one-way ANOVA, F=3.13, p=0.039, Tukey's HSD, P<0.05). No other significant differences in taxa richness existed between substrate group.

However, as illustrated by NMDS ordination (Figure 10) and confirmed by ANOSIM (global R = 0.355, P=0.001), significant differences in community composition existed between substrate groups. Pairwise comparisons determined that communities in sand substrates differed from all other substrate groups (all P<0.027, all R>0.231). Communities found in mud substrates also differed significantly from those found in muddy sand (p=0.013, R=0.352). These community differences are apparent in the NMDS ordination, which shows clustering of sample points by substrate group, with notable separation between mud and sand, mud and muddy sand, and sand and all other substrate groups.

SIMPER analysis identified the orbiniid polychaete *Leitoscoloplos* sp., the spionid polychaete *Streblospio benedicti*, and tellin clams as the taxa most responsible for differences between mud and sand samples and mud and muddy sand samples (the contribution of each taxon to total dissimilarity between the benthic communities was at least 10%). *Leitoscoloplos* sp. was generally found in greater densities in mud samples than in sand or muddy sand samples, while tellin clams and *S. benedicti* polychaetes were found at lower densities. These patterns roughly align with differences noted between Onshore Export Cable Common Corridor samples and samples from other Project component areas, which is expected given the distribution of substrate types (Figure 5, Figure 8).

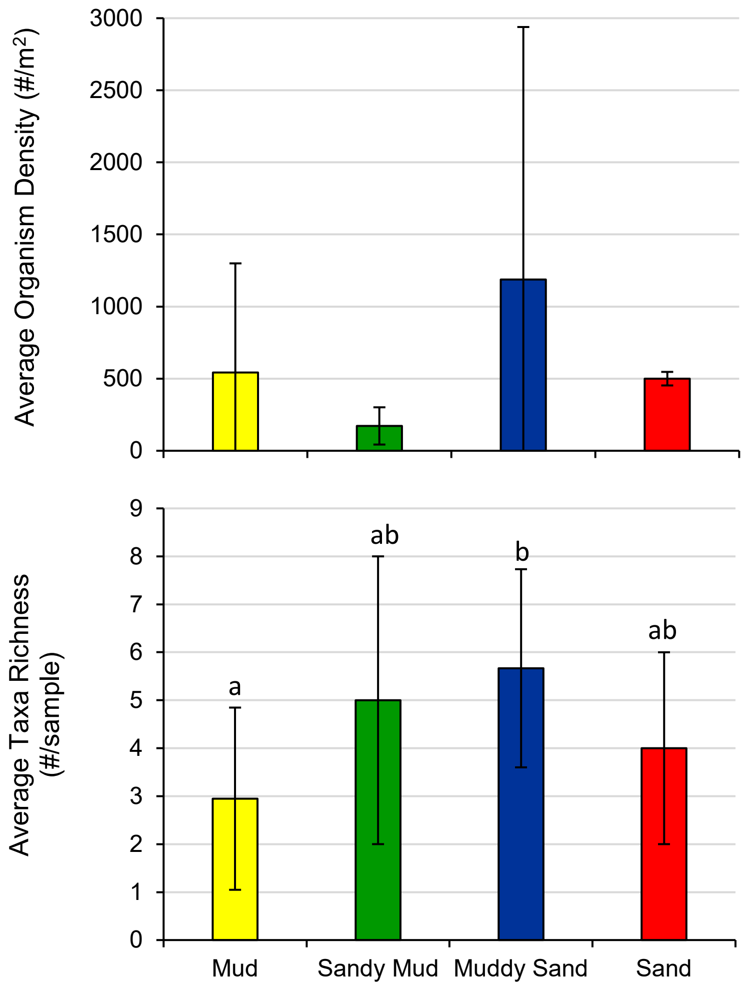


Figure 9. Average Organism Density and Average Taxa Richness of Benthic Samples by CMECS Substrate Groups

Log transformed organism density did not differ significantly between the four CMECS substrate groups encountered in Onshore Export Cable Corridor samples (One-way ANOVA: F=1.14, p=0.35). Taxa richness was significantly greater in muddy sand samples than in mud samples (One-way ANOVA, F=3.13, p =0.04, Tukey's HSD, $p < 0.05$). Mud N= 19, Sandy Mud N= 3, Muddy Sand N= 6, Sand N = 7.

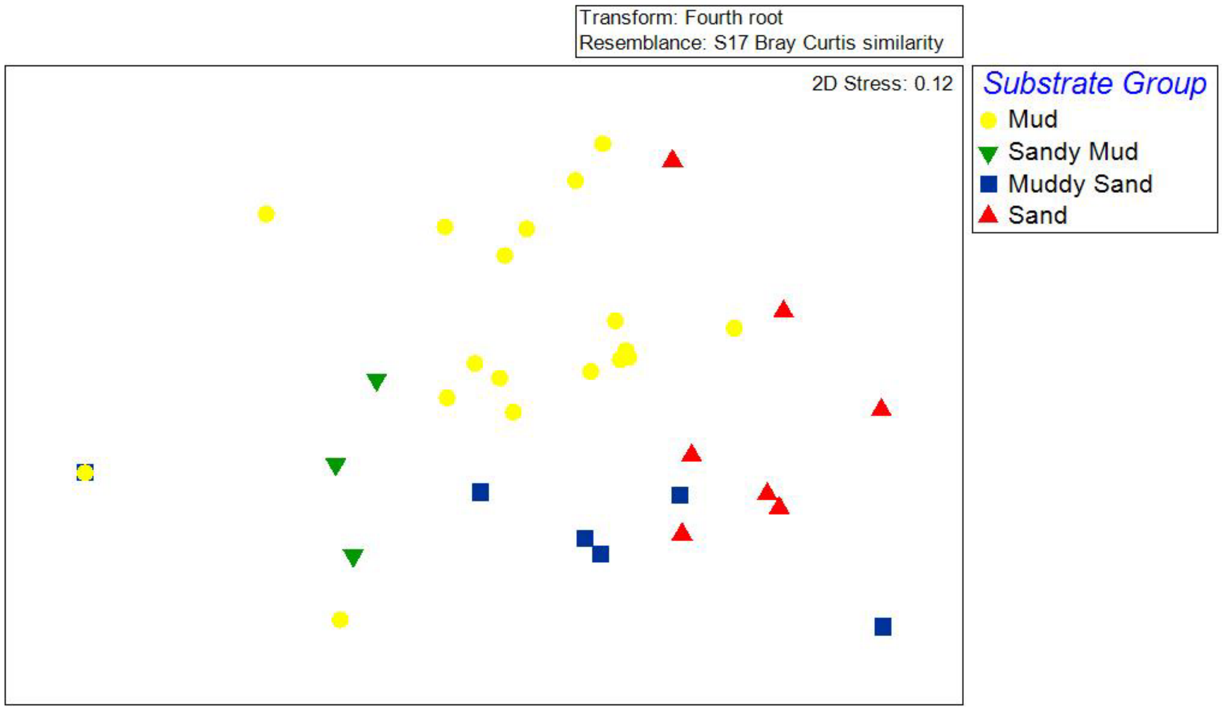


Figure 10. NMDS Ordination of Benthic Community Composition

4.0 Summary and Conclusions

Approach

A benthic field survey was completed in August 2022 to collect site-specific benthic community and habitat data within Indian River Bay in the vicinity of the Onshore Export Cable Corridors. A total of 35 locations were sampled using collection of benthic grabs.

These data were used to characterize the benthic macrofaunal community and generate taxonomic classifications of benthic habitats in sampled portions of the Onshore Export Cable Common Corridor, Onshore Export Cable North Corridor, and Onshore Export Cable South Corridor under the NMFS-modified CMECS taxonomic classification system.

Overall Conditions

All benthic grab samples were classified as fine unconsolidated sediment under the NMFS-modified CMECS classification system. The majority of samples (19 samples, 54%) were classified as mud, while sand and muddy sand substrates accounted for 20 percent and 17 percent of all samples, respectively (7 and 6 samples) and sandy mud substrates were observed least frequently (3 samples, 9%). All sand substrates encountered were determined to be fine to very fine sand, therefore, coarse sediments are anticipated to be very rare in the Onshore Export Cable Corridors.

A total of 35 marine invertebrate taxa, including polychaete worms, crustaceans, mollusks, oligochaete worms, and nemertean ribbon worms were found in the 35 macrofaunal grab samples collected during the 2022 Onshore Export Cable Corridor benthic survey program.

Taxa identified in grab samples collected from all Project component areas were typical of soft-sediment estuarine habitats of the mid-Atlantic United States. Widespread or abundant organisms included polychaete worms (e.g., *Leitoscoloplos* sp., *Streblospio benedicti*, *Notomastus* sp., *Mediomastus* sp., Cirratulidae, *Nephtys bucera,* goniadidae), tellin clams, amphipods (*Idunella* sp., *Rhepoxynius epistomus*), and oligochaete worms.

Comparisons between Project Component Areas

The percentage of benthic grab samples classified as mud substrate was notably greater in Onshore Export Cable Common Corridor samples (95%) than in Onshore Export Cable North Corridor or Onshore Export Cable South Corridor samples (11% and 0%, respectively). These habitat differences are reflected in the infaunal data. Average taxa richness per sample was lower in Onshore Export Cable Common Corridor samples than Onshore Export Cable South Corridor samples, though average organism density (log transformed) did not differ significantly between Project component areas.

Multivariate analyses (NMDS ordination and ANOSIM), which offer a more accurate means of comparison than univariate approaches, indicated that benthic community composition did not differ significantly between Onshore Export Cable North Corridor samples and Onshore Export Cable South Corridor samples. However, infaunal communities differed significantly between Onshore Export Cable Common Corridor samples and samples from the other two Project component areas. Some of the taxa most responsible for differences between these communities were identified as the orbiniid polychaete *Leitoscoloplos* sp. and tellin clams. *Leitoscoloplos* sp. were generally more abundant in Onshore Export Cable Common Corridor samples than in samples from other Project component areas. In contrast, tellin clams were generally present at lower densities in Onshore Export Cable Common Corridor samples than samples from other Project component areas. Though fine-scale soft substrate preference information for *Leitoscoloplos* sp. and tellin clams (and certain other taxa encountered in Onshore Export Cable Corridor samples) is not available in the literature, these taxa were also some of those most responsible for differences between mud and sand and mud and muddy sand substrates. These results indicate that differences in substrate type likely contributes to differences in the infaunal community observed within different Project component areas.

Though community-level differences exist between samples from the Onshore Export Cable Common Corridor and other Project component areas, all taxa and communities observed are typical of soft-sediment estuarine environments. Many of the most widespread and abundant taxa in all Project component areas are adapted to periodic disturbance events and are able to able to rapidly recolonize disturbed habitats (*Streblospio benedicti*: Thompson and Lowe 2004; *Notomastus* sp. and *Mediomastus* sp. Borja et al. 2000). Many of these taxa are also generally tolerant of contamination and organic enrichment (*Streblospio benedicti*: Llanso 1991, Thompson and Lowe 2004; *Notomastus* sp. and *Mediomastus* sp.: Rakocinshi et al. 2000). No rare species, of taxa indicative of sensitive habitats (hard bottom habitat or SAV) were present in any of the samples, and no submerged aquatic vegetation was observed during the survey (at sample locations or during transit).

In sum, communities in all Project component areas are typical of soft-sediment habitats. There were few discernable geographic trends in univariate community metrics; consistent spatial patterns in total organism density were not apparent, though total taxa richness per sample appeared greatest in the eastern portion of the Onshore Export Cable Common Corridor and the western portions of the Onshore Export Cable North Corridor and the Onshore Export Cable

South Corridor. Differences in infaunal community composition between Project component areas likely results from differences in sediment type, as well as other factors which were not examined (e.g., salinity). Disturbance-tolerant taxa were common in all Project component areas.

Comparison between 2022 and 2017 Benthic Survey Results

Though the results of the 2022 Inshore Export Cable survey share notable similarities with results of the 2017 survey, some differences were noted. Average benthic organism density was notably higher in samples collected in 2017 (6,488 ± 8,796 individuals/m^2, 12 samples) than in samples collected in 2022 (547.7 ± 934 individuals/m^2; 35 samples). Similarly, average taxa richness per sample was greater in 2017 samples (15.8 ± 3.8) than in 2022 samples (3.8 ± 2.2).

Higher organism densities reported in 2017 samples were largely driven by the spionid polychaete *Streblospio benedicti* and the capitellid polychaete *Mediomastus ambiseta*, which accounted for over 70 percent, and over 10 percent, of all organisms identified, respectively. In 2022, *Streblospio benedicti* remained the most abundant taxa, but accounted for a much lower proportion of individuals (just under 30 percent). *Mediomastus* sp. was also abundant in 2022 samples, though this taxon similarly accounted for a lower proportion of total organism density than in 2017. Certain taxa, including the spionid polychaete *Polydora* sp., cirratulid polychaetes, and the capitellid polychaete *Notomastus* sp., were notably more common in 2022 samples than in 2017 samples, and the ampeliscid amphipod *Ampelisca* sp. was notably more abundant in 2017 samples than 2022 samples. However, several additional taxa were widespread and abundant in both 2017 and 2022 samples, including orbiniid polychaetes (*Leitoscoloplos* sp.), goniadid polychaetes, and the liljeborgiid amphipod *Idunella* sp. (previously *Listriella barnardi*).

Though the benthic community encountered in samples collected from the Onshore Export Cable differed between the 2017 and 2022 sampling events, communities present during both surveys are typical of estuarine soft sediment habitats. Polychaete worms, specifically various taxa of spionid polychaetes, accounted for the majority of organisms during both the 2017 and 2022 surveys. No species indicative of sensitive habitats were observed during either the 2017 or 2022 surveys. Samples were collected in October 2017 and August 2022. Therefore, differences between 2017 and 2022 benthic communities may be attributable to seasonal or interannual variability (N'Siala et al. 2008, Warwick et al. 2002, Jaramillo et al. 2001, Cloern and Nichols 1985, Boesch et al. 1976).

5.0 References

Abbott, R.T. and P.A. Morris. 1995. Shells of the Atlantic and Gulf Coasts and the West Indies. Boston, MA: Houghton Mifflin Company.

Bartholomew, A. 2001. Polychaete Key for Chesapeake Bay and Coastal Virginia.

Blake, J. A. 2021. New species and records of *Orbiniidae (Annelida, Polychaeta)* from continental shelf and slope depths of the Western North Atlantic Ocean. *Zootaxa*, 4930(1), 1-123.

Boesch, D.F., Wass, M.L. and Virnstein, R.W., 1976. The dynamics of estuarine benthic communities. In Estuarine processes (pp. 177-196). Academic Press.

Borja, A., Franco, J., & Pérez, V. 2000. A marine biotic index to establish the ecological quality of soft-bottom benthos within European estuarine and coastal environments. *Marine Pollution Bulletin*, 40(12), 1100-1114.

Bousfield, E.L. 1973. Shallow-water Gammaridean Amphipoda of New England. Ithaca, NY: Cornell University Press.

Bray, J. R., and J. T. Curtis. 1957. An ordination of the upland forest communities of southern Wisconsin. *Ecological Monographs*, *27*(4), 325-349.

Byers, J. E. and J.H. Grabowski. 2014. Soft-sediment communities. *Marine Community Ecology*. Eds.: M. D. Bertness, J. F. Bruno, B. R. Silliman & J. J. Stachowicz. Sinauer, p.227-249.

Clarke, K. R. and R. N. Gorley. 2006. PRIMER v6: User Manual/Tutorial. Plymouth, United Kingdom: PRIMER-E, Ltd.

Cloern, J.E. and Nichols, F.H., 1985. Time scales and mechanisms of estuarine variability, a synthesis from studies of San Francisco Bay. In Temporal Dynamics of an Estuary: San Francisco Bay (pp. 229-237). Springer, Dordrecht.

Cuffney, T. F., M.D. Bilger, and A. M. Haigler. 2007*.* Ambiguous taxa: effects on the characterization and interpretation of invertebrate assemblages. *Journal of the North American Benthological Society* 26, no. 2: 286-307.

Dean, H. K. 2008. The use of polychaetes *(Annelida)* as indicator species of marine pollution: a review. *International Journal of Tropical Biology*, 56(Supplement 4): 11-38.

Fauchald, Kristian and Jumars, Peter A. 1979. The diet of worms: A study of polychaete feeding guilds. *Oceanography and Marine Biology Annual Review*. 17:193–284.

Gosner, K.L. 1971. Guide to Identification of Marine and Estuarine Invertebrates: Cape Hatteras to the Bay of Fundy. New York: John Wiley and Sons, Inc.

Gosner, K.L. 1978. The Peterson Field Guide Series. A Field Guide to the Atlantic Seashore from the Bay of Fundy to Cape Hatteras. Boston, MA: Houghton Mifflin Company.

Jaramillo, E., Contreras, H. and Quijon, P.A., 2001. Seasonal and inter-annual variability in population abundances of the intertidal macroinfauna of Queule river estuary, South-Central Chile. Revista Chilena de Historia Natural, 74(2), pp.455-468.

Kikuchi, E. 1987. Effects of the brackish deposit-feeding polychaetes *Notomastus sp. (*Capitellidae) and *Neanthes japonica* (Izuka)(Nereidae) on sedimentary O2 consumption and CO2 production rates. *Journal of Experimental Marine Biology and Ecology*, 114(1), 15-25.

Kruskal, J. B. 1964. Multidimensional scaling by optimizing goodness of fit to a nonmetric hypothesis. *Psychometrika*, 29(1), 1-27.

Lazo-Wasem, E. A. 1985. *Idunella smithi*, a new species of marine amphipod (Gammaridea: Liljeborgiidae) from the east coast of the United States. *Proceedings of the Biological Society of Washington*, 98(3), 705-710.

Levin, L. A., and Creed, E. L. 1986. Effect of temperature and food availability on reproductive responses of *Streblospio benedicti* (Polychaeta: Spionidae) with planktotrophic or lecithotrophic development. *Marine Biology*, 92(1), 103-113.

Llansó, R. J. 1991. Tolerance of low dissolved oxygen and hydrogen sulfide by the polychaete *Streblospio benedicti* (Webster). *Journal of Experimental Marine Biology and Ecology*, 153(2), 165-178.

Magurran, A.E. 2003. Measuring Biological Diversity. Malden, MA: Blackwell Publishing Ltd.

Martinez, A.J. 1999. Marine Life of the North Atlantic, Canada to New England. Rockport, ME: Down East Books.

Meredith, C.S., A.S Trebitz, and J.C. Hoffman. 2019. Resolving taxonomic ambiguities: effects on rarity, projected richness, and indices in macroinvertebrate datasets. *Ecological Indicators*, 98: 137-148.

Mikkelsen, P. M., & Bieler, R. 2021. Seashells of southern Florida: living marine mollusks of the Florida Keys and adjacent regions: bivalves. Princeton University Press.

N'Siala, G.M., Grandi, V., Iotti, M., Montanari, G., Prevedelli, D. and Simonini, R., 2008. Responses of a northern Adriatic Ampelisca–Corbula community to seasonality and short-term hydrological changes in the Po river. Marine Environmental Research, 66(4), pp.466-476.

Palmer, T. A., Montagna, P. A., & Kalke, R. D. 2002. Downstream effects of restored freshwater inflow to Rincon Bayou, Nueces Delta, Texas, USA. Estuaries, 25(6), 1448-1456.

Pettibone, M.H. 1963. Marine Polychaete Worms of the New England Region, Part 1, Families Aphroditidae through Trochochaetidae. Bulletin of the U.S. National Museum, 227: 1-356.

Pollock, L.W. 1998. A Practical Guide to the Marine Animals of Northeastern North America. New Brunswick, NJ: Rutgers University Press.

Rakocinski, C. F., Brown, S. S., Gaston, G. R., Heard, R. W., Walker, W. W., & Summers, J. K. 2000. Species-abundance-biomass responses by estuarine macrobenthos to sediment chemical contamination. *Journal of Aquatic Ecosystem Stress and Recovery*, 7(3), 201-214.

Smith. R.I. 1964. Keys to the Marine Invertebrates of the Woods Hole Region: a manual for the identification of the more common marine invertebrates. Woods Hole, MA: Marine Biological Laboratory.

Smithsonian Environmental Research Center (SERC). 2022 *Streblospio benedicti*. National Estuarine and Marine Exotic Species Information System (NEMESIS). https://invasions.si.edu/nemesis/species_summary/66939

Taylor, R.B. 1998. Density, biomass and productivity of animals on four subtidal rocky reef habitats: the importance of small mobile invertebrates. *Marine Ecology Progress Series*, 172(37): 37-51.

Thompson, B., & Lowe, S. 2004. Assessment of macrobenthos response to sediment contamination in the San Francisco Estuary, California, USA. *Environmental Toxicology and Chemistry: An International Journa*l, 23(9), 2178-2187. https://www.sfei.org/sites/default/files/biblio_files/MacrobenSedResponseSFEI60.pdf

Warwick, R.M., Ashman, C.M., Brown, A.R., Clarke, K.R., Dowell, B., Hart, B., Lewis, R.E., Shillabeer, N., Somerfield, P.J. and Tapp, J.F., 2002. Inter-annual changes in the biodiversity and community structure of the macrobenthos in Tees Bay and the Tees estuary, UK, associated with local and regional environmental events. Marine ecology progress series, 234, pp.1-13.

Weiss, H.M. 1995. Marine Animals of Southern New England and New York. Identification Keys to Common Nearshore and Shallow Water Macrofauna. Bulletin 115 of the State Geological and Natural History Survey of Connecticut. Connecticut Department of Environmental Protection.

Attachment A. Benthic Sample Taxonomy and Enumeration Results

Row Labels	IRB-BG-TRC-01	IRB-BG-TRC-02	IRB-BG-TRC-03	IRB-BG-TRC-04	IRB-BG-TRC-05	IRB-BG-TRC-06	IRB-BG-TRC-07	IRB-BG-TRC-08	IRB-BG-TRC-09	IRB-BG-TRC-10	IRB-BG-TRC-11	IRB-BG-TRC-12	IRB-BG-TRC-13	IRB-BG-TRC-14	IRB-BG-TRC-15	IRB-BG-TRC-16	IRB-BG-TRC-17	IRB-BG-TRC-18	IRB-BG-TRC-19	IRB-BG-TRC-20	IRB-BG-TRC-21	IRB-BG-TRC-22	IRB-BG-TRC-23	IRB-BG-TRC-24	IRB-BG-TRC-25	IRB-BG-TRC-26	IRB-BG-TRC-27	IRB-BG-TRC-28	IRB-BG-TRC-29	IRB-BG-TRC-30	IRB-BG-TRC-31	IRB-BG-TRC-32	IRB-BG-TRC-33	IRB-BG-TRC-34	IRB-BG-TRC-35
Location Category	OECNC	OECNC	OECNC	OECNC	OECNC	OECNC	OECNC	OECNC	OECNC	OECSC	N/A	OECSC	OECCC	OECSC	OECSC	OECSC	OECSC	OECCC	OECCC	OECCC	OECCC	OECCC	OECCC	OECCC	OECCC	OECCC	OECCC	OECCC	OECCC	OECCC	OECCC	OECCC	OECCC	OECCC	OECCC
Crustacea																																			
Ampelisca sp.				10.8																															
Corophium sp.				32.3				64.6							64.6																				
Leptocheirus plumulosus														21.5																					
Idunella sp.						21.5	86.1					64.6			64.6	21.5		344.4		86.1			43.1												86.1
Lysianassidae								21.5																											
Rhepoxynius epistomus									172.2																										
Leucon americanus												21.5																							
Gilvossius setimanus								43.1																											
Ogyrides sp.																			86.1																
Pagurus longicarpus		43.1																																	
Pinnixa sp.								43.1																											
Upogebia affinis								21.5																											
Cyathura polita														21.5																					
Tanaidacea																					86.1														
Mollusca																																			
Solenidae					10.8																														
Tellininae				53.8	10.8			43.1	129.2	43.1	43.1			21.5																					
Astarte sp.																	150.7																		
Ilyanassa trivittata				10.8							21.5																								
Bivalvia type a																	150.7																		
Nemertea																																			
Nemertea																21.5			86.1														86.1		
Oligochaeta																																			
Naididae w/out hair chaetae							86.1				21.5		172.2		96.9	21.5	150.7				86.1		172.2												
Polychaeta																																			
Scoletoma sp.													86.1		32.3																				
Glycera sp.					10.8																				86.1	86.1									
Goniadidae						21.5			43.1			21.5				21.5	150.7			86.1			21.5									86.1			
Nephtys bucera	21.5		43.1		10.8																														
Nereididae												21.5						86.1																	
Paraprionospio sp.												21.5	86.1							86.1						86.1									
Polydora sp.		86.1										43.1	2411.1			86.1						86.1													
Streblospio benedicti			43.1	129.2			86.1		86.1	21.5	322.9		86.1	43.1	290.6		3164.6	86.1	86.1	86.1			64.6			258.3			430.6	129.2	172.2			86.1	
Cirratulidae				86.1	10.8					21.5	43.1			43.1	387.5		301.4																		
Terebellidae															32.3																				
Heteromastus filiformis																				86.1															
Mediomastus sp.				21.5							86.1				258.3		602.8									86.1			172.2	129.2				86.1	
Notomastus sp.							86.1					43.1	258.3					344.4					21.5	172.2	430.6										
Leitoscoloplos sp.	21.5			21.5			172.2					64.6	258.3					516.7		86.1	172.2				86.1	86.1	21.5		258.3	129.2	258.3	172.2	86.1	86.1	
Total Organism Density*	43.1	129.2	86.1	366.0	53.8	43.1	516.7	236.8	430.6	86.1	538.2	301.4	3358.3	150.7	1227.1	172.2	4671.5	1377.8	258.3	516.7	344.4	86.1	322.9	172.2	602.8	602.8	21.5	0.0	861.1	387.5	430.6	258.3	172.2	258.3	86.1
Taxa Richness*	2	2	2	8	5	2	5	6	4	3	6	8	7	5	8	5	7	5	3	6	3	1	5	1	3	5	1	0	3	3	2	2	2	3	1

*All metrics were calculated using the corrected dataset presented above. Taxonomic ambiguity in the raw dataset was resolved using the RPMC-G method described in Cuffney et al. (2007). The RPMC-G method was applied to the raw dataset as detailed below.
Parent taxa with lower abundances than their taxonomic children were removed from the dataset. The following taxa were removed: Amphipoda, Bivalvia, Capitellidae.
Child taxa with lower abundance than their parent taxa were merged with the parent taxa. The following corrections were made to the dataset: *Glycera americana* merged with *Glycera* sp.
Parent taxa with taxonomic children present in the dataset, but which were unique taxa (not any of the identified children taxa), were retained for analyses. The following taxa were retained for analyses: Bivalvia type a

Attachment B. Benthic Grab Logs

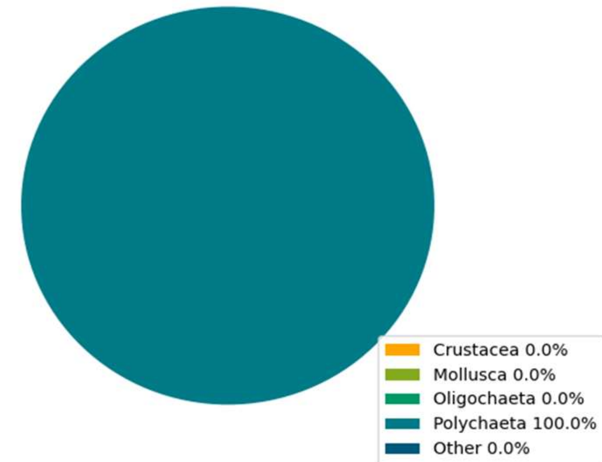
Sample Photograph

Benthic Grab IRB-BG-TRC-01

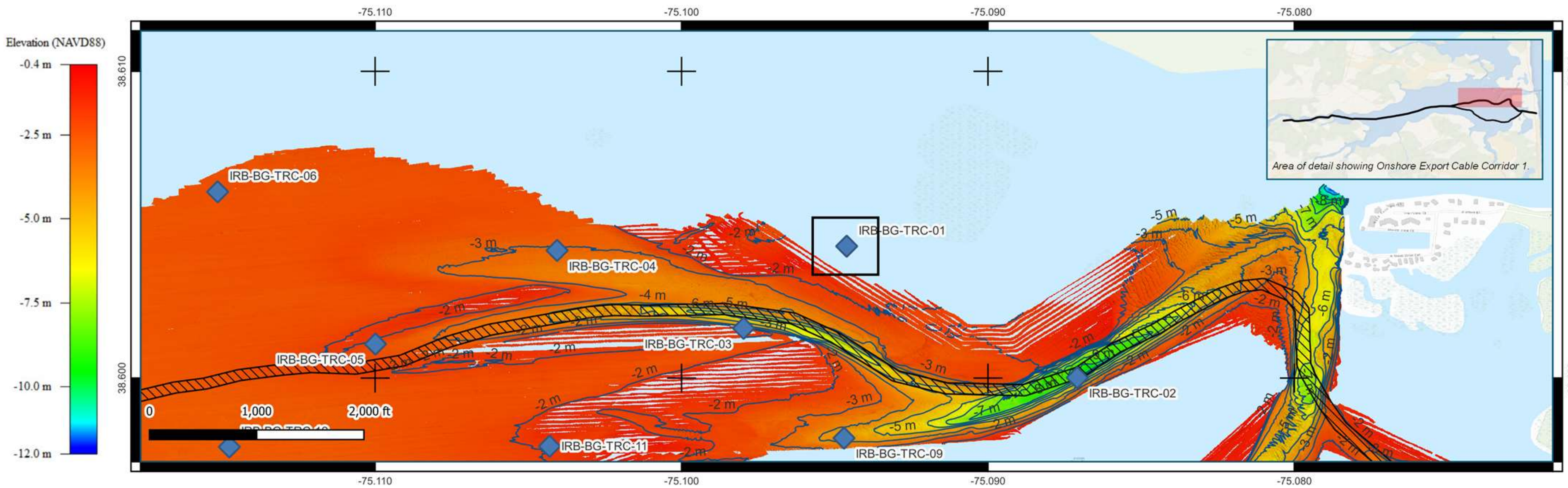
CMECS Habitat Classification	Substrate Subclass:	Fine Unconsolidated
	Substrate Group:	Sand
	Substrate Subgroup:	Fine/Very Fine Sand
Benthic Organism Density (individuals/m^2)[1]:		43.1
Taxa Richness[1]:		2

[1]All metrics calculated after taxonomic ambiguity in the dataset was resolved using the RPMC-G method described in Cuffney et al. (2007).

Benthic Organism Density by Taxa Group



Map of Benthic Grab Location



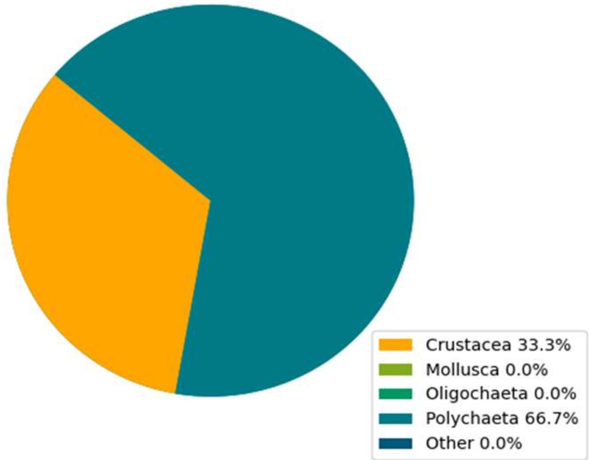
Sample Photograph

Benthic Grab IRB-BG-TRC-02

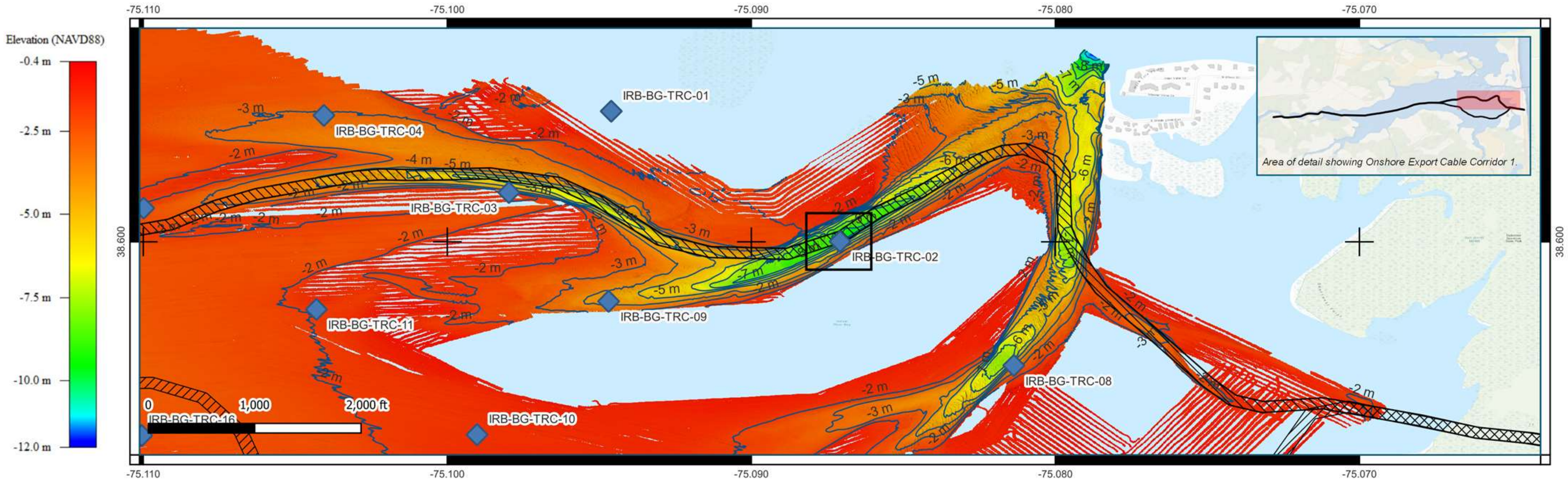
CMECS Habitat Classification	Substrate Subclass:	Fine Unconsolidated
	Substrate Group:	Muddy Sand
	Substrate Subgroup:	NA
Benthic Organism Density (individuals/m^2)[1]:		129.2
Taxa Richness[1]:		2

[1]All metrics calculated after taxonomic ambiguity in the dataset was resolved using the RPMC-G method described in Cuffney et al. (2007).

Benthic Organism Density by Taxa Group



Map of Benthic Grab Location



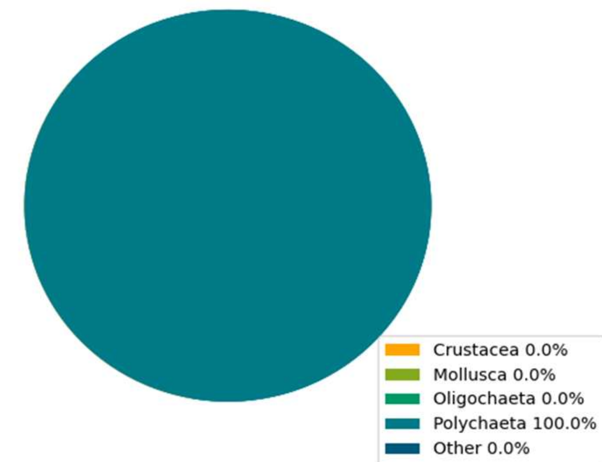
Sample Photograph

Benthic Grab IRB-BG-TRC-03

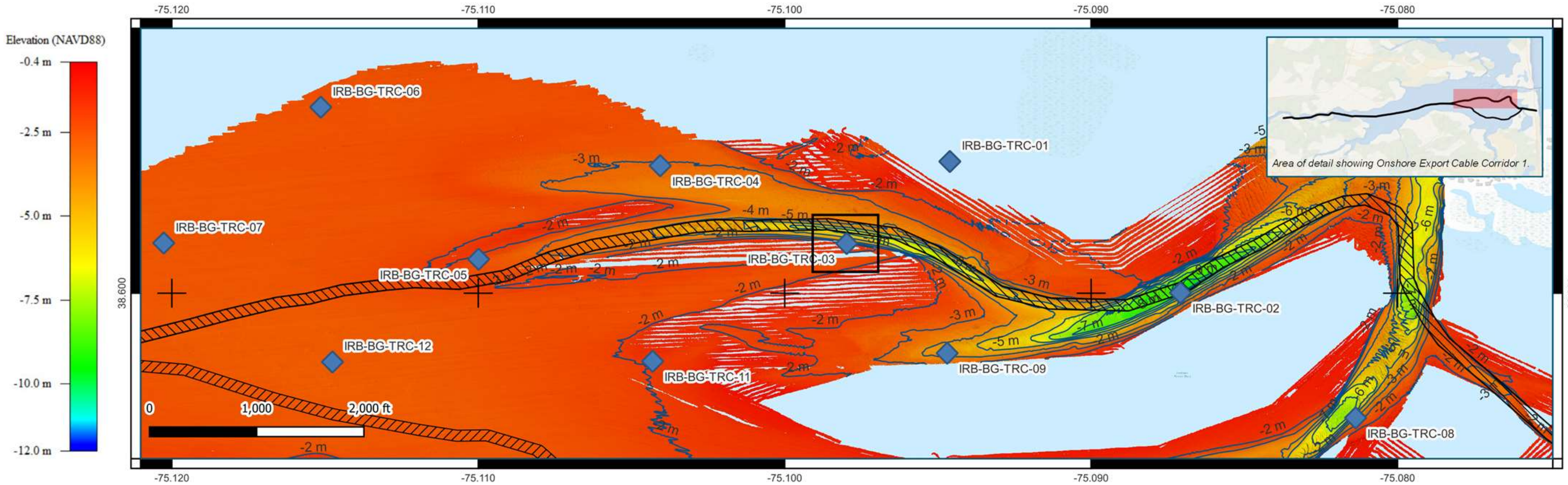
CMECS Habitat Classification	Substrate Subclass:	Fine Unconsolidated
	Substrate Group:	Sand
	Substrate Subgroup:	Fine/Very Fine Sand
Benthic Organism Density (individuals/m^2)[1]:		86.1
Taxa Richness[1]:		2

[1]All metrics calculated after taxonomic ambiguity in the dataset was resolved using the RPMC-G method described in Cuffney et al. (2007).

Benthic Organism Density by Taxa Group



Map of Benthic Grab Location



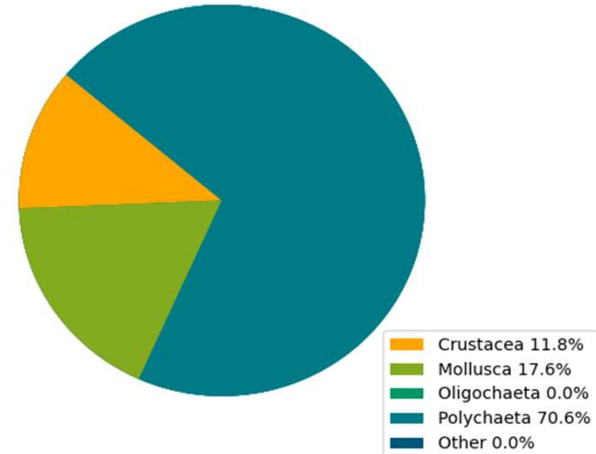
Sample Photograph

Benthic Grab IRB-BG-TRC-04

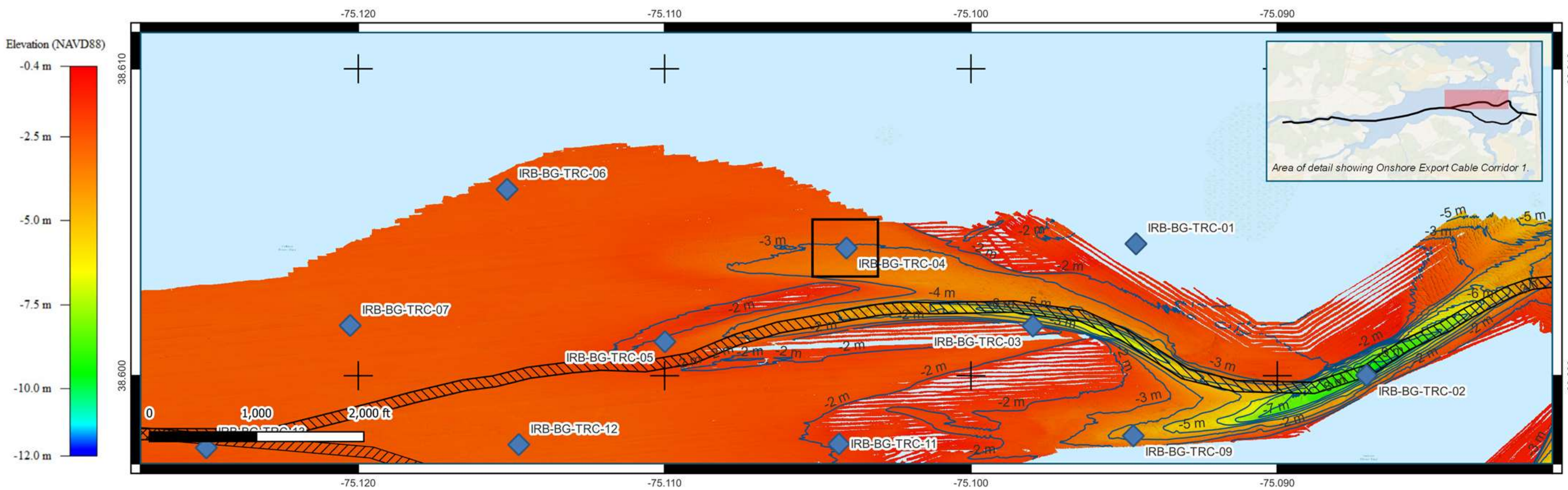
CMECS Habitat Classification	Substrate Subclass:	Fine Unconsolidated
	Substrate Group:	Sand
	Substrate Subgroup:	Fine/Very Fine Sand
Benthic Organism Density (individuals/m^2)[1]:		366.0
Taxa Richness[1]:		8

[1]All metrics calculated after taxonomic ambiguity in the dataset was resolved using the RPMC-G method described in Cuffney et al. (2007).

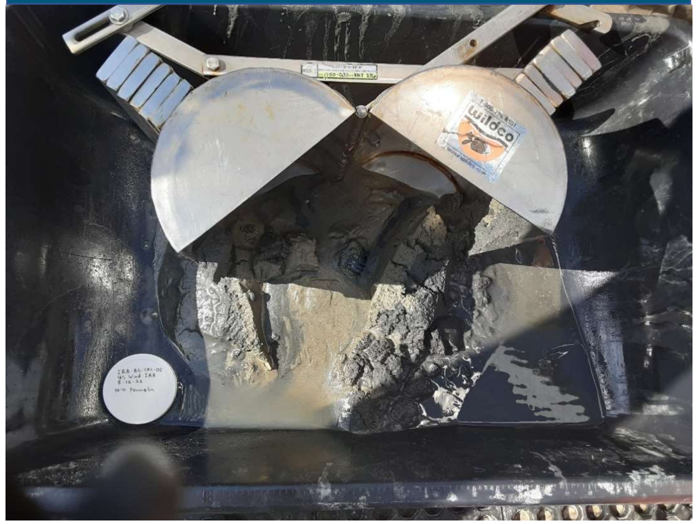
Benthic Organism Density by Taxa Group



Map of Benthic Grab Location



Sample Photograph

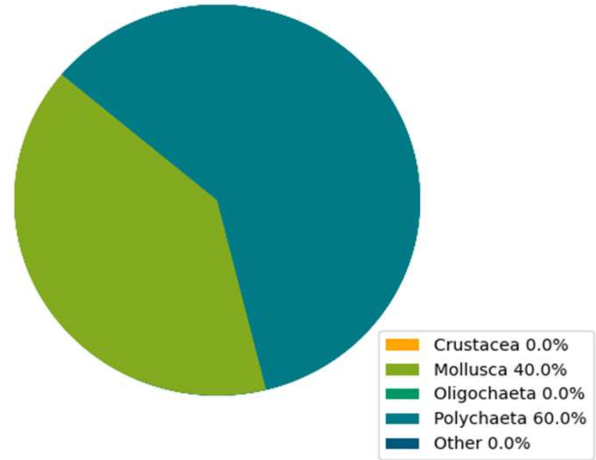


Benthic Grab IRB-BG-TRC-05

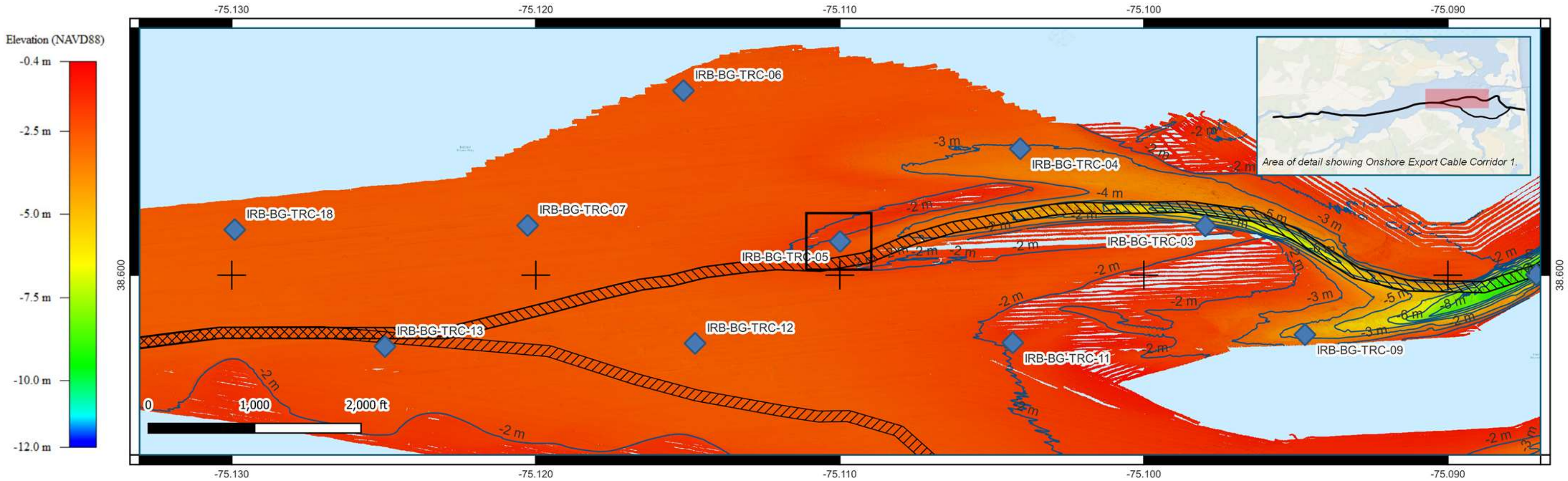
CMECS Habitat Classification	Substrate Subclass:	Fine Unconsolidated
	Substrate Group:	Sand
	Substrate Subgroup:	Fine/Very Fine Sand
Benthic Organism Density (individuals/m^2)[1]:		53.8
Taxa Richness[1]:		5

[1] All metrics calculated after taxonomic ambiguity in the dataset was resolved using the RPMC-G method described in Cuffney et al. (2007).

Benthic Organism Density by Taxa Group



Map of Benthic Grab Location



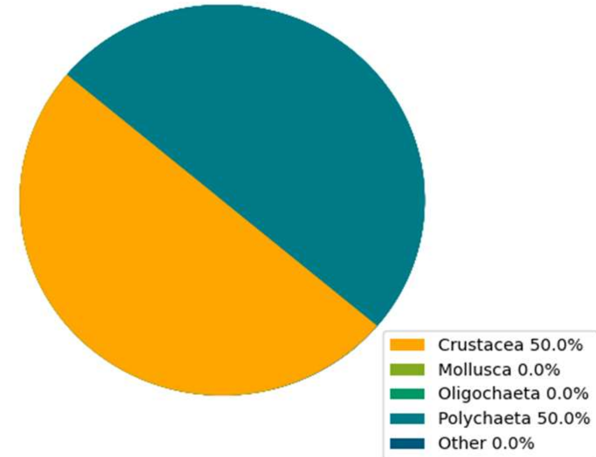
Sample Photograph

Benthic Grab IRB-BG-TRC-06

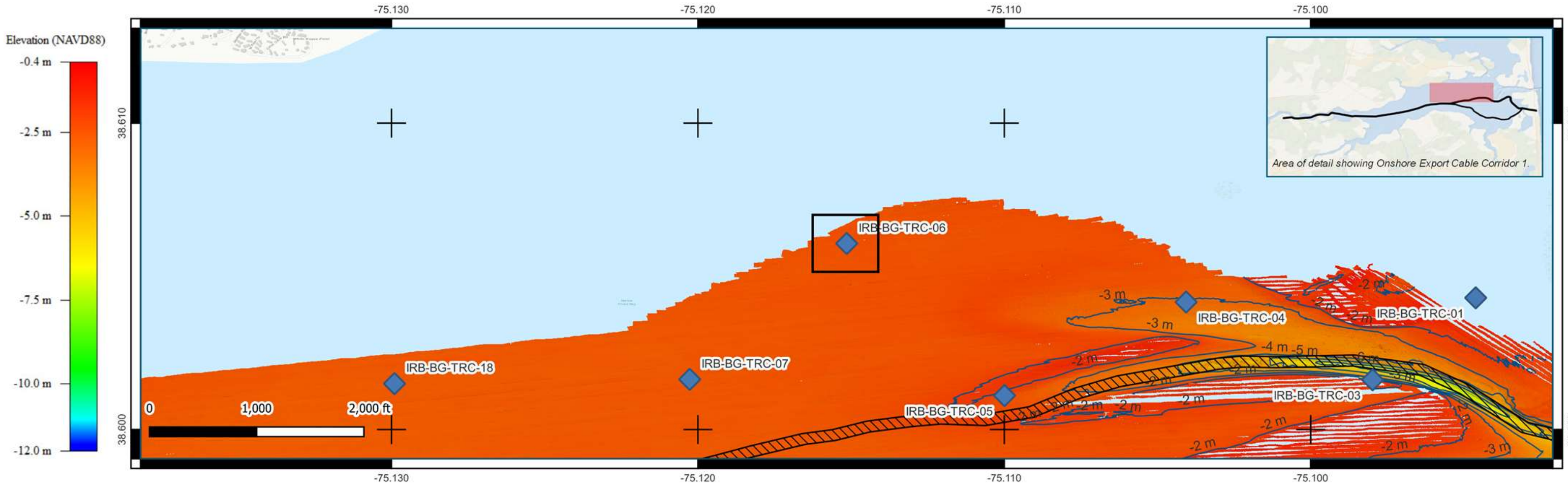
CMECS Habitat Classification	Substrate Subclass:	Fine Unconsolidated
	Substrate Group:	Sandy Mud
	Substrate Subgroup:	NA
Benthic Organism Density (individuals/m^2)[1]:		43.1
Taxa Richness[1]:		2

[1] All metrics calculated after taxonomic ambiguity in the dataset was resolved using the RPMC-G method described in Cuffney et al. (2007).

Benthic Organism Density by Taxa Group



Map of Benthic Grab Location



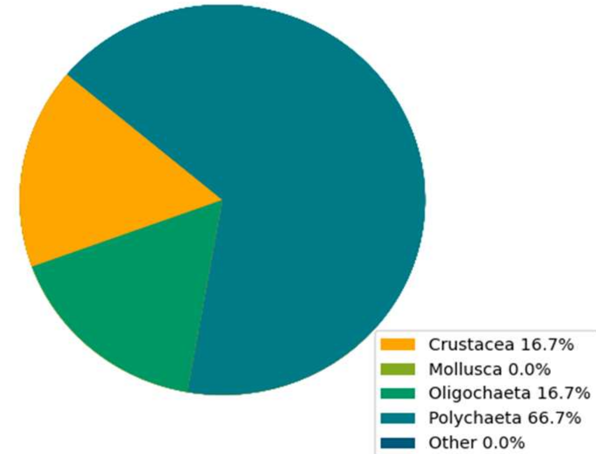
Sample Photograph

Benthic Grab IRB-BG-TRC-07

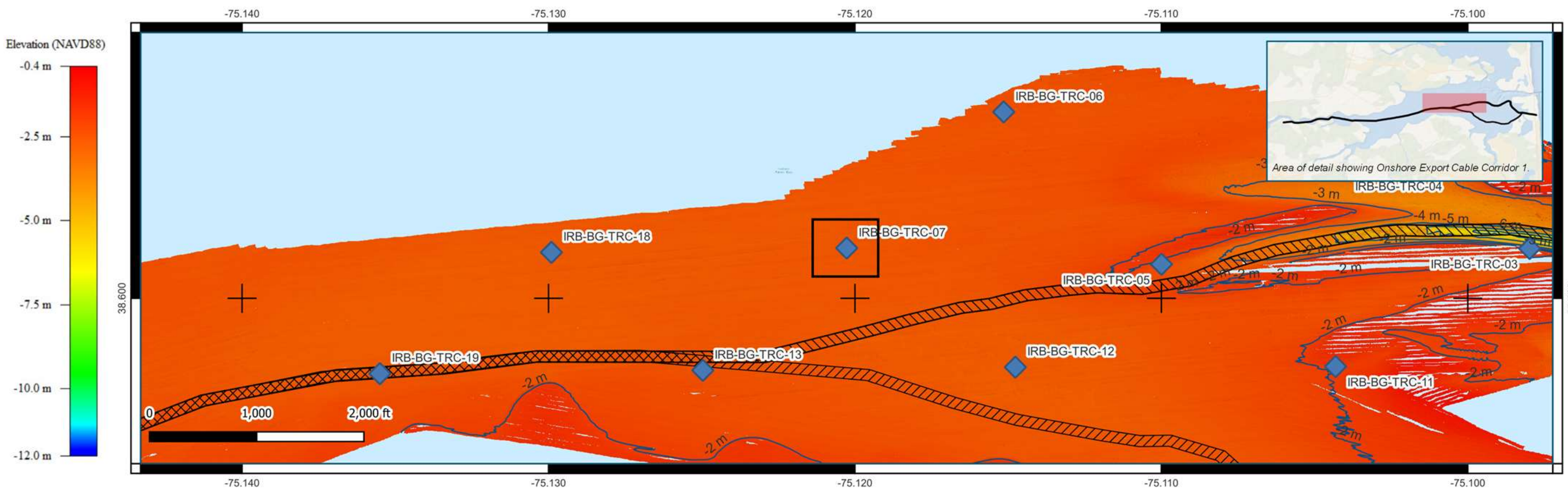
CMECS Habitat Classification	Substrate Subclass:	Fine Unconsolidated
	Substrate Group:	Mud
	Substrate Subgroup:	NA
Benthic Organism Density (individuals/m^2)[1]:		516.7
Taxa Richness[1]:		5

[1]All metrics calculated after taxonomic ambiguity in the dataset was resolved using the RPMC-G method described in Cuffney et al. (2007).

Benthic Organism Density by Taxa Group



Map of Benthic Grab Location



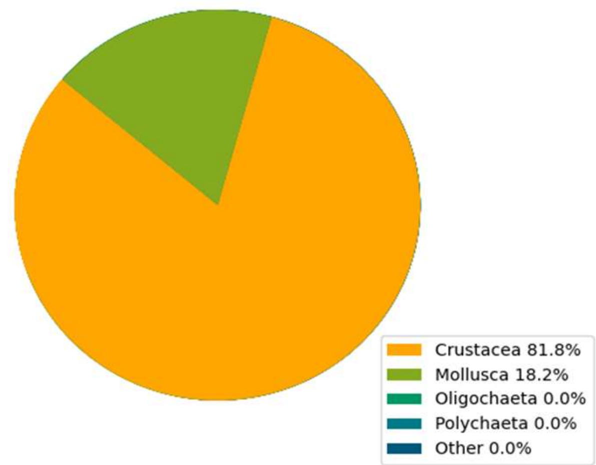
Sample Photograph

Benthic Grab IRB-BG-TRC-08

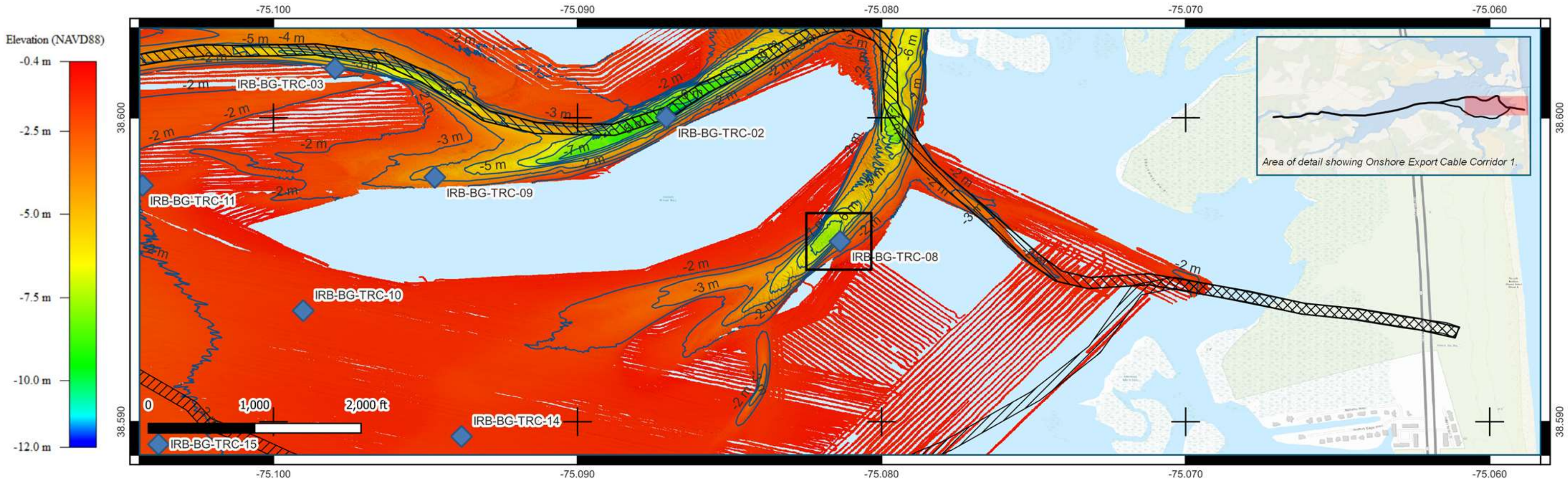
CMECS Habitat Classification	Substrate Subclass:	Fine Unconsolidated
	Substrate Group:	Muddy Sand
	Substrate Subgroup:	NA
Benthic Organism Density (individuals/m^2)[1]:		236.8
Taxa Richness[1]:		6

[1]All metrics calculated after taxonomic ambiguity in the dataset was resolved using the RPMC-G method described in Cuffney et al. (2007).

Benthic Organism Density by Taxa Group



Map of Benthic Grab Location



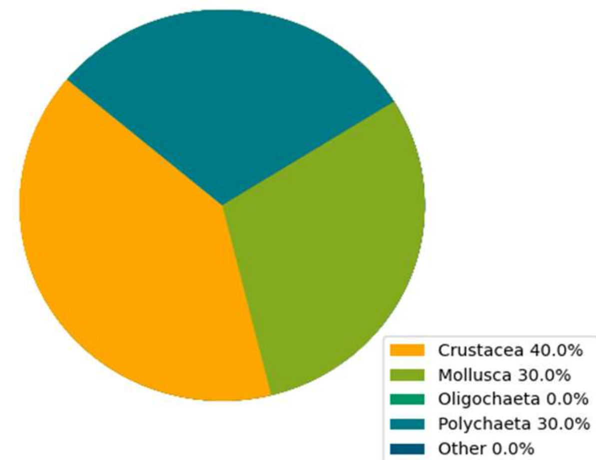
Sample Photograph

Benthic Grab IRB-BG-TRC-09

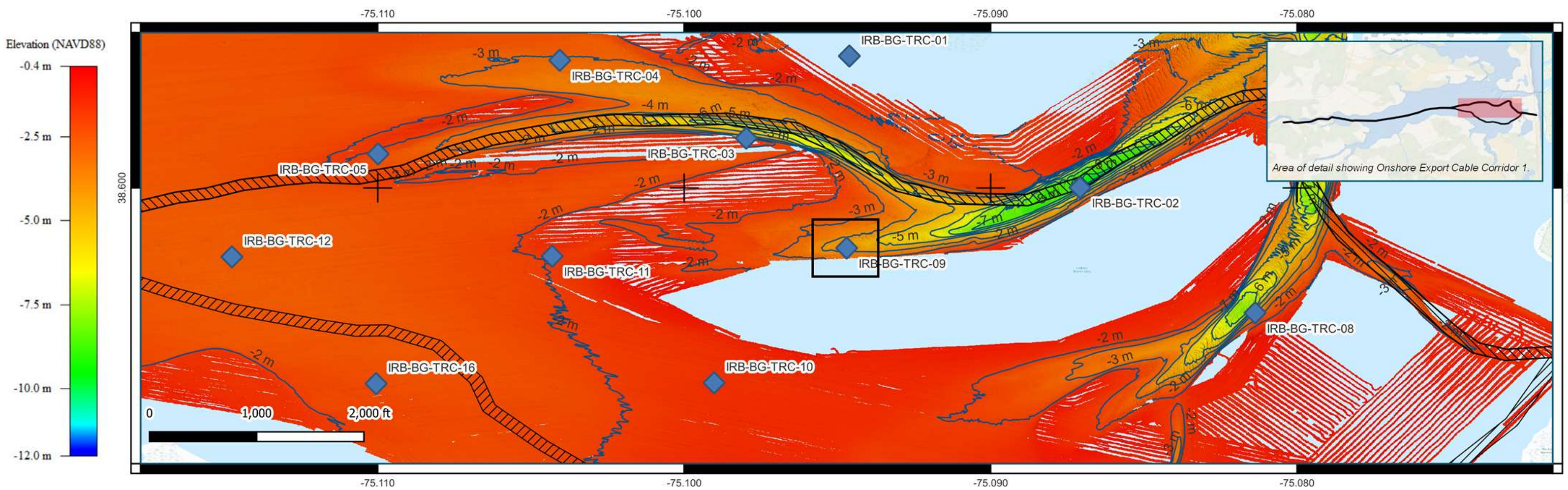
CMECS Habitat Classification	Substrate Subclass:	Fine Unconsolidated
	Substrate Group:	Sand
	Substrate Subgroup:	Fine/Very Fine Sand
Benthic Organism Density (individuals/m^2)[1]:		430.6
Taxa Richness[1]:		4

[1]All metrics calculated after taxonomic ambiguity in the dataset was resolved using the RPMC-G method described in Cuffney et al. (2007).

Benthic Organism Density by Taxa Group



Map of Benthic Grab Location



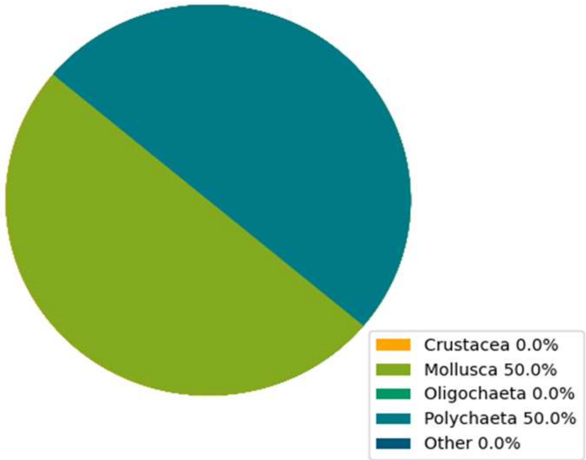
Sample Photograph

Benthic Grab IRB-BG-TRC-10

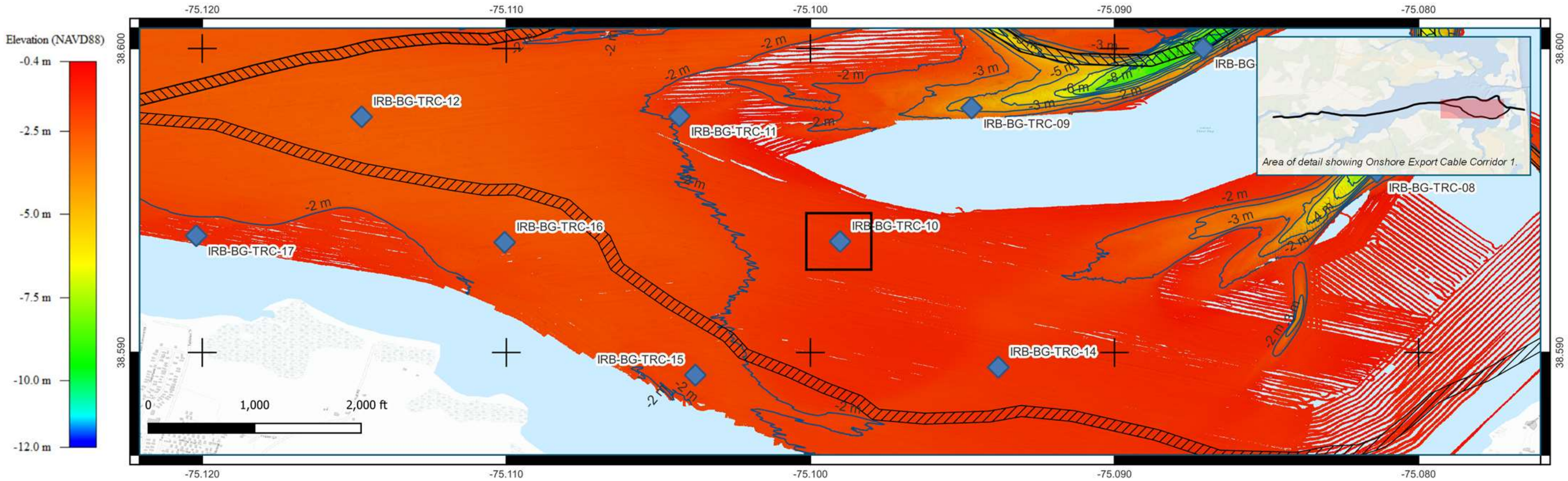
CMECS Habitat Classification	Substrate Subclass:	Fine Unconsolidated
	Substrate Group:	Sand
	Substrate Subgroup:	Fine/Very Fine Sand
Benthic Organism Density (individuals/m^2)[1]:		86.1
Taxa Richness[1]:		3

[1]All metrics calculated after taxonomic ambiguity in the dataset was resolved using the RPMC-G method described in Cuffney et al. (2007).

Benthic Organism Density by Taxa Group



Map of Benthic Grab Location



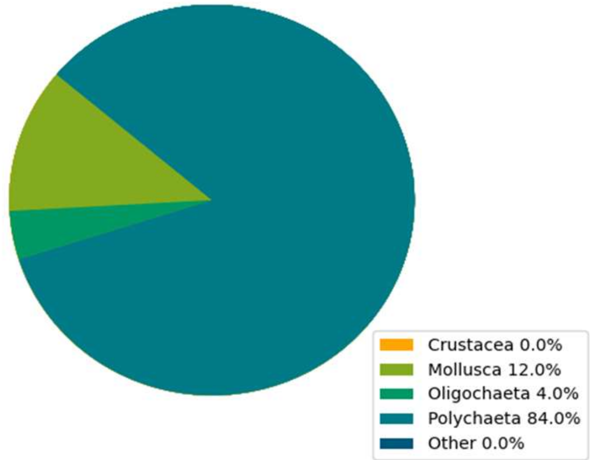
Sample Photograph

Benthic Grab IRB-BG-TRC-11

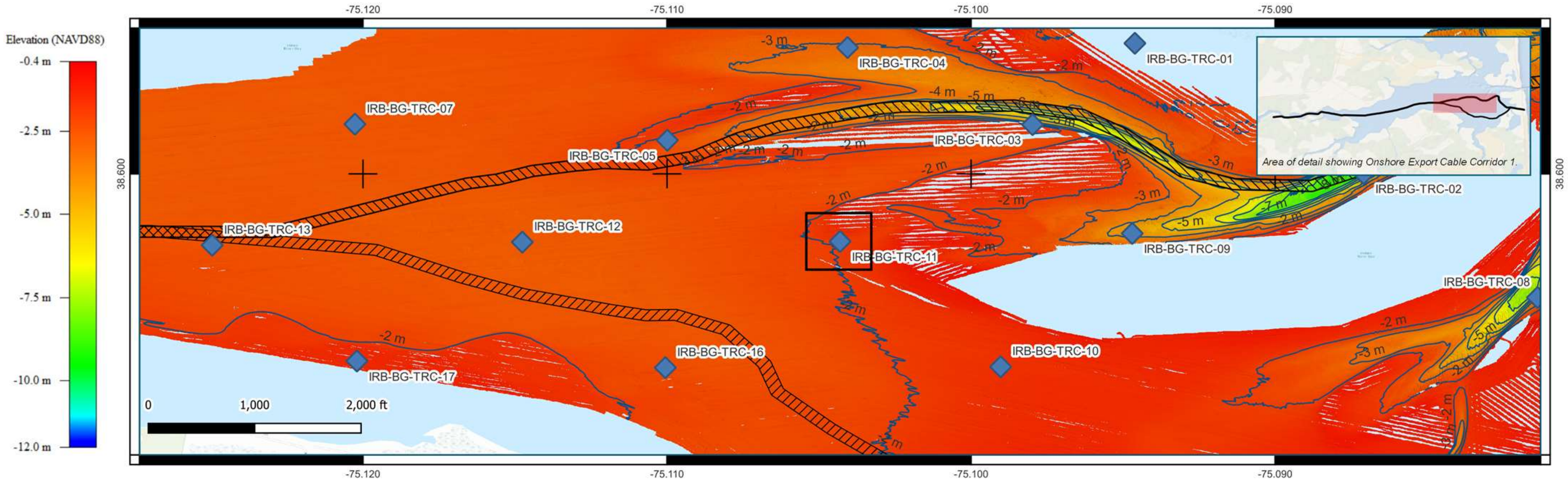
CMECS Habitat Classification	Substrate Subclass:	Fine Unconsolidated
	Substrate Group:	Muddy Sand
	Substrate Subgroup:	NA
Benthic Organism Density (individuals/m^2)[1]:		538.2
Taxa Richness[1]:		6

[1]All metrics calculated after taxonomic ambiguity in the dataset was resolved using the RPMC-G method described in Cuffney et al. (2007).

Benthic Organism Density by Taxa Group



Map of Benthic Grab Location



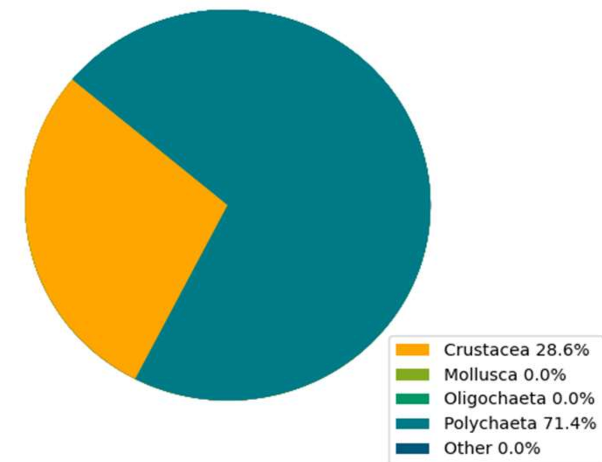
Sample Photograph

Benthic Grab IRB-BG-TRC-12

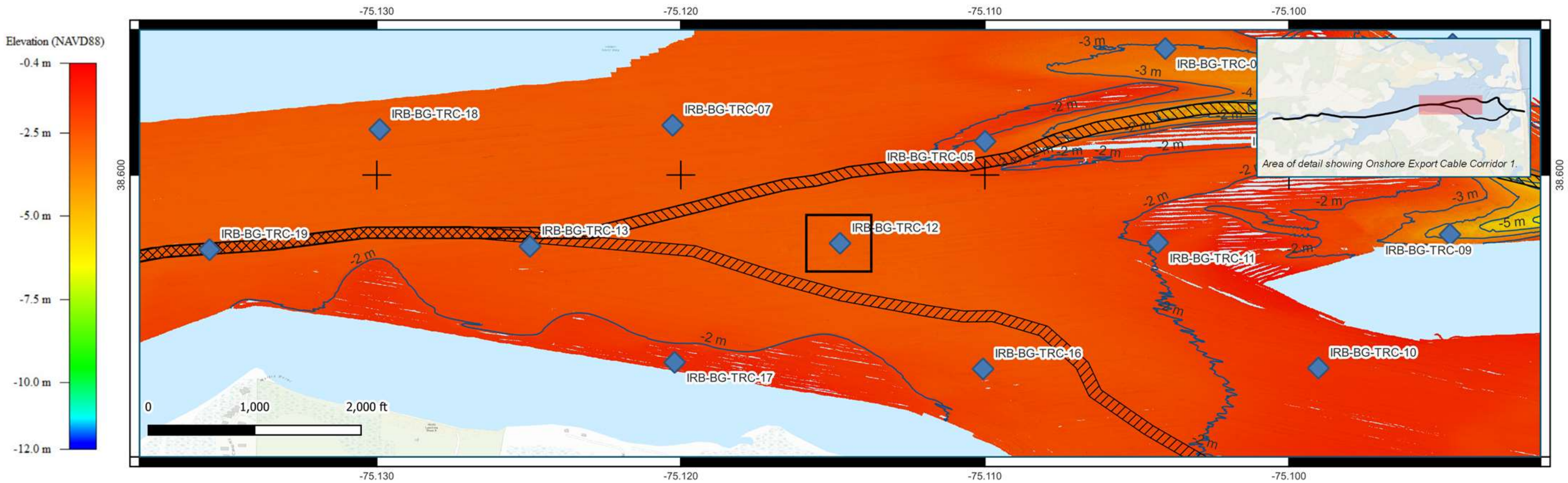
CMECS Habitat Classification	Substrate Subclass:	Fine Unconsolidated
	Substrate Group:	Sandy Mud
	Substrate Subgroup:	NA
Benthic Organism Density (individuals/m²)[1]:		301.4
Taxa Richness[1]:		8

[1]All metrics calculated after taxonomic ambiguity in the dataset was resolved using the RPMC-G method described in Cuffney et al. (2007).

Benthic Organism Density by Taxa Group



Map of Benthic Grab Location



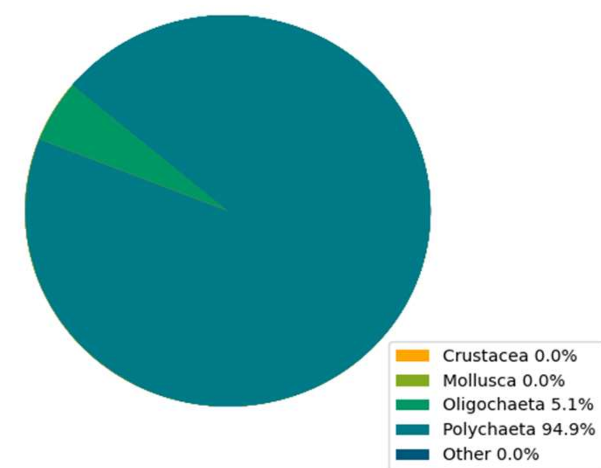
Sample Photograph

Benthic Grab IRB-BG-TRC-13

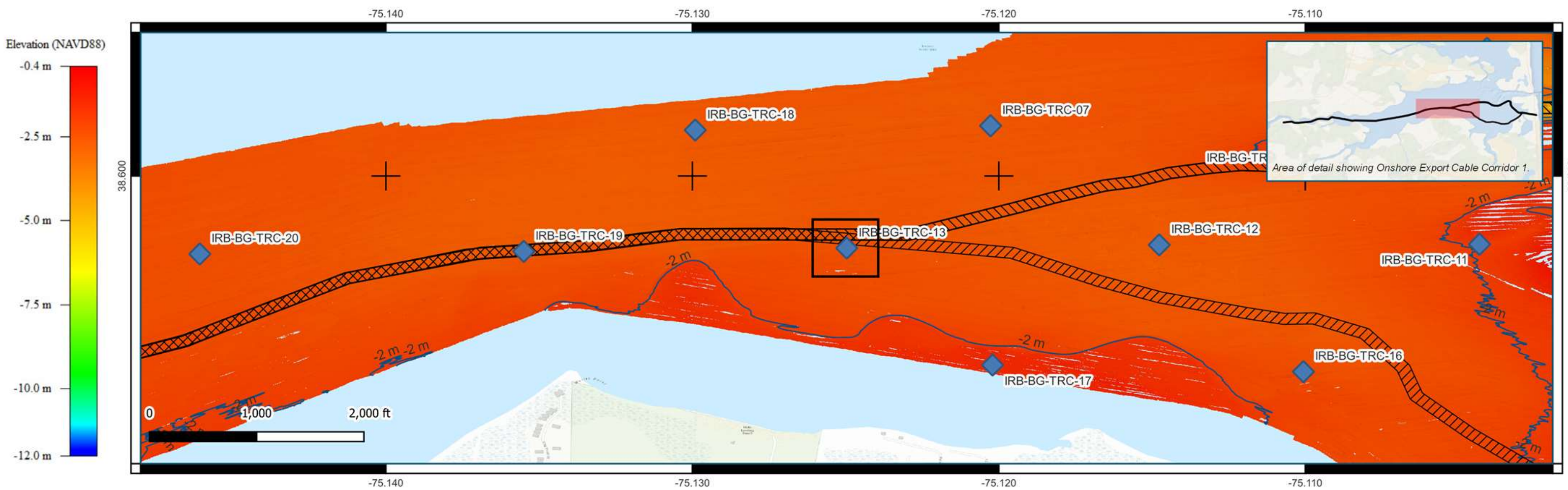
CMECS Habitat Classification	Substrate Subclass:	Fine Unconsolidated
	Substrate Group:	Mud
	Substrate Subgroup:	NA
Benthic Organism Density (individuals/m^2)[1]:		3358.3
Taxa Richness[1]:		7

[1]All metrics calculated after taxonomic ambiguity in the dataset was resolved using the RPMC-G method described in Cuffney et al. (2007).

Benthic Organism Density by Taxa Group



Map of Benthic Grab Location



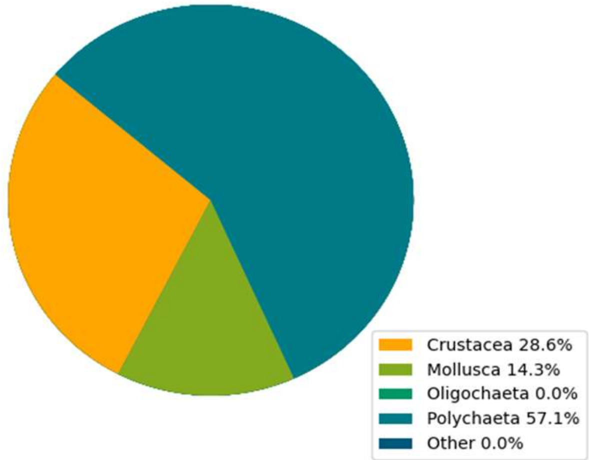
Sample Photograph

Benthic Grab IRB-BG-TRC-14

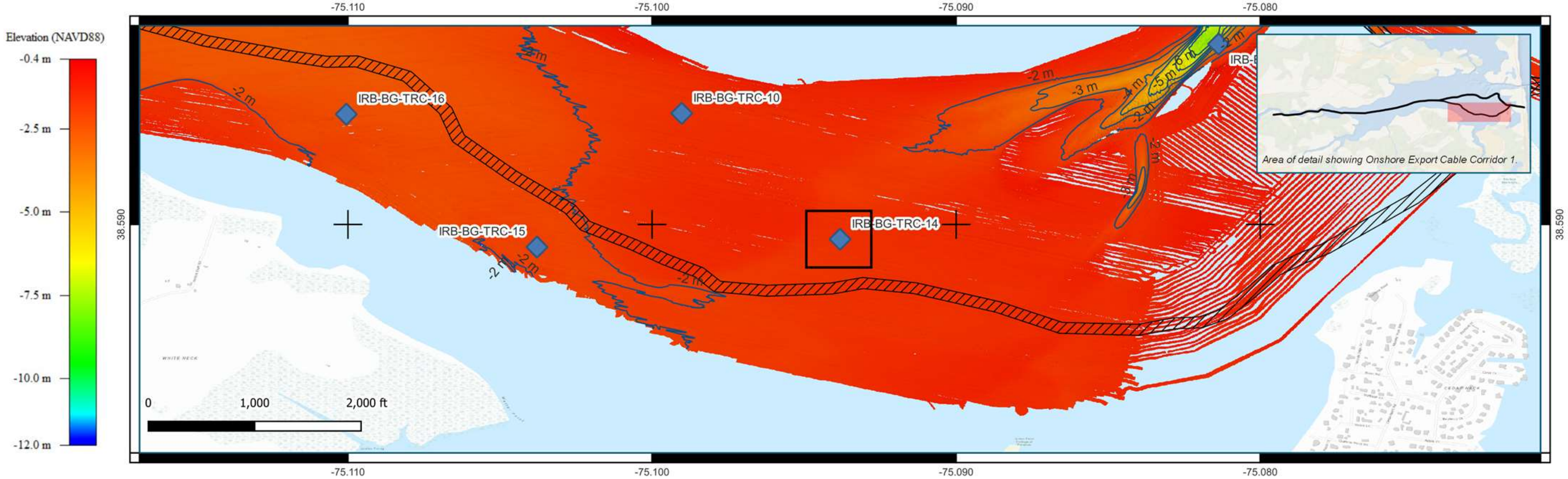
CMECS Habitat Classification	Substrate Subclass:	Fine Unconsolidated
	Substrate Group:	Sand
	Substrate Subgroup:	Fine/Very Fine Sand
Benthic Organism Density (individuals/m^2)[1]:		150.7
Taxa Richness[1]:		5

[1]All metrics calculated after taxonomic ambiguity in the dataset was resolved using the RPMC-G method described in Cuffney et al. (2007).

Benthic Organism Density by Taxa Group



Map of Benthic Grab Location



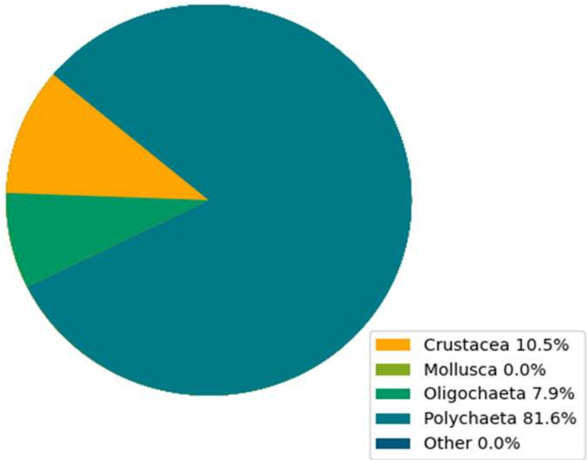
Sample Photograph

Benthic Grab IRB-BG-TRC-15

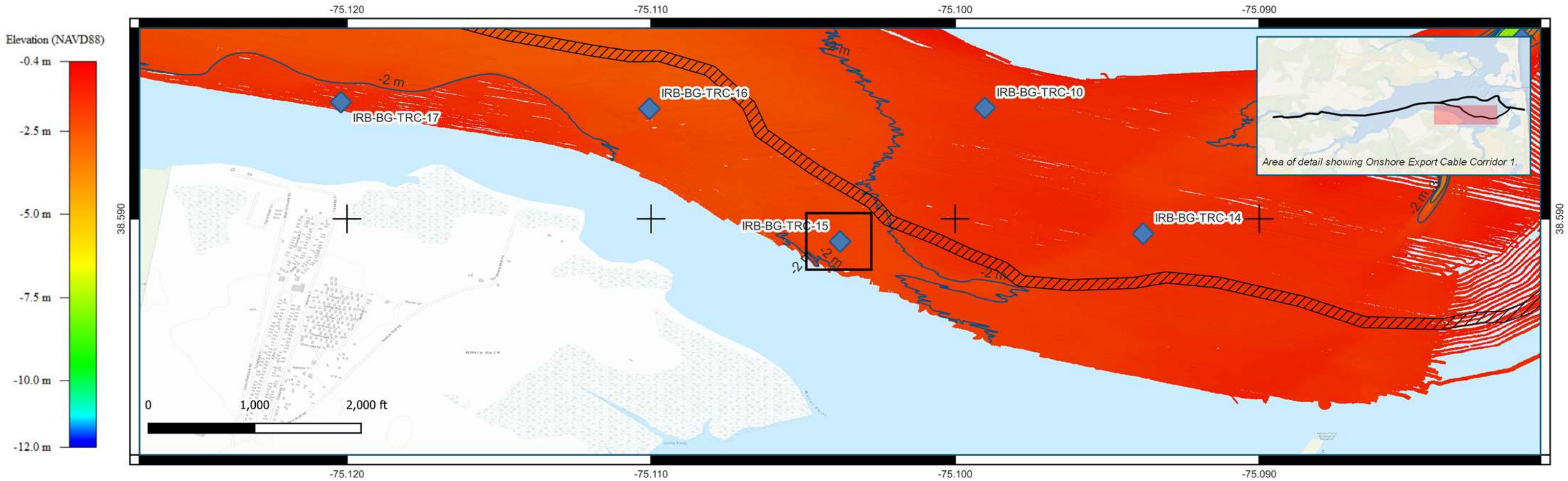
CMECS Habitat Classification	Substrate Subclass:	Fine Unconsolidated
	Substrate Group:	Muddy Sand
	Substrate Subgroup:	NA
Benthic Organism Density (individuals/m^2)[1]:		1227.1
Taxa Richness[1]:		8

[1]All metrics calculated after taxonomic ambiguity in the dataset was resolved using the RPMC-G method described in Cuffney et al. (2007).

Benthic Organism Density by Taxa Group



Map of Benthic Grab Location



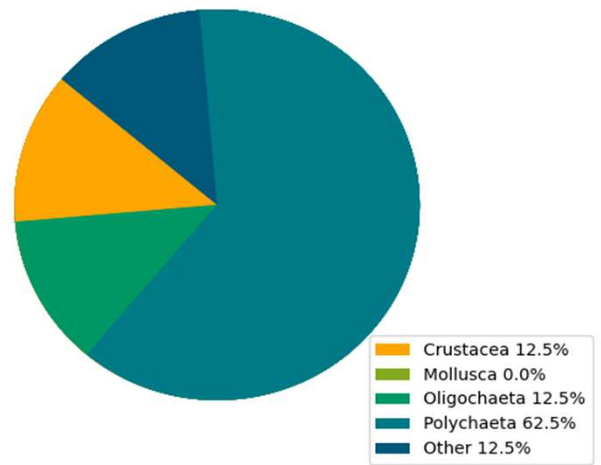
Sample Photograph

Benthic Grab IRB-BG-TRC-16

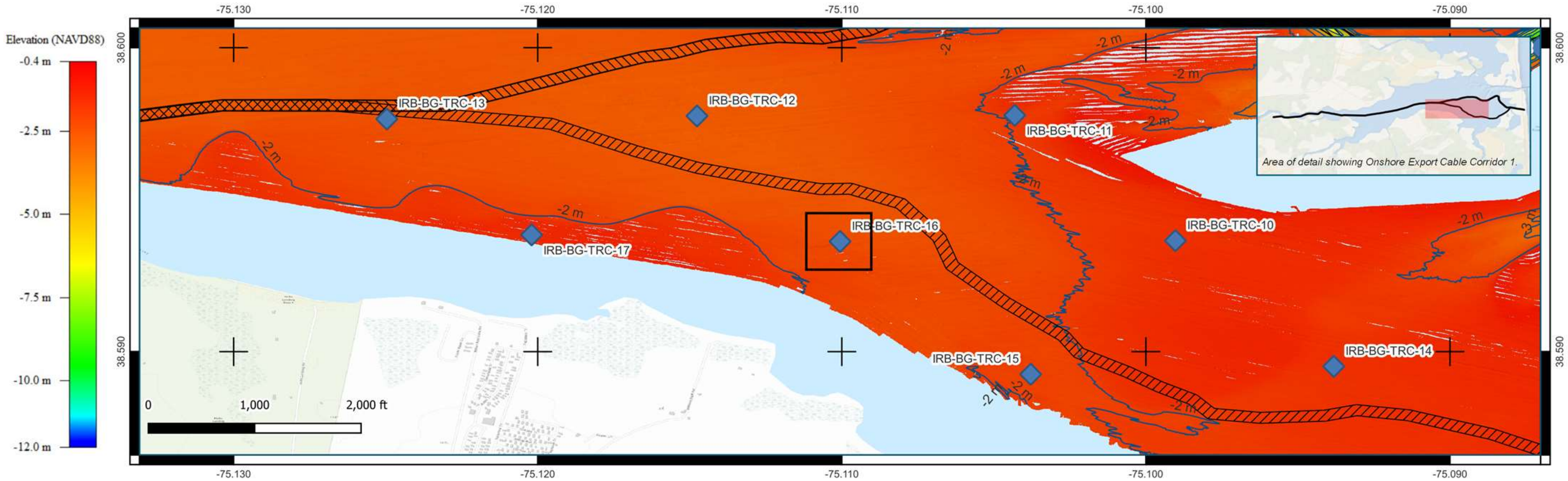
CMECS Habitat Classification	Substrate Subclass:	Fine Unconsolidated
	Substrate Group:	Sandy Mud
	Substrate Subgroup:	NA
Benthic Organism Density (individuals/m^2)[1]:		172.2
Taxa Richness[1]:		5

[1]All metrics calculated after taxonomic ambiguity in the dataset was resolved using the RPMC-G method described in Cuffney et al. (2007).

Benthic Organism Density by Taxa Group



Map of Benthic Grab Location



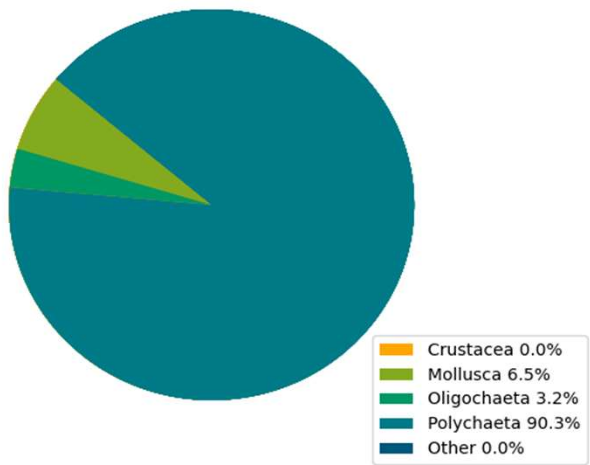
Sample Photograph

Benthic Grab IRB-BG-TRC-17

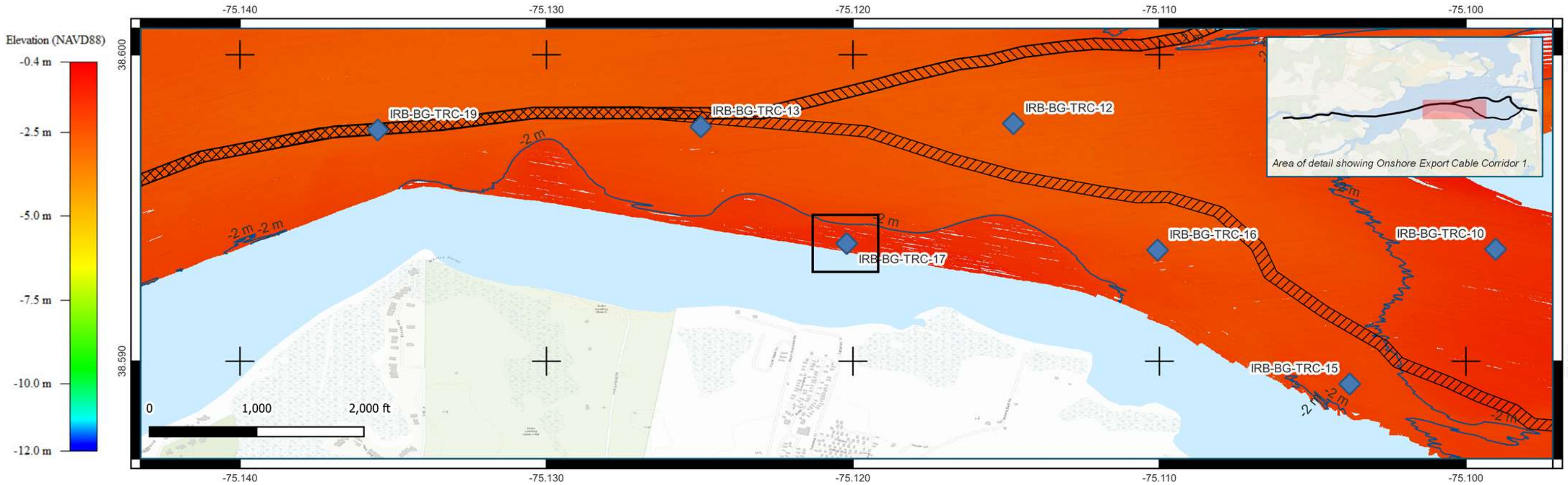
CMECS Habitat Classification	Substrate Subclass:	Fine Unconsolidated
	Substrate Group:	Muddy Sand
	Substrate Subgroup:	NA
Benthic Organism Density (individuals/m²)[1]:		4671.5
Taxa Richness[1]:		7

[1]All metrics calculated after taxonomic ambiguity in the dataset was resolved using the RPMC-G method described in Cuffney et al. (2007).

Benthic Organism Density by Taxa Group



Map of Benthic Grab Location



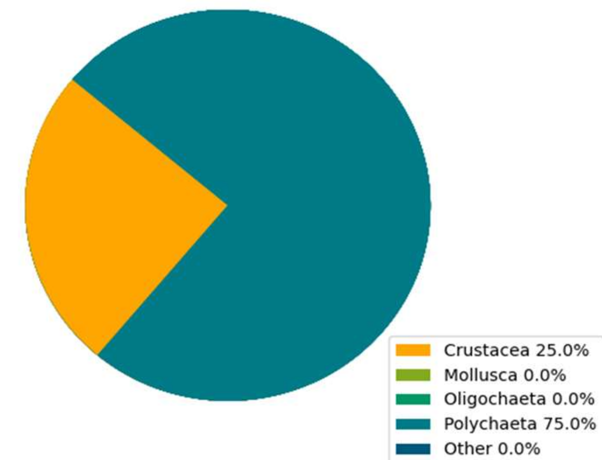
Sample Photograph

Benthic Grab IRB-BG-TRC-18

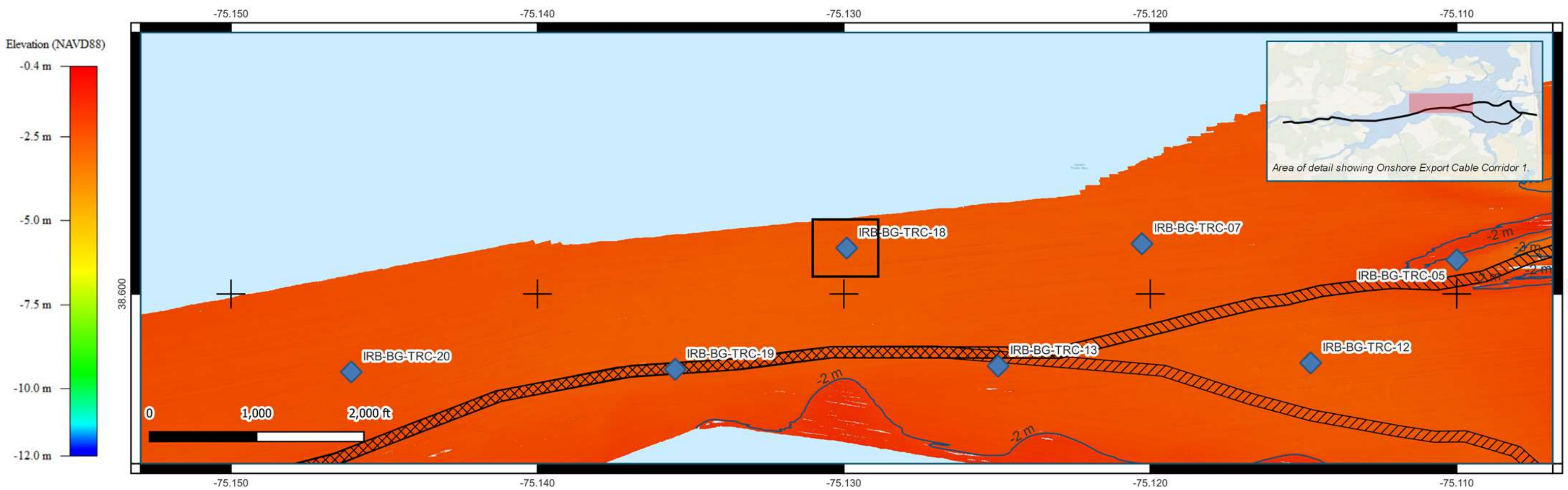
CMECS Habitat Classification	Substrate Subclass:	Fine Unconsolidated
	Substrate Group:	Mud
	Substrate Subgroup:	NA
Benthic Organism Density (individuals/m^2)[1]:		1377.8
Taxa Richness[1]:		5

[1]All metrics calculated after taxonomic ambiguity in the dataset was resolved using the RPMC-G method described in Cuffney et al. (2007).

Benthic Organism Density by Taxa Group



Map of Benthic Grab Location



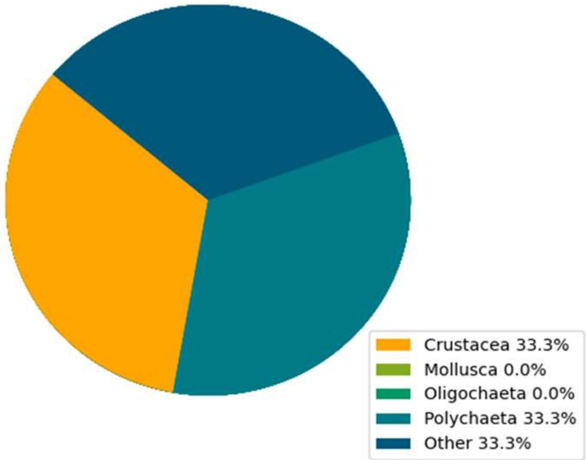
Sample Photograph

Benthic Grab IRB-BG-TRC-19

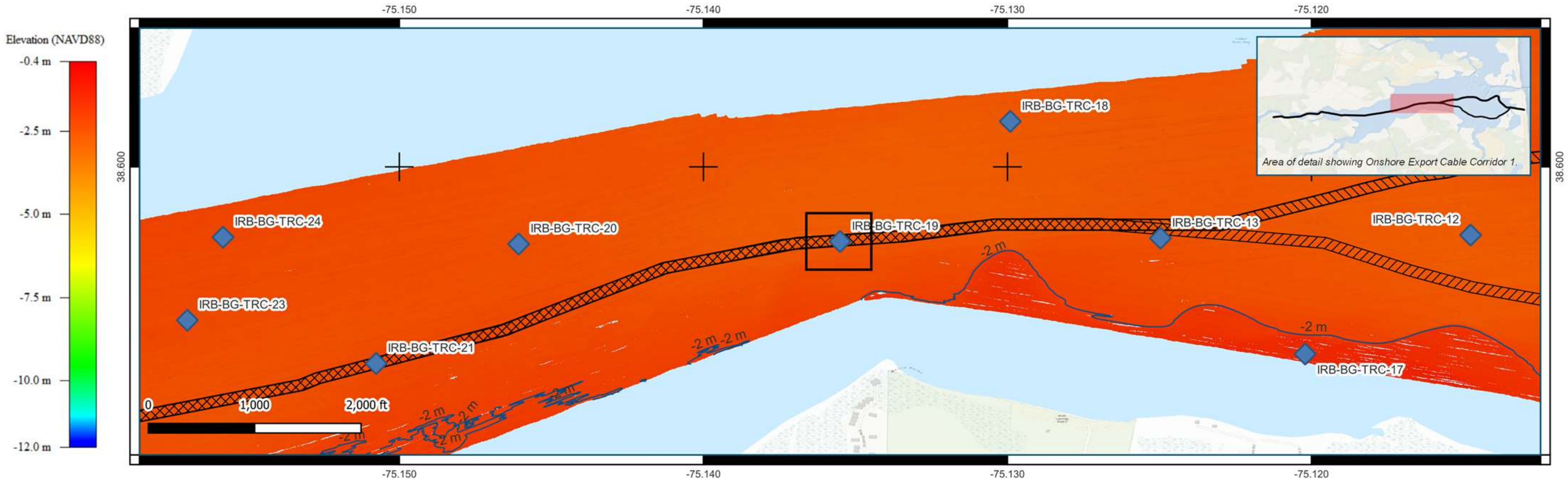
CMECS Habitat Classification	Substrate Subclass:	Fine Unconsolidated
	Substrate Group:	Mud
	Substrate Subgroup:	NA
Benthic Organism Density (individuals/m^2)[1]:		258.3
Taxa Richness[1]:		3

[1]All metrics calculated after taxonomic ambiguity in the dataset was resolved using the RPMC-G method described in Cuffney et al. (2007).

Benthic Organism Density by Taxa Group



Map of Benthic Grab Location

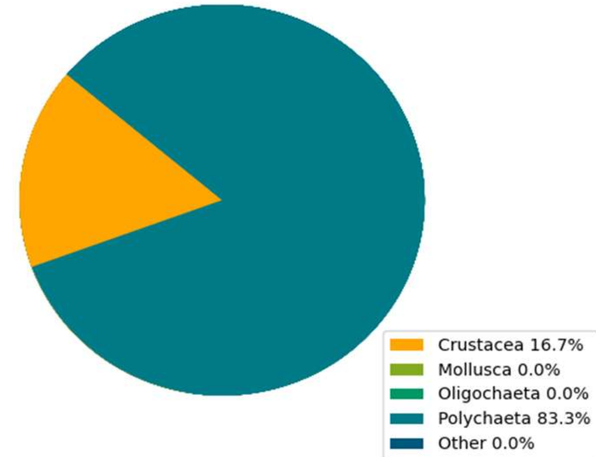


Sample Photograph

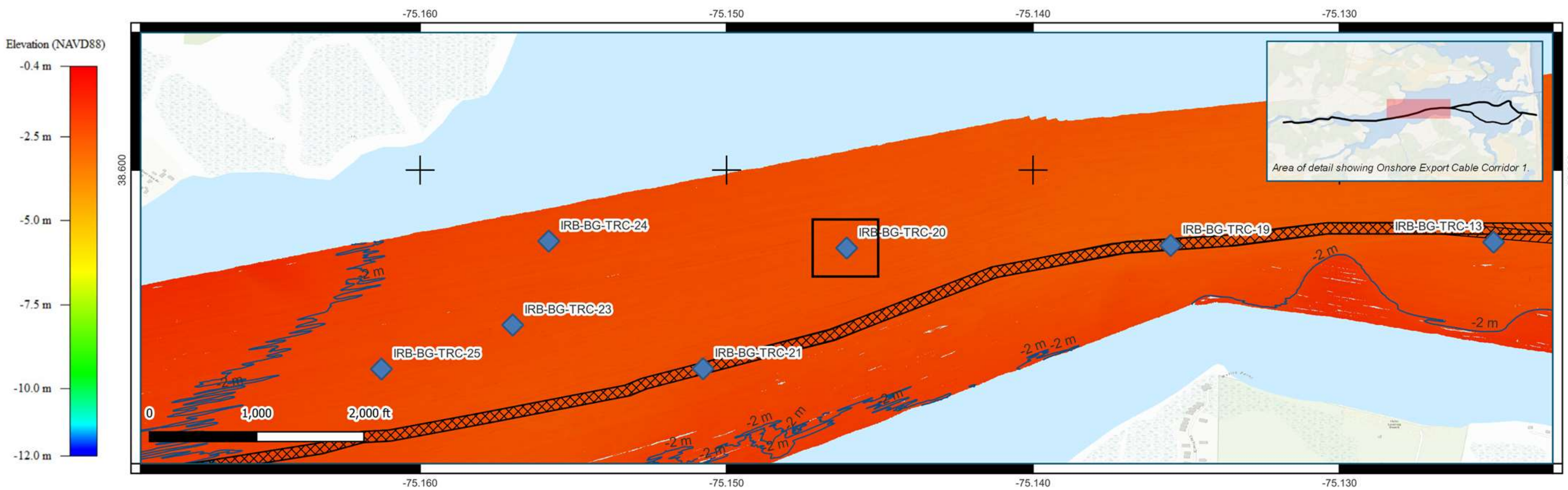
Benthic Grab IRB-BG-TRC-20		
CMECS Habitat Classification	Substrate Subclass:	Fine Unconsolidated
	Substrate Group:	Mud
	Substrate Subgroup:	NA
Benthic Organism Density (individuals/m^2)[1]:		516.7
Taxa Richness[1]:		6

[1]All metrics calculated after taxonomic ambiguity in the dataset was resolved using the RPMC-G method described in Cuffney et al. (2007).

Benthic Organism Density by Taxa Group



Map of Benthic Grab Location



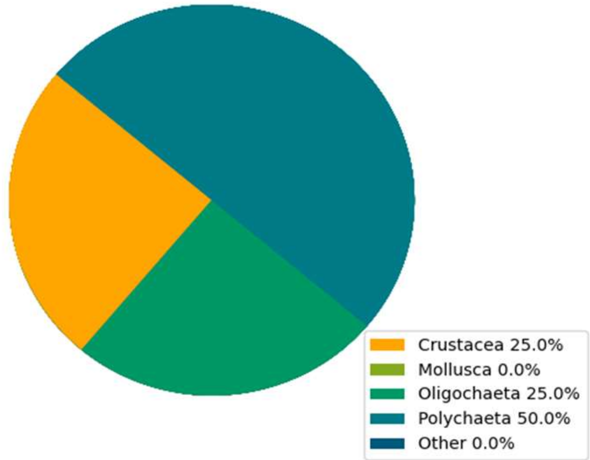
Sample Photograph

Benthic Grab IRB-BG-TRC-21

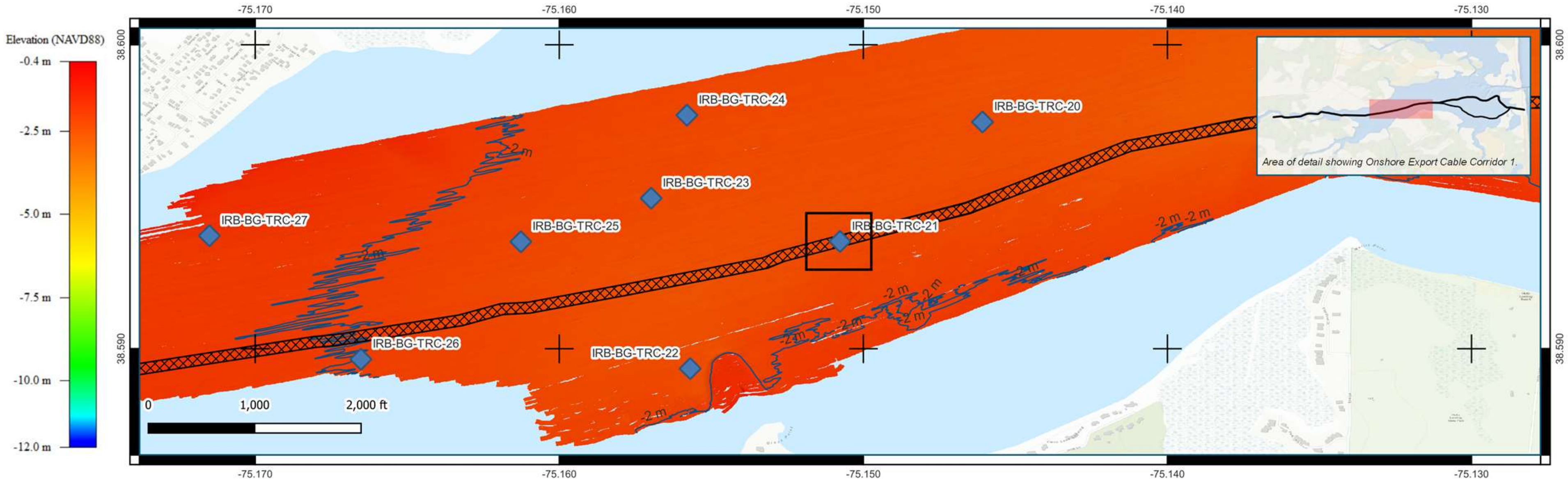
CMECS Habitat Classification	Substrate Subclass:	Fine Unconsolidated
	Substrate Group:	Mud
	Substrate Subgroup:	NA
Benthic Organism Density (individuals/m^2)[1]:		344.4
Taxa Richness[1]:		3

[1] All metrics calculated after taxonomic ambiguity in the dataset was resolved using the RPMC-G method described in Cuffney et al. (2007).

Benthic Organism Density by Taxa Group



Map of Benthic Grab Location



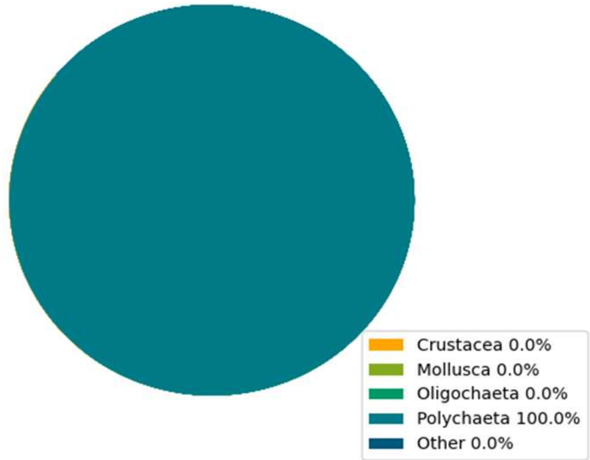
Sample Photograph

Benthic Grab IRB-BG-TRC-22

CMECS Habitat Classification	Substrate Subclass:	Fine Unconsolidated
	Substrate Group:	Mud
	Substrate Subgroup:	NA
Benthic Organism Density (individuals/m^2)[1]:		86.1
Taxa Richness[1]:		1

[1]All metrics calculated after taxonomic ambiguity in the dataset was resolved using the RPMC-G method described in Cuffney et al. (2007).

Benthic Organism Density by Taxa Group



Map of Benthic Grab Location

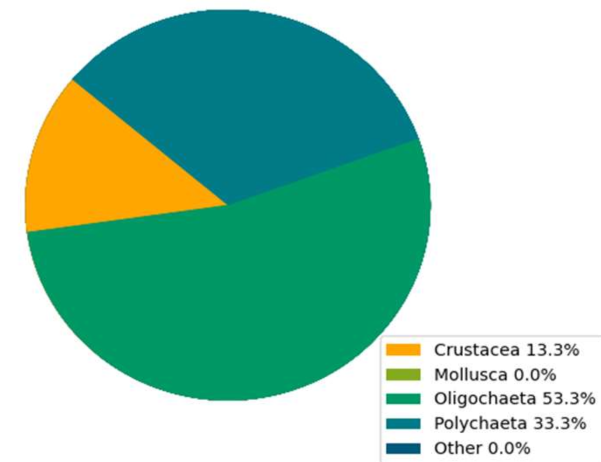
Sample Photograph

Benthic Grab IRB-BG-TRC-23

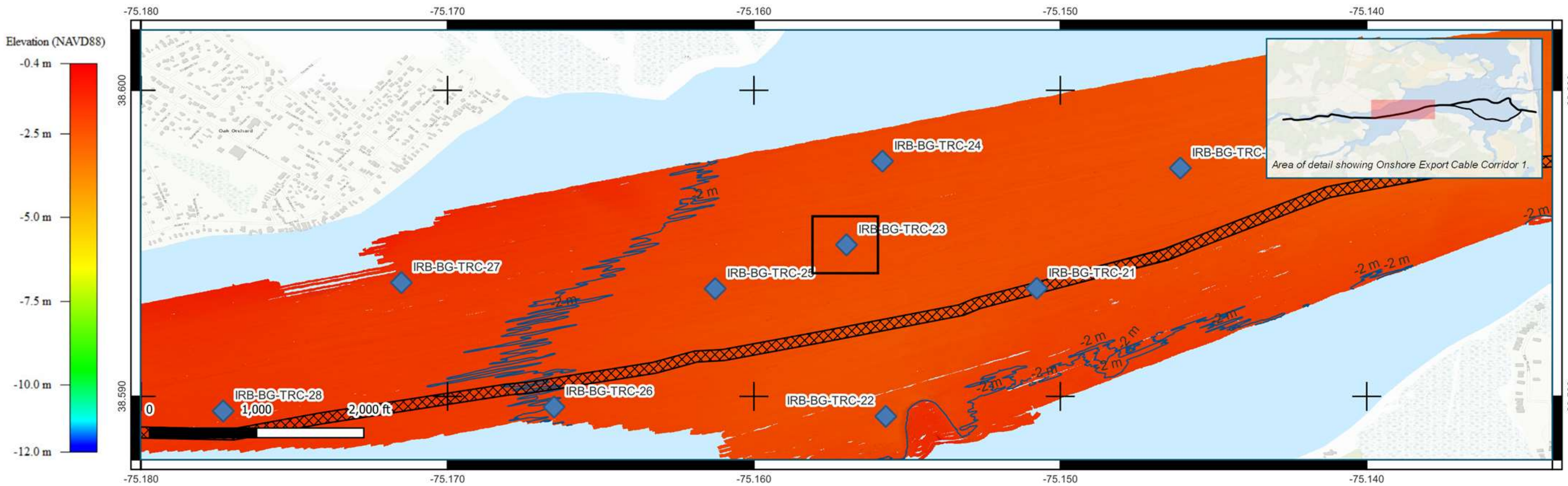
CMECS Habitat Classification	Substrate Subclass:	Fine Unconsolidated
	Substrate Group:	Muddy Sand
	Substrate Subgroup:	NA
Benthic Organism Density (individuals/m^2)[1]:		322.9
Taxa Richness[1]:		5

[1]All metrics calculated after taxonomic ambiguity in the dataset was resolved using the RPMC-G method described in Cuffney et al. (2007).

Benthic Organism Density by Taxa Group



Map of Benthic Grab Location



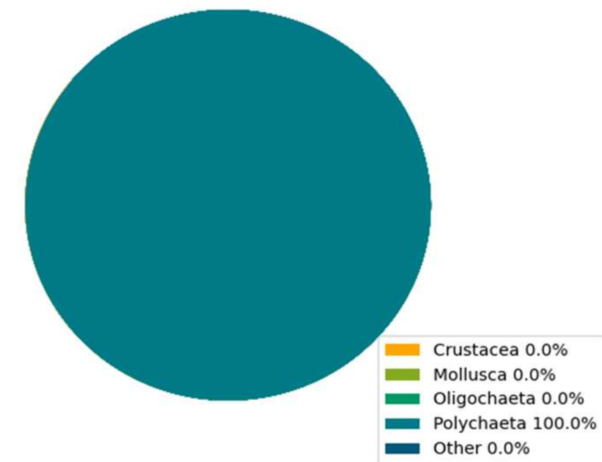
Sample Photograph

Benthic Grab IRB-BG-TRC-24

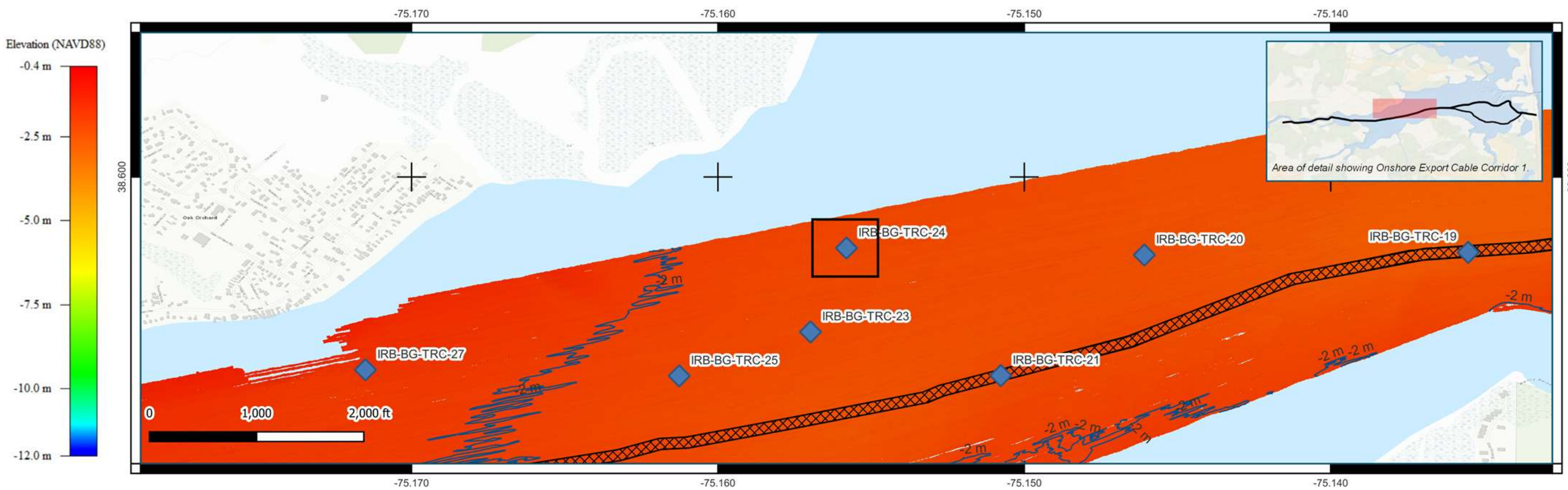
CMECS Habitat Classification	Substrate Subclass:	Fine Unconsolidated
	Substrate Group:	Mud
	Substrate Subgroup:	NA
Benthic Organism Density (individuals/m^2)[1]:		172.2
Taxa Richness[1]:		1

[1]All metrics calculated after taxonomic ambiguity in the dataset was resolved using the RPMC-G method described in Cuffney et al. (2007).

Benthic Organism Density by Taxa Group



Map of Benthic Grab Location



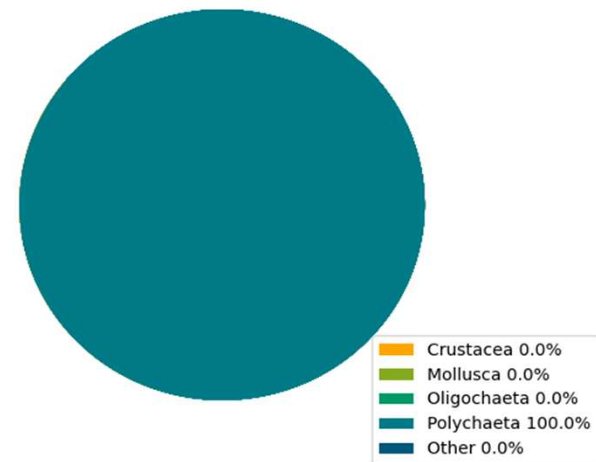
Sample Photograph

Benthic Grab IRB-BG-TRC-25

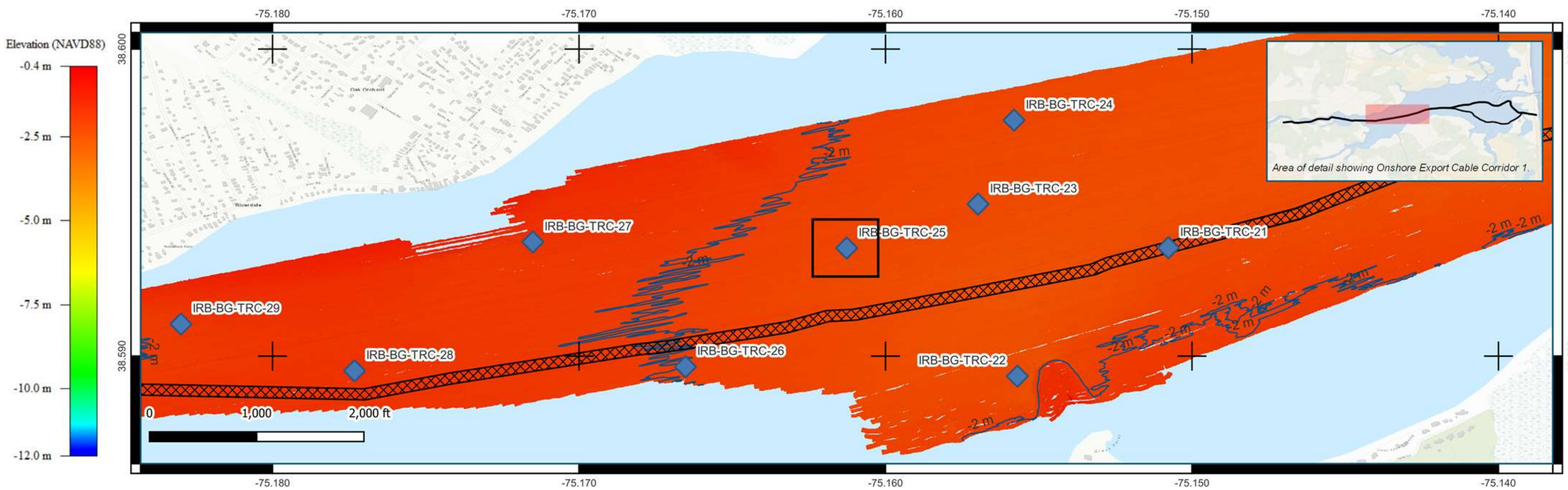
CMECS Habitat Classification	Substrate Subclass:	Fine Unconsolidated
	Substrate Group:	Mud
	Substrate Subgroup:	NA
Benthic Organism Density (individuals/m^2)[1]:		602.8
Taxa Richness[1]:		3

[1] All metrics calculated after taxonomic ambiguity in the dataset was resolved using the RPMC-G method described in Cuffney et al. (2007).

Benthic Organism Density by Taxa Group



Map of Benthic Grab Location



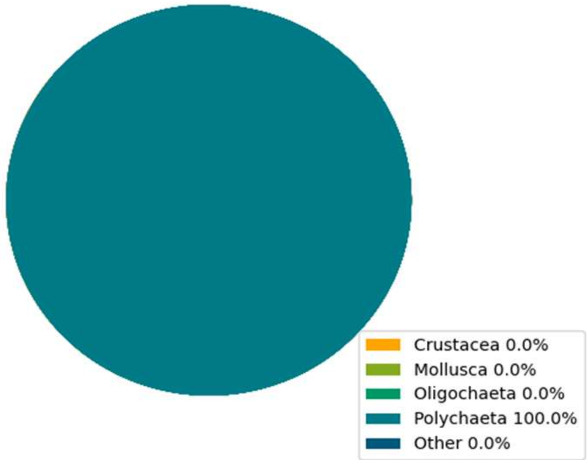
Sample Photograph

Benthic Grab IRB-BG-TRC-26

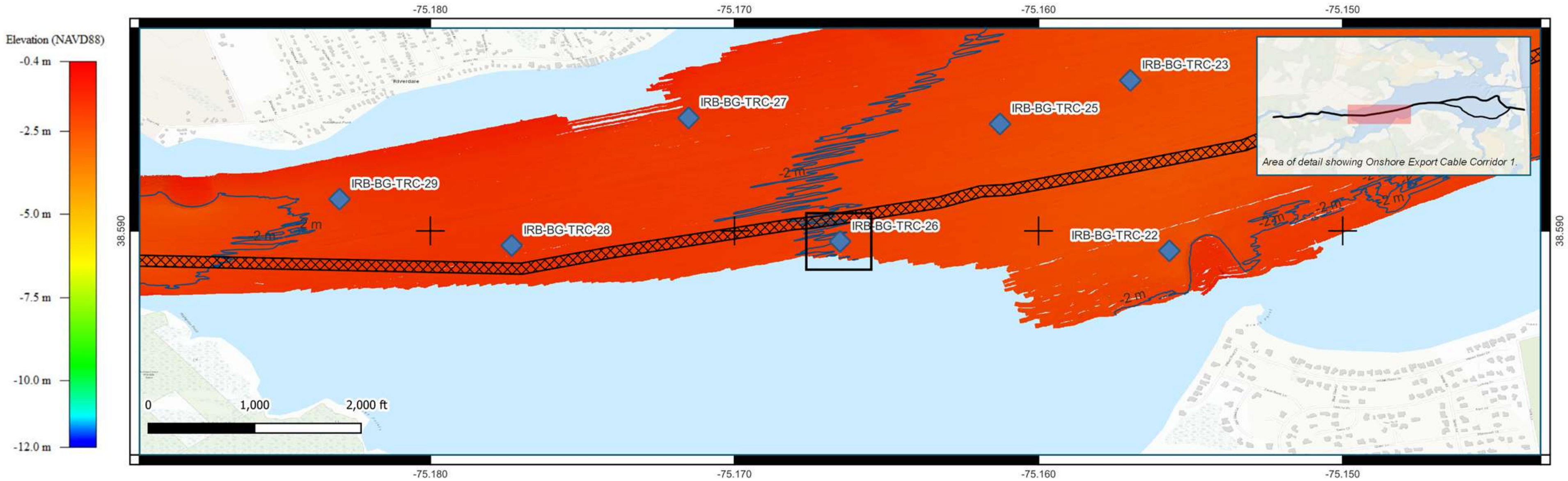
CMECS Habitat Classification	Substrate Subclass:	Fine Unconsolidated
	Substrate Group:	Mud
	Substrate Subgroup:	NA
Benthic Organism Density (individuals/m^2)[1]:		602.8
Taxa Richness[1]:		5

[1]All metrics calculated after taxonomic ambiguity in the dataset was resolved using the RPMC-G method described in Cuffney et al. (2007).

Benthic Organism Density by Taxa Group



Map of Benthic Grab Location



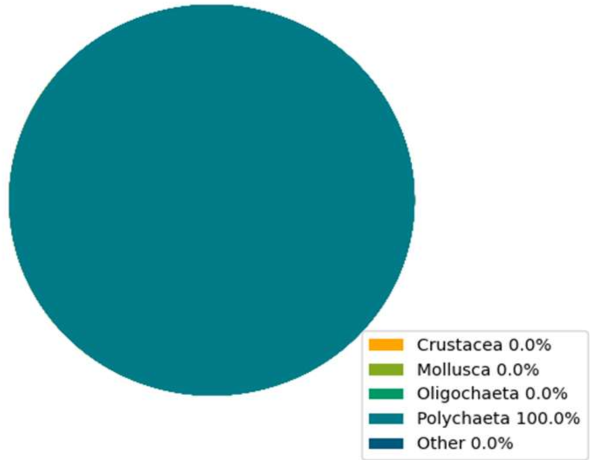
Sample Photograph

Benthic Grab IRB-BG-TRC-27

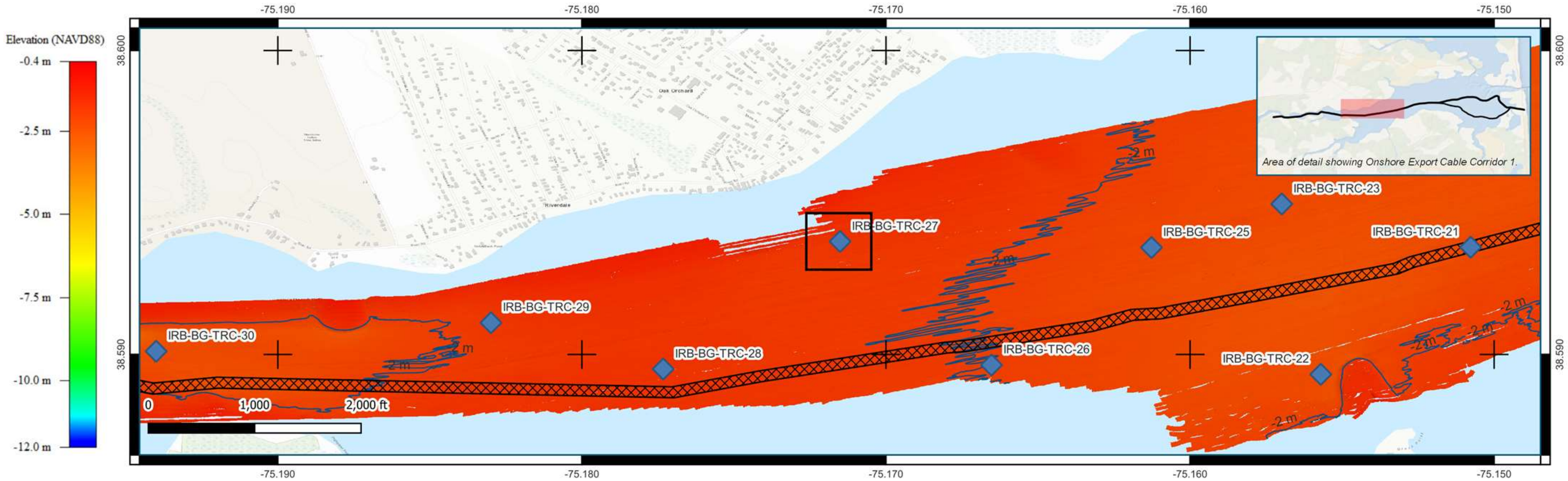
CMECS Habitat Classification	Substrate Subclass:	Fine Unconsolidated
	Substrate Group:	Mud
	Substrate Subgroup:	NA
Benthic Organism Density (individuals/m^2)[1]:		21.5
Taxa Richness[1]:		1

[1]All metrics calculated after taxonomic ambiguity in the dataset was resolved using the RPMC-G method described in Cuffney et al. (2007).

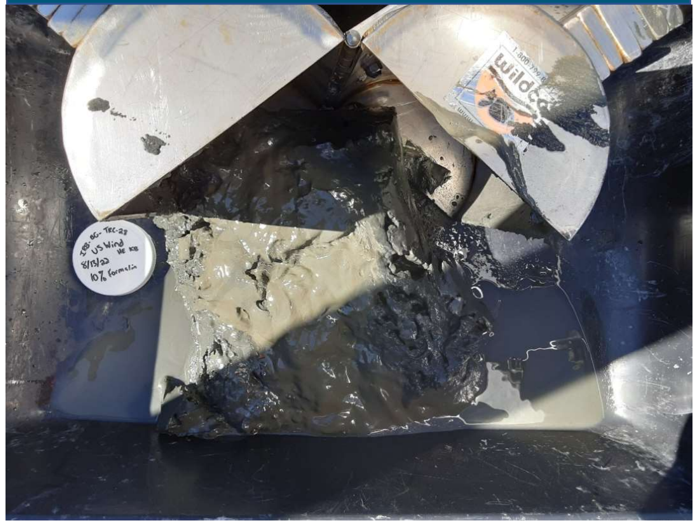
Benthic Organism Density by Taxa Group



Map of Benthic Grab Location



Sample Photograph



Benthic Grab IRB-BG-TRC-28

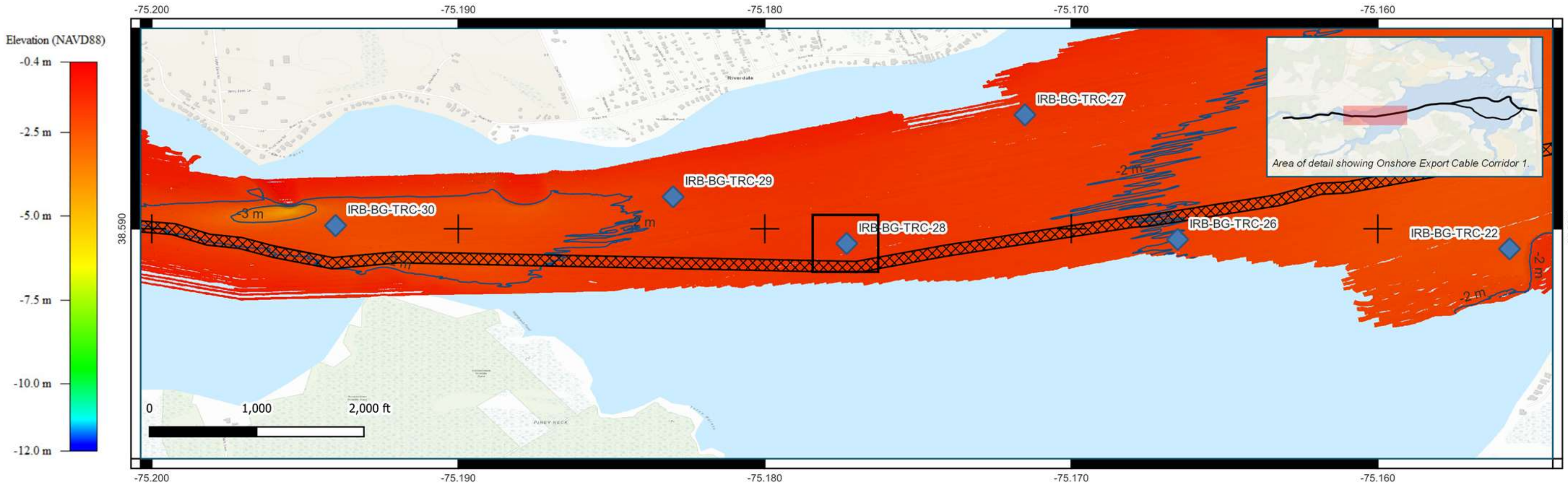
CMECS Habitat Classification	Substrate Subclass:	Fine Unconsolidated
	Substrate Group:	Mud
	Substrate Subgroup:	NA
Benthic Organism Density (individuals/m^2)[1]:		0.0
Taxa Richness[1]:		0

[1]All metrics calculated after taxonomic ambiguity in the dataset was resolved using the RPMC-G method described in Cuffney et al. (2007).

Benthic Organism Density by Taxa Group

No Infaunal Organisms Identified in Sample

Map of Benthic Grab Location



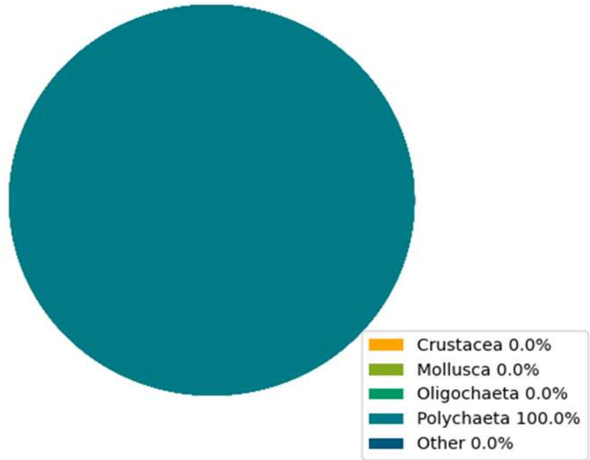
Sample Photograph

Benthic Grab IRB-BG-TRC-29

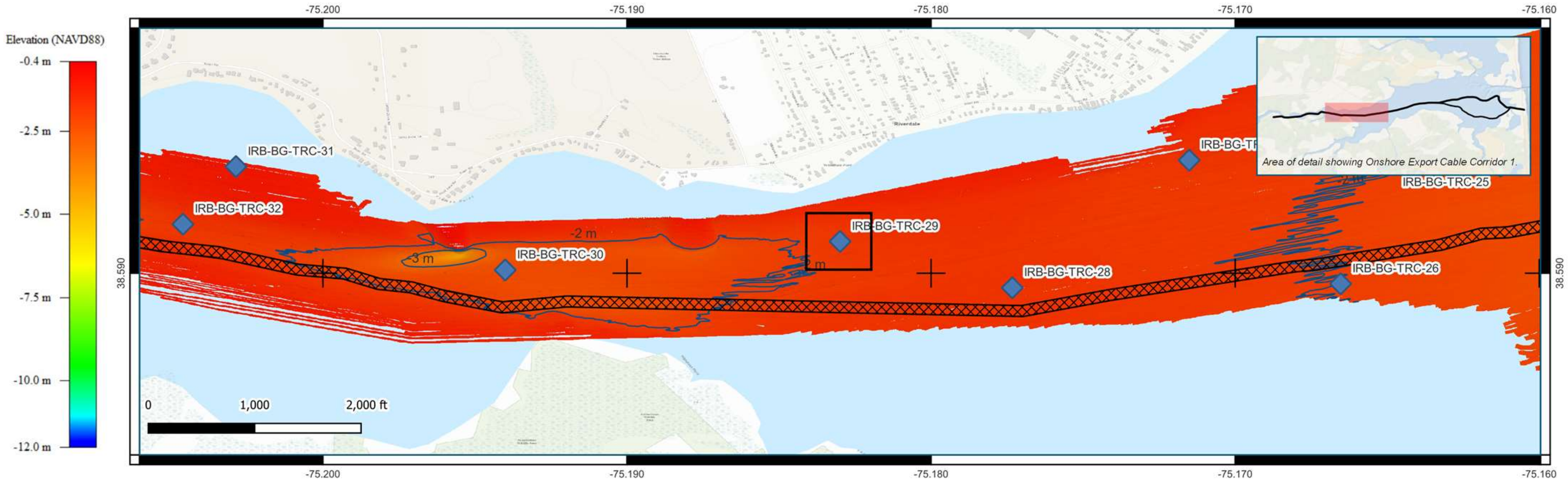
CMECS Habitat Classification	Substrate Subclass:	Fine Unconsolidated
	Substrate Group:	Mud
	Substrate Subgroup:	NA
Benthic Organism Density (individuals/m^2)[1]:		861.1
Taxa Richness[1]:		3

[1] All metrics calculated after taxonomic ambiguity in the dataset was resolved using the RPMC-G method described in Cuffney et al. (2007).

Benthic Organism Density by Taxa Group



Map of Benthic Grab Location



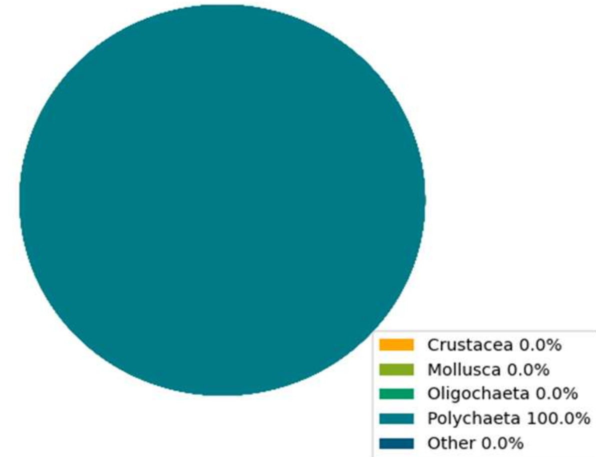
Sample Photograph

Benthic Grab IRB-BG-TRC-30

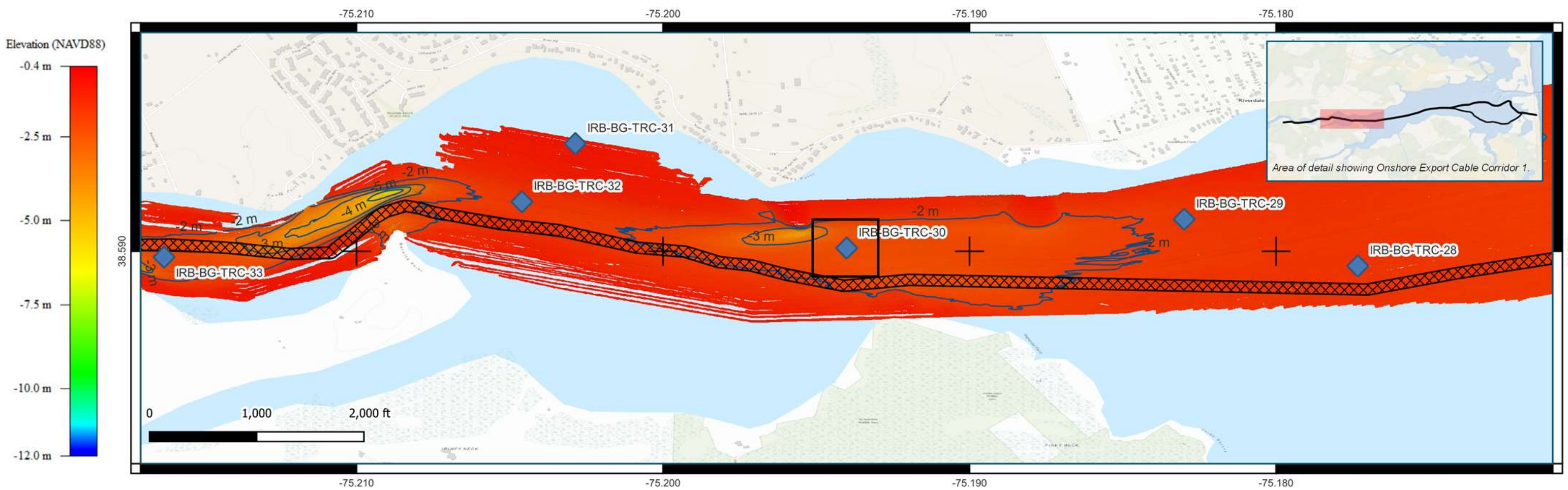
CMECS Habitat Classification	Substrate Subclass:	Fine Unconsolidated
	Substrate Group:	Mud
	Substrate Subgroup:	NA
Benthic Organism Density (individuals/m^2)[1]:		387.5
Taxa Richness[1]:		3

[1]All metrics calculated after taxonomic ambiguity in the dataset was resolved using the RPMC-G method described in Cuffney et al. (2007).

Benthic Organism Density by Taxa Group



Map of Benthic Grab Location



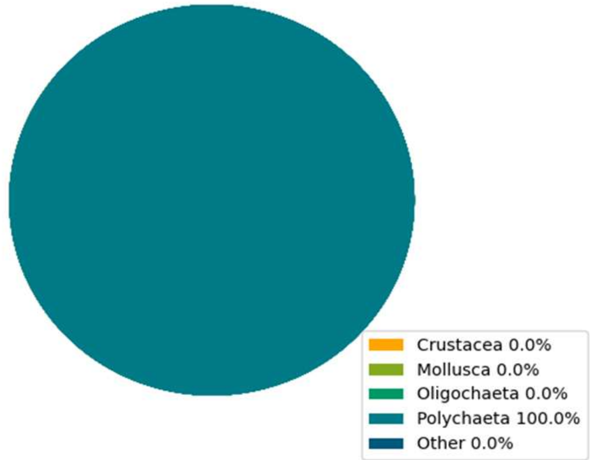
Sample Photograph

Benthic Grab IRB-BG-TRC-31

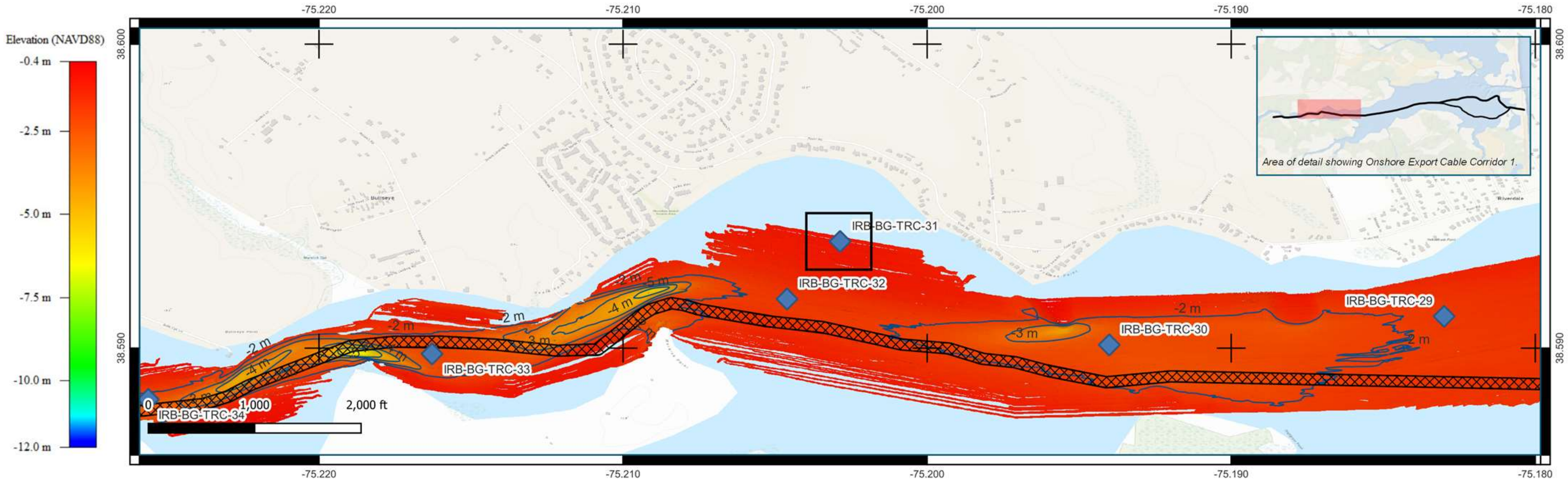
CMECS Habitat Classification	Substrate Subclass:	Fine Unconsolidated
	Substrate Group:	Mud
	Substrate Subgroup:	NA
Benthic Organism Density (individuals/m^2)[1]:		430.6
Taxa Richness[1]:		2

[1]All metrics calculated after taxonomic ambiguity in the dataset was resolved using the RPMC-G method described in Cuffney et al. (2007).

Benthic Organism Density by Taxa Group



Map of Benthic Grab Location



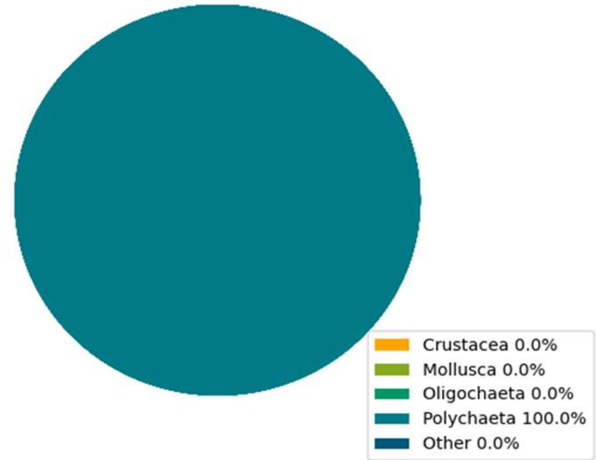
Sample Photograph

Benthic Grab IRB-BG-TRC-32

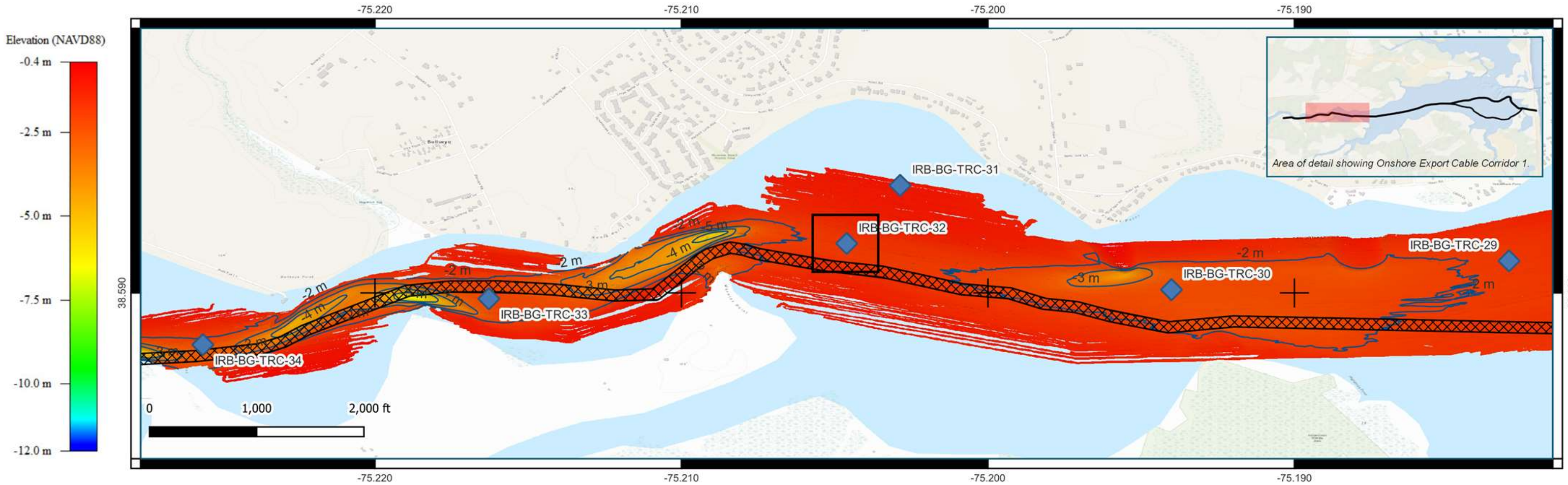
CMECS Habitat Classification	Substrate Subclass:	Fine Unconsolidated
	Substrate Group:	Mud
	Substrate Subgroup:	NA
Benthic Organism Density (individuals/m^2)[1]:		258.3
Taxa Richness[1]:		2

[1]All metrics calculated after taxonomic ambiguity in the dataset was resolved using the RPMC-G method described in Cuffney et al. (2007).

Benthic Organism Density by Taxa Group



Map of Benthic Grab Location



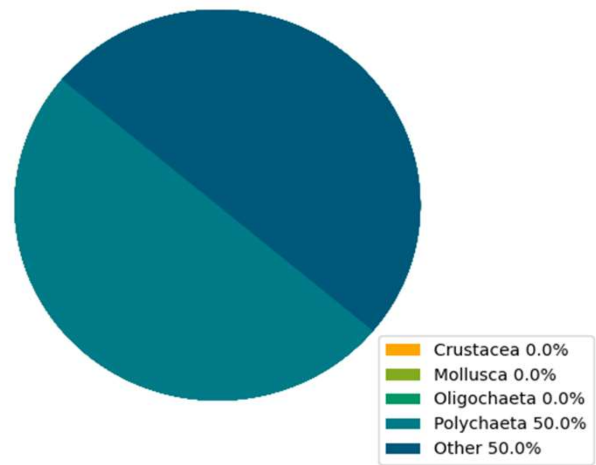
Sample Photograph

Benthic Grab IRB-BG-TRC-33

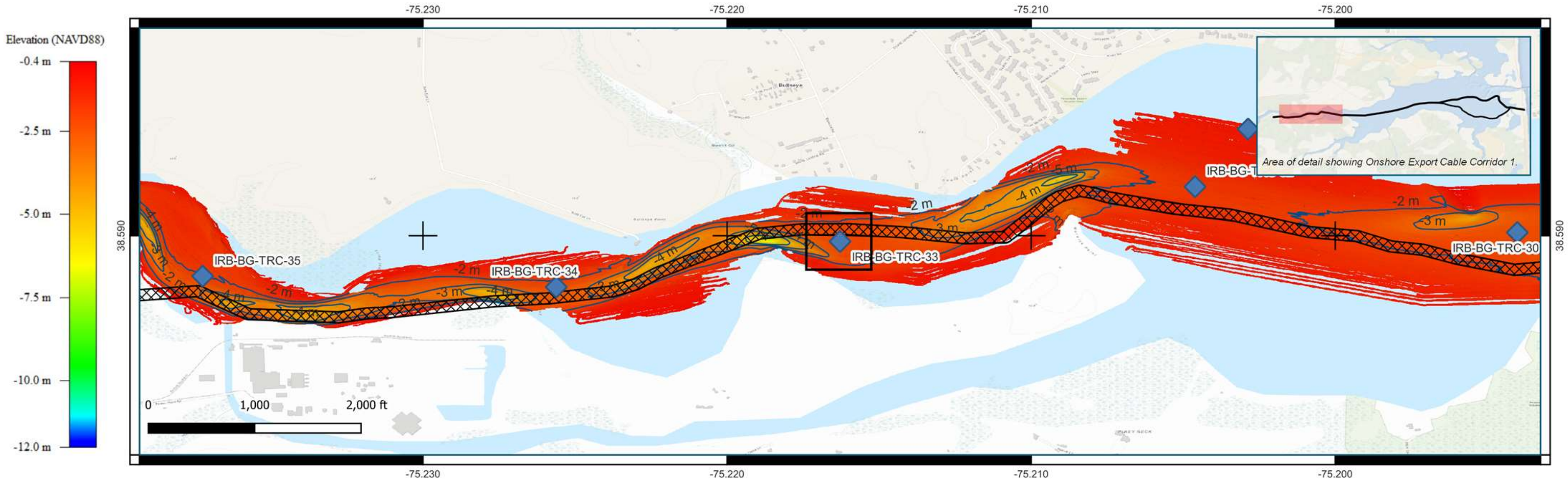
CMECS Habitat Classification	Substrate Subclass:	Fine Unconsolidated
	Substrate Group:	Mud
	Substrate Subgroup:	NA
Benthic Organism Density (individuals/m^2)[1]:		172.2
Taxa Richness[1]:		2

[1]All metrics calculated after taxonomic ambiguity in the dataset was resolved using the RPMC-G method described in Cuffney et al. (2007).

Benthic Organism Density by Taxa Group



Map of Benthic Grab Location



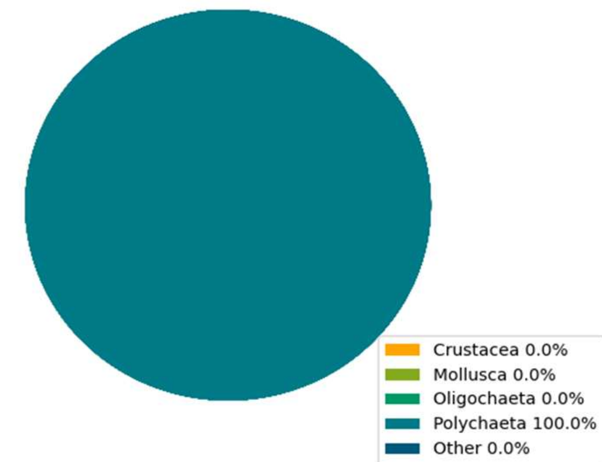
Sample Photograph

Benthic Grab IRB-BG-TRC-34

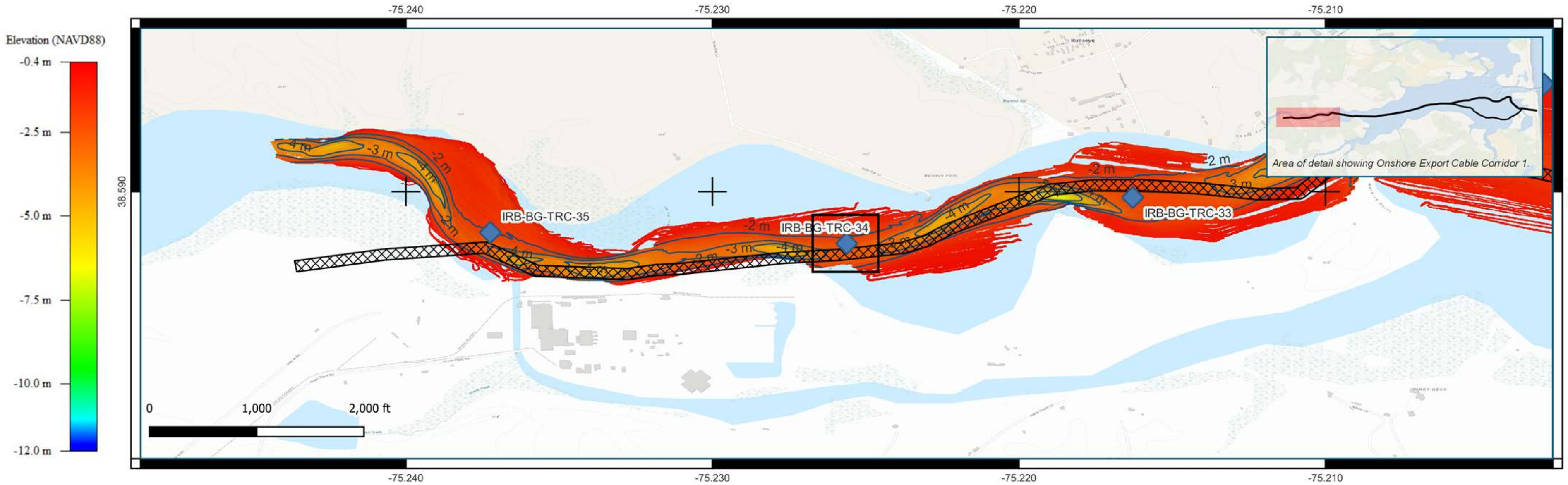
CMECS Habitat Classification	Substrate Subclass:	Fine Unconsolidated
	Substrate Group:	Mud
	Substrate Subgroup:	NA
Benthic Organism Density (individuals/m^2)[1]:		258.3
Taxa Richness[1]:		3

[1]All metrics calculated after taxonomic ambiguity in the dataset was resolved using the RPMC-G method described in Cuffney et al. (2007).

Benthic Organism Density by Taxa Group



Map of Benthic Grab Location



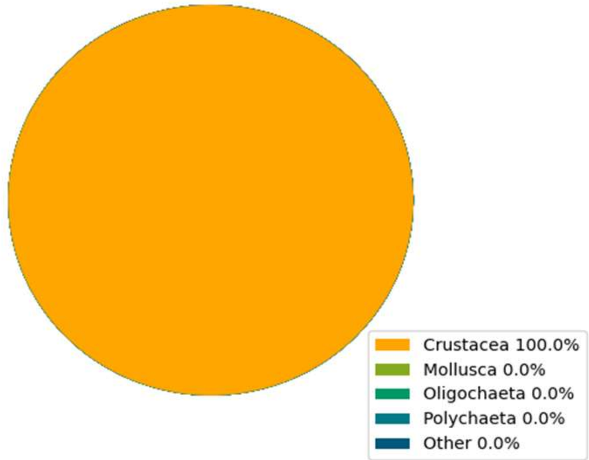
Sample Photograph

Benthic Grab IRB-BG-TRC-35

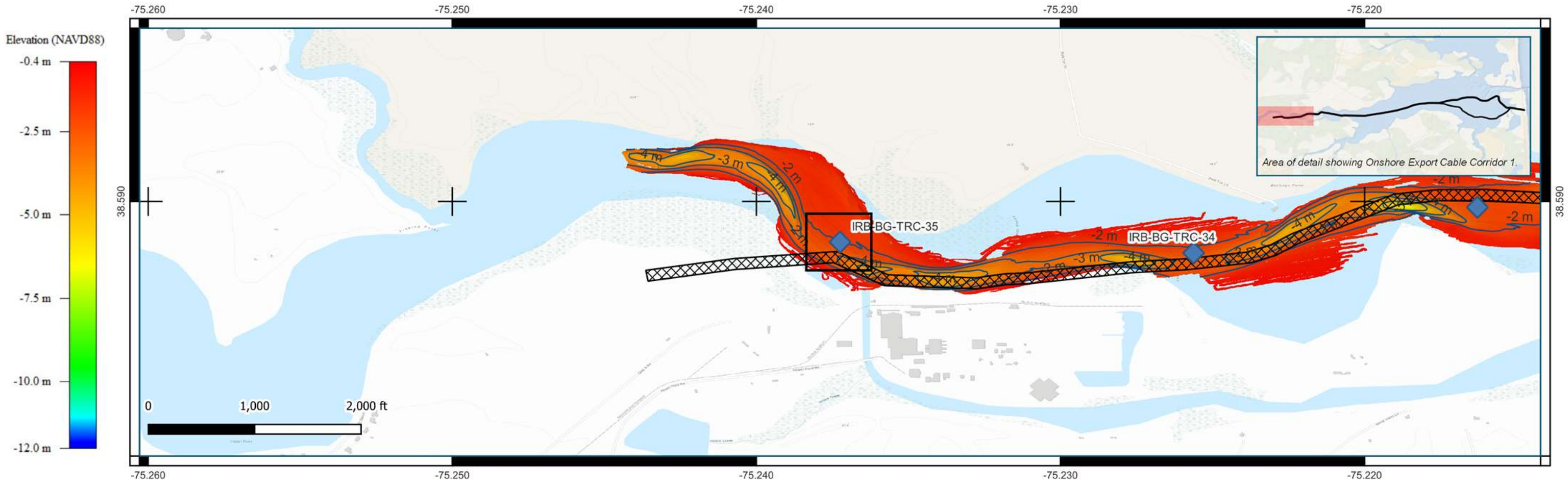
CMECS Habitat Classification	Substrate Subclass:	Fine Unconsolidated
	Substrate Group:	Mud
	Substrate Subgroup:	NA
Benthic Organism Density (individuals/m^2)[1]:		86.1
Taxa Richness[1]:		1

[1]All metrics calculated after taxonomic ambiguity in the dataset was resolved using the RPMC-G method described in Cuffney et al. (2007).

Benthic Organism Density by Taxa Group



Map of Benthic Grab Location



Attachment C. Indian River Bay Shellfish Density Survey Report

Indian River Bay Shellfish Density Survey Report

October 2022

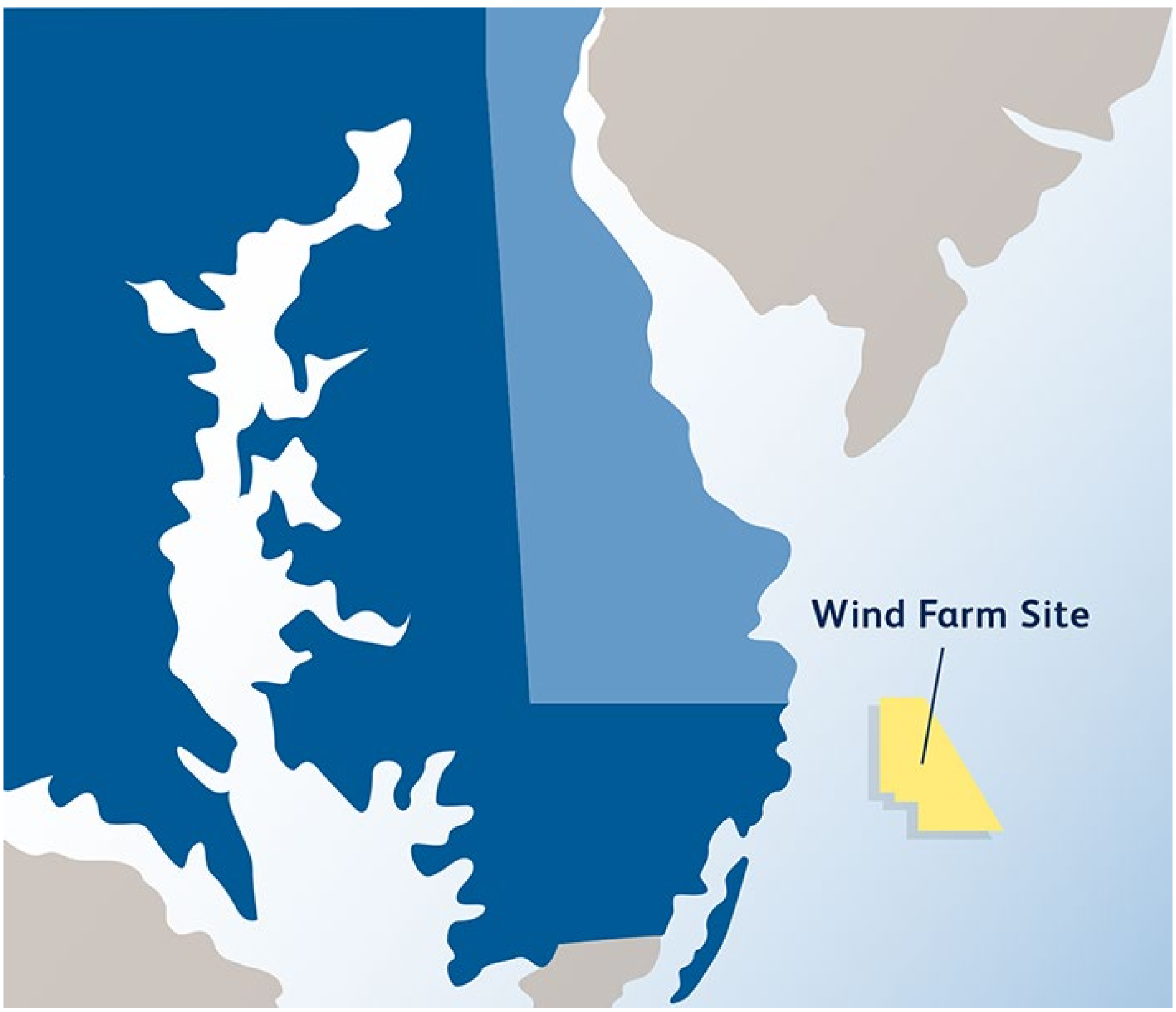
Maryland Offshore Wind Project

Prepared For:

US Wind, Inc.
Baltimore, MD

Prepared By:

TRC Companies
Waltham, MA



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Tables

Figures

1.0 Introduction

US Wind, Inc. (US Wind) is developing the Maryland Offshore Wind Project[1] (the Project), an offshore wind project of up to 2 gigawatts within OCS-A 0490 (the Lease), an area off the coast of Maryland on the Outer Continental Shelf. US Wind obtained the Lease in 2014 when the company won an auction for two leases from the Bureau of Ocean Energy Management (BOEM) which in 2018 were combined into the Lease. The Project will include as many as 121 wind turbine generators (WTG), up to four (4) offshore substations (OSS), and one (1) Met Tower in the roughly 80,000-acre Lease area. The Project is proposed to be interconnected to the onshore electric grid by up to four new 230 kV export cables into a substation in Delaware.

1.1 Purpose

US Wind plans to locate one of its planned export cable corridors, designated as Onshore Export Cable Corridor 1, within Indian River Bay (the Bay), Delaware. The Delaware Department of Natural Resources and Environmental Control (DNREC) has expressed concern in the past over export cables passing through the Bay due to high densities of hard clams (*Mercenaria mercenaria*) occurring along a previously proposed alignment (DNREC 2017). TRC undertook a shellfish density survey in Onshore Export Cable Corridor 1 from August 10 to 11, 2022. The goal of this survey was to determine the existing shellfish density and distribution within Onshore Export Cable Corridor 1 and compare the results to previous shellfish density surveys conducted within Indian River Bay.

1.2 Prior Research Efforts

Shellfish density field sampling locations were selected to supplement and update existing available historical data collected in Indian River Bay.

The most recent shellfish survey of Indian River Bay available on public record was completed by DNREC staff in 2011. Bott and Wong (2012) focused on hard clam (*Mercenaria mercenaria*) distributions and densities within Rehoboth Bay and Indian River Bay. They reported that hard clam densities were generally low throughout Indian River Bay, with concentrated high densities in shallow mobile sandy bottom areas off of Walter Point and within Beach Cove inside the Bay (Figure 1-1).

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[1] The Project includes MarWin, a wind farm of approximately 300 MW for which US Wind was awarded Offshore Renewable Energy Credits (ORECs) in 2017 by the state of Maryland; Momentum Wind, a wind farm of approximately 808 MW for which US Wind was awarded ORECs in 2021 by the state of Maryland; and any subsequent development within the Lease area.

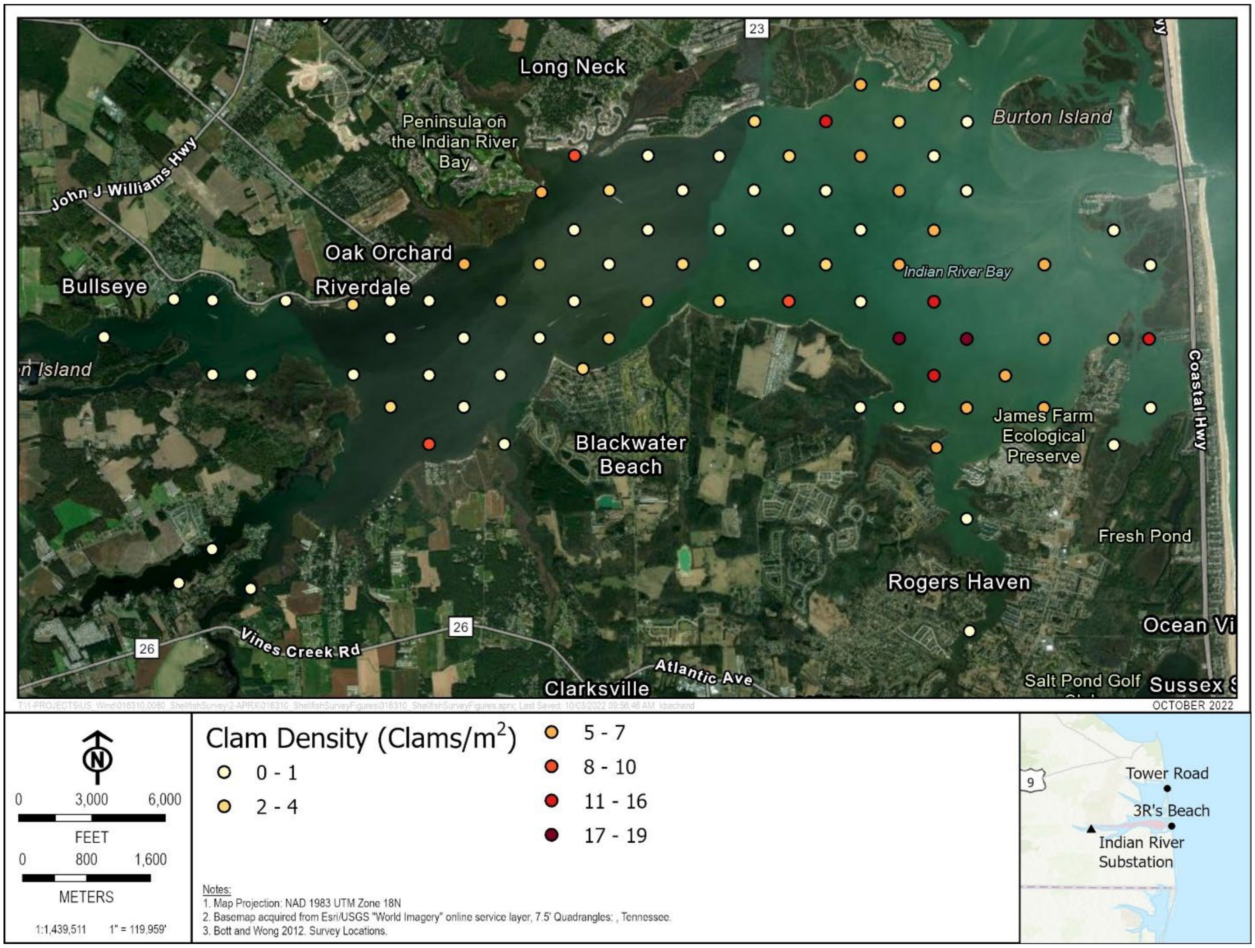

Figure 1-1. Location and Hard Clam Densities for the Bott and Wong (2012) Study

2.0 Approach

2.1 Study Area

The defined area of study was in Indian River Bay, Delaware, within the proposed Onshore Export Cable Corridor 1, as shown on Figure 2-1.

Alignment of the export cables within Onshore Export Cable Corridor 1 was not final at the time of sampling. Therefore, the limits of Onshore Export Cable Corridor 1 were used to define the general limits of field investigation activities.

Initial sampling locations were the same as those in the Bott and Wong (2012) study. TRC has performed previous shellfish density surveys, typically in shallow water accessed via wading and sampled with a shellfish rake. Due to this previous experience, TRC elected to use this same sampling method (detailed in Section 2.2). As a result, only sites in the easternmost section of Onshore Export Cable Corridor 1 were surveyed. This resulted in 11 initial sites, located in shallow areas consisting of mostly sand, with a mix of silts and mud. Upon arrival in Delaware, additional sites (two total) were included based on anecdotal information learned from locals, who were familiar with the locations of shellfish harvest areas within Indian River Bay. This resulted in a total of 13 locations sampled as part of the shellfish density survey.

Upon completion of the shellfish density survey, TRC also collected benthic grabs to assess the benthic community living within Indian River Bay (Indian River Bay Benthic Report, 2022). These locations were also based on the Bott and Wong (2012) survey but consisted of the locations not covered in the shellfish density survey to prevent double counting. Any shellfish observed in the process of sampling were also included in this analysis, resulting in an additional 35 sites as seen in Figure 2-1.

In considering both the shellfish density survey and the benthic community survey, this report assesses the shellfish collected from both surveys for a total of 48 locations.

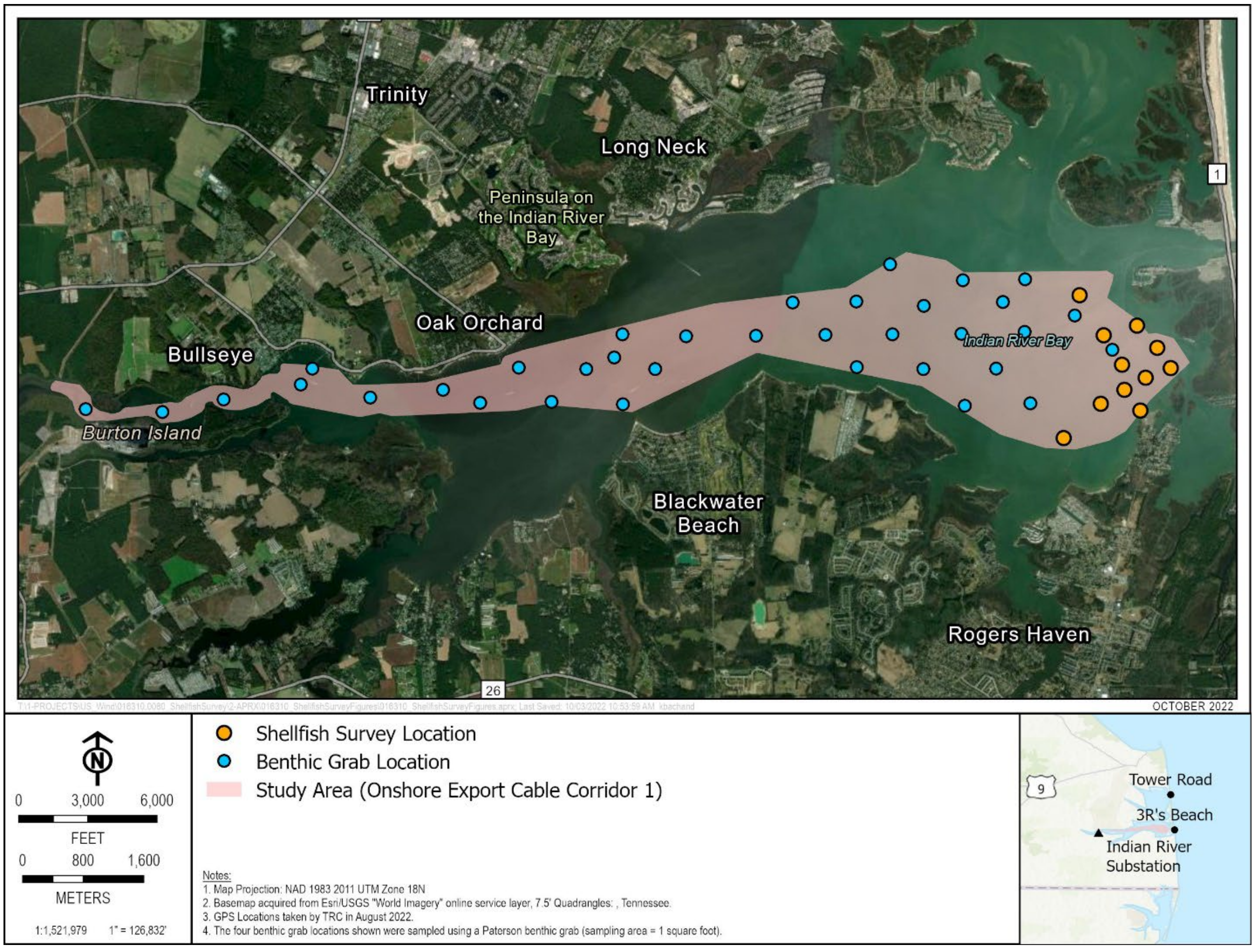

Figure 2-1. Shellfish Sampling Locations.

2.2 Sample Collection

2.2.1 Shellfish Density Survey

The study area was accessed using the S.T. Hudson Engineers, Inc. vessel, the *MV Almar-31.* For safety and effective sampling, the water depth needed to be no more than 4 feet (ft; 1.2 meters [m]) deep at the time of sampling.

Shellfish samples were collected via wading to each sample location using a GPS device (Bad Elf). The Bad Elf was connected via Bluetooth to a Samsung Galaxy Tab A tablet, allowing the field crew to see their current location to an accuracy of approximately 10-30 ft (3-9 m). Data was collected using a Fulcrum generated form, which recorded the latitude and longitude of the sample location. Additional data collected included date and time of sampling, water depth, shellfish information (i.e., species, length), and general information on other infauna species observed during sampling.

Upon arrival to each shellfish density sample location, a square meter PVC quadrat was deployed underwater. A 10-inch (in; 25-centimeter [cm]) clam rake modified with a mesh wire sieve was used to dig approximately 5 in (12 cm) into the bottom substrate within the full quadrat area. The total area was raked two to three times to ensure the entire surface was sampled. Animals and organic material found were noted in the field tablet. If shellfish were found, they were placed in a bucket, brought on-board, measured with calipers and a photo was taken for taxonomic ID reference. The shellfish were then released back where they were collected.

2.2.2 Benthic Community Survey

Sampling for the benthic community survey was done from the *Almar-31*. Navigation to each location was confirmed using the vessel's onboard navigation system, Applanix POSMV 320. As stated above, shellfish observed throughout the process of the benthic community survey were included in this analysis to provide a greater spatial coverage than the shellfish density locations that could be accessed via wading.

Benthic grabs were collected using a Peterson grab sampler (sampling area 144 in^2 [929 cm^2]), which was deployed from the bow of the boat. Once a sample was successfully collected, the grab was opened and the sediment was emptied into a large container. The contents were evenly spread into fractions for subsampling and further processing. Shellfish present were measured, photographed, and released in the same manner as during the shellfish density survey.

2.3 Data Analysis

This report focuses on data related to shellfish species density and distribution. The analysis of the benthic community found within Indian River Bay will be discussed under separate cover.

Data on shellfish observed was extracted from the Fulcrum form and processed for use in GIS software. This was done for both the shellfish density survey and the benthic community survey. For ease of analysis, the data from both surveys was combined into a single data set. Densities were reported in clams per square meter ($clam/m^2$). For the benthic grab locations, density was calculated based on the size of the Peterson grab sampling area to determine clams per square meter.

The results of the surveys were then mapped using ArcPro (ESRI 2021) to examine shellfish trends within Onshore Export Cable Corridor 1. The metrics examined were shellfish density per location and shellfish size per location. The mean size was found where applicable.

3.0 Results

The only live shellfish observed were hard clams (see Figure 3-1). Sampled sites included crushed shells of various sizes, which consisted mostly of razor clam shells and the occasional hard clam shell.

Figure **3-1. Hard Clams Found during Survey Efforts**

3.1 Shellfish Density

Of the thirteen sites sampled as part of the shellfish density survey, shellfish were collected at two locations (IRB-SF-TRC-10A and IRB-SF-TRC-12). Shellfish were also collected at an additional four sites from the benthic community survey (IRB-BG-TRC-02, IRB-BG-TRC-05, IRB-BG-TRC-17, and IRB-BG-TRC-23). Densities observed ranged from 1 clam/m^2 to 32.3 clam/m^2. The highest densities were found on the western portion of the study area. Results are shown in Figure 3-2.

The sampling site with the highest clam density was part of the benthic community survey (IRB-BG-TRC-23). This site was chosen because of an irregular area of the Bay bottom captured by the side scan sonar during the geophysical survey completed by S.T. Hudson Engineers Inc. in May-June 2022 and recommended for further investigation (S.T. Hudson 2022). The initial benthic grab at this location collected three hard clams, translating to a density of 32.3 clam/m^2. After further discussion, the site was revisited to determine if more hard clams were present. However, after two investigative benthic grabs, no additional hard clams were collected.

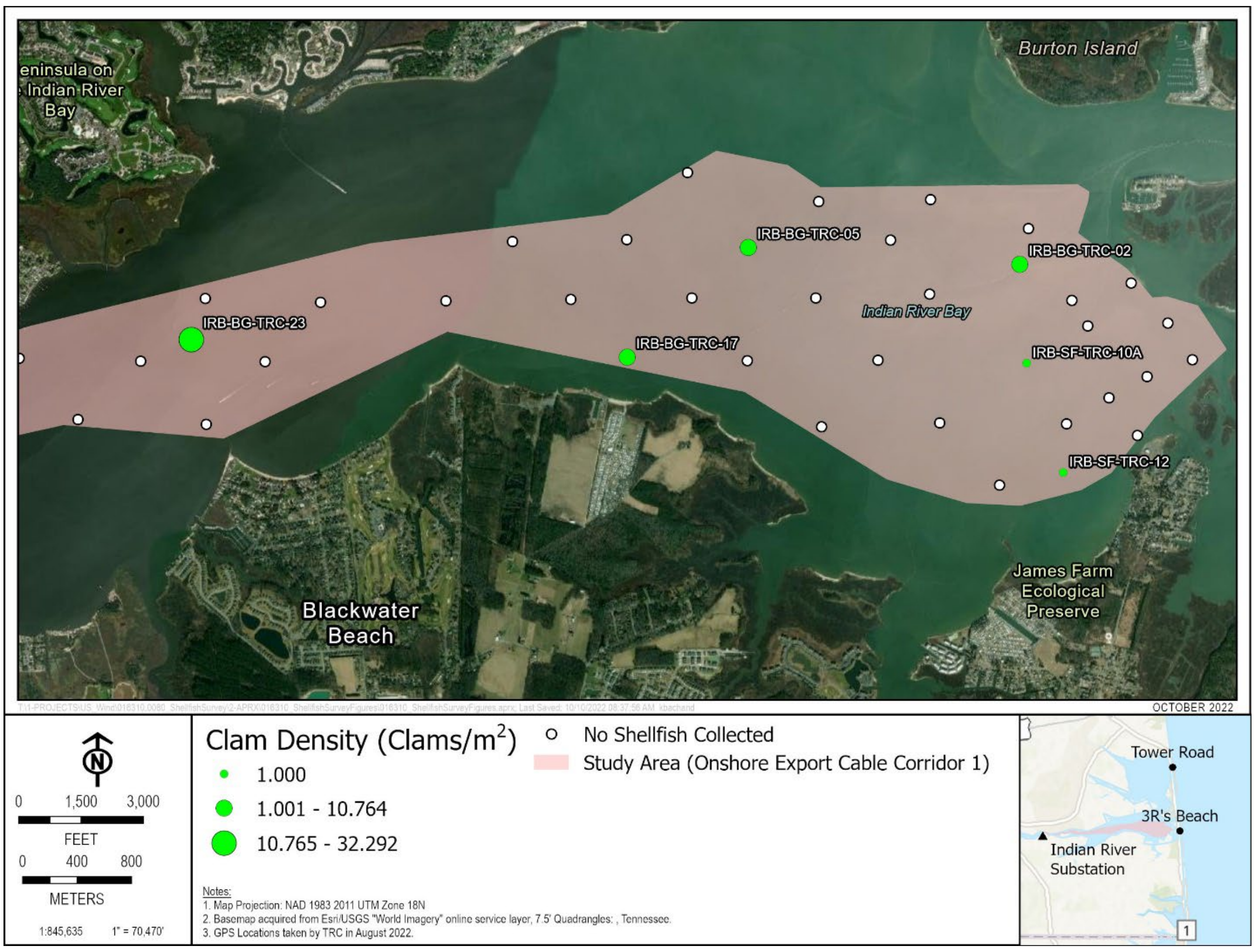

Figure 3-2. Clam Density within the Study Area

3.2 Shellfish Size

Sizes of hard clams collected during the survey are shown in Table 3-1. The largest clam collected was 11.0 cm from IRB-BG-TRC-23. The smallest clam collected was 3.7 cm from IRB-BG-TRC-02. The average size of collected clams was larger on the eastern side of the study area (toward the Indian River Bay Inlet) than the western side (toward Indian River) (Figure 3-3).

Table 3-1. Clam Size per Location

Sampling Location	Length (cm)
IRB-SF-TRC-10A	8.8
IRB-SF-TRC-12	8.8
IRB-BG-TRC-02	3.7
IRB-BG-TRC-05	6.9
IRB-BG-TRC-17	5.1
IRB-BG-TRC-23	11.0 8.8 5.7

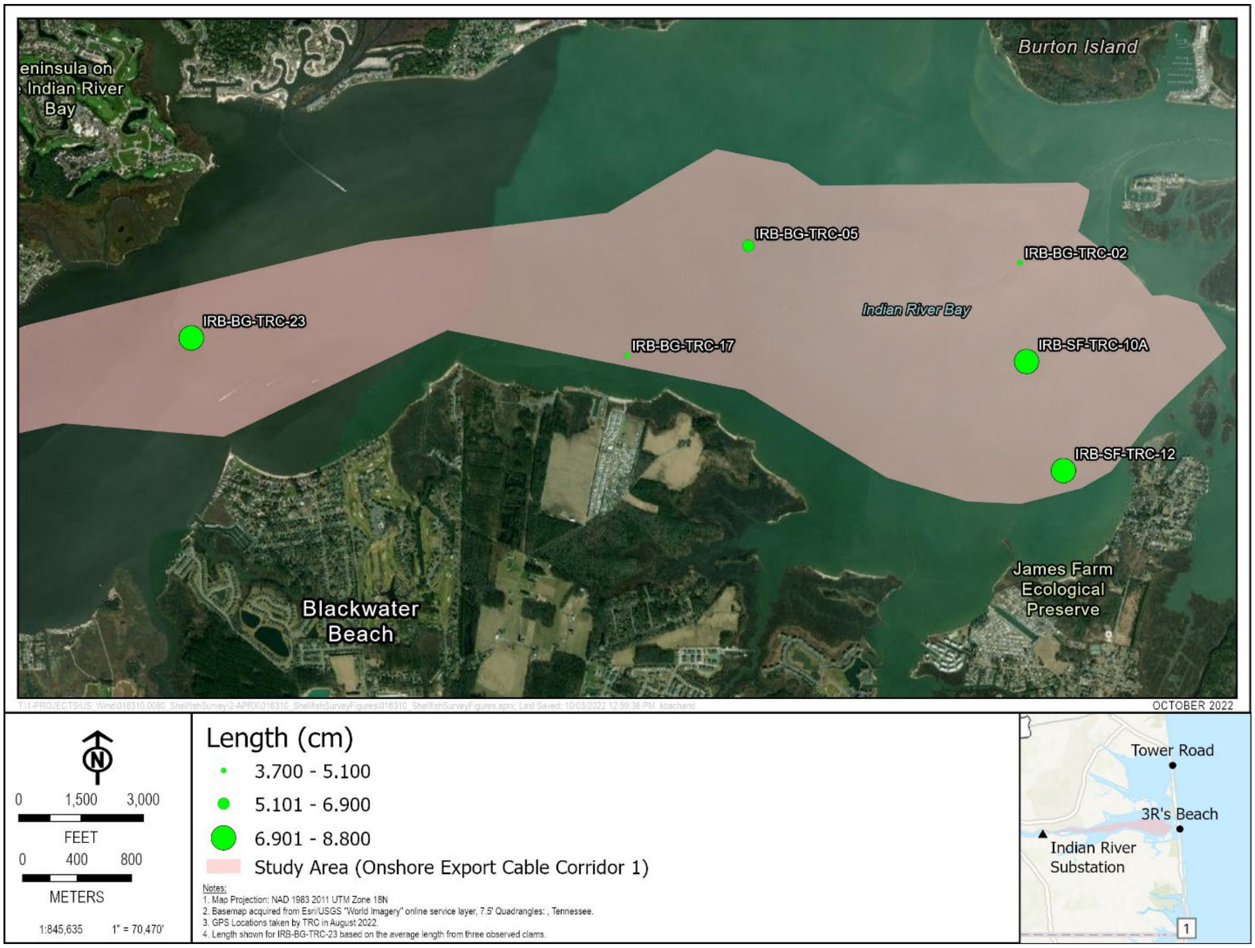

Figure 3-3. Clam Length within the Study Area

4.0 Summary and Conclusions

The field data indicates that shellfish density within the Indian River Bay (specifically Onshore Export Cable Corridor 1) is generally low.

The legal size of clams to be harvested in Delaware is 1.5 inches (3.8 cm) across the shell (DNREC 2022). All of the collected clams were above the legal size except one, found at IRB-BG-TRC-02 (3.7 cm [1.46 in]). The majority of Indian River Bay is open to the harvesting of shellfish year-round. The only area where shellfish harvesting is prohibited for any reason at any time that fell within the study area (both the shellfish density survey and the benthic community survey) is within Indian River just past Oak Orchard, Delaware (DNREC 2022).

In comparing the TRC 2022 study with the Bott and Wong (2012) study, the studies came to the same conclusion: that shellfish densities within Indian River Bay are low (Bott and Wong 2012). The main difference is that the survey location with the highest clam density was in a different area of the Bay. For Bott and Wong (2012), the highest densities were observed in the White Creek area in the southeastern side of the study area (Bott and Wong 2012). For the TRC study, although the highest density was observed towards the mouth of Indian River, north of Holts Landing State Park, no shellfish were collected at any other locations in this area.

Various long-term environmental factors may impact shellfish densities within Indian River Bay. These include but are not limited to dissolved oxygen concentrations, food availability, water temperature, salinity, sedimentation, predation, and fishing pressure.

Based on the results of this study, shellfish density within Indian River Bay, particularly Onshore Export Cable Corridor 1, are low. Therefore, the installation of export cables for the Maryland Offshore Wind Project would have a low impact on shellfish resources within Indian River Bay.

5.0 References

Bott, M., and R. Wong. 2012. *Hard Clam (Mercenaria mercenaria) Population Density and Distribution in Rehoboth Bay and Indian River Bay, Delaware.* Delaware Department of Natural Resources and Environmental Control.

Department of Natural Resources and Environmental Control (DNREC). 2017. "ESS 2017 Maryland Offshore Wind Energy Project."

---. 2022. *Shellfish Harvest Areas*. Interactive Map, Details Section. Accessed September 27, 2022. https://dnrec.maps.arcgis.com/apps/OnePane/basicviewer/index.html?appid=bb37754f376349198c76e2cba80732bd#:~:text=Remember%20a%20fishing%20license%20is,2%20inches%20across%20the%20shell.

ESRI Inc. 2021. ArcGIS Pro 2.9.0.

S.T. Hudson Engineers Inc. (S.T. Hudson). 2022. *US Wind – Nearshore Marine High Resolution Geophysical Services Geophysical Survey Final Report*. Draft Report, July 28, 2022.